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(54) **FABRIC ARTICLE TREATING DEVICE AND SYSTEM**

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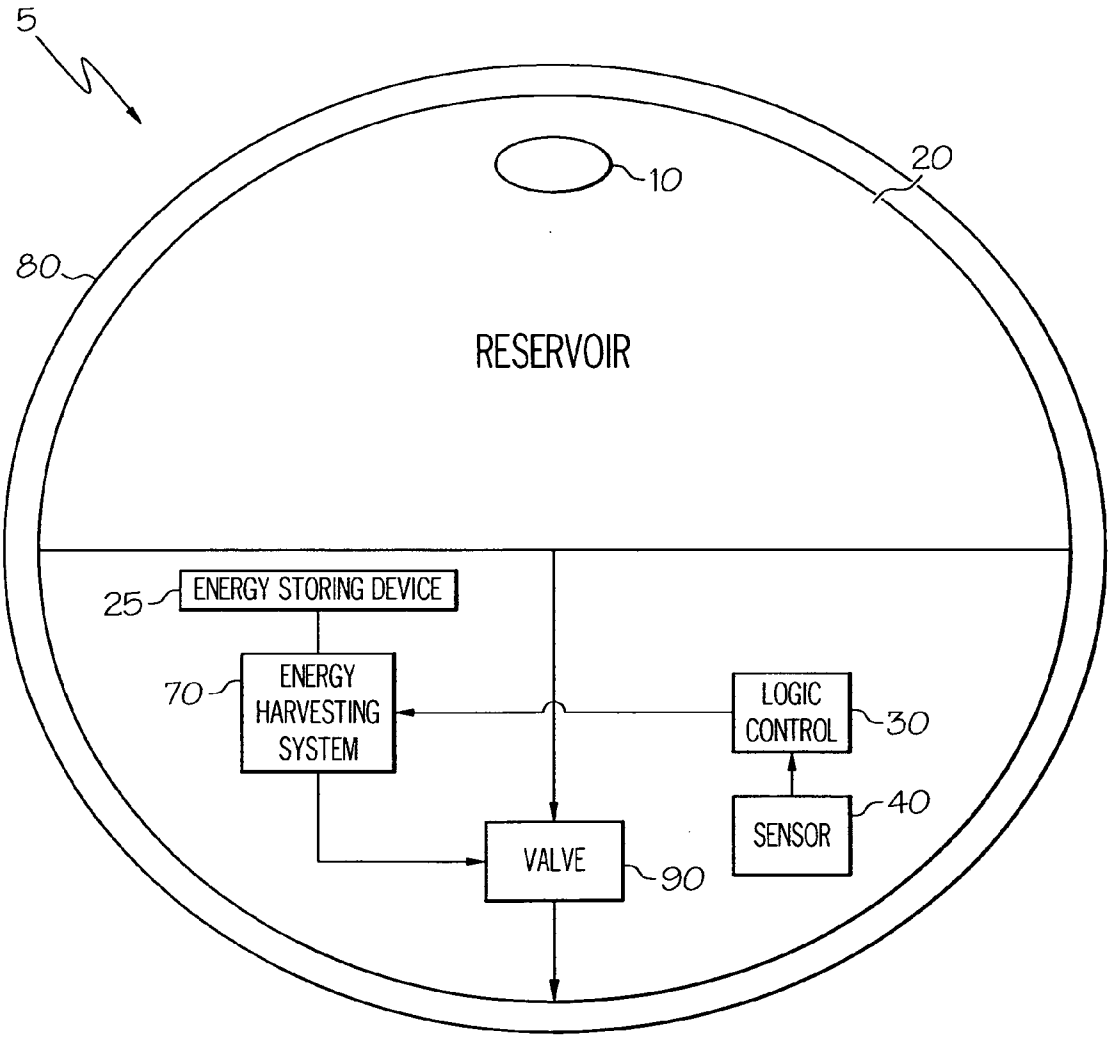
(57) **ABSTRACT**

A fabric article treating device for dispensing benefit composition to a fabric article treating appliance. The device includes a housing which contains a reservoir, an energy harvesting system, an energy storing device, a fluid handling system and a control unit. The reservoir contains a benefit composition. The control unit is adapted to control dispensing of benefit composition from the device utilizing the fluid handling system. The energy harvesting system is adapted to convert mechanical or thermal energy into electrical energy.



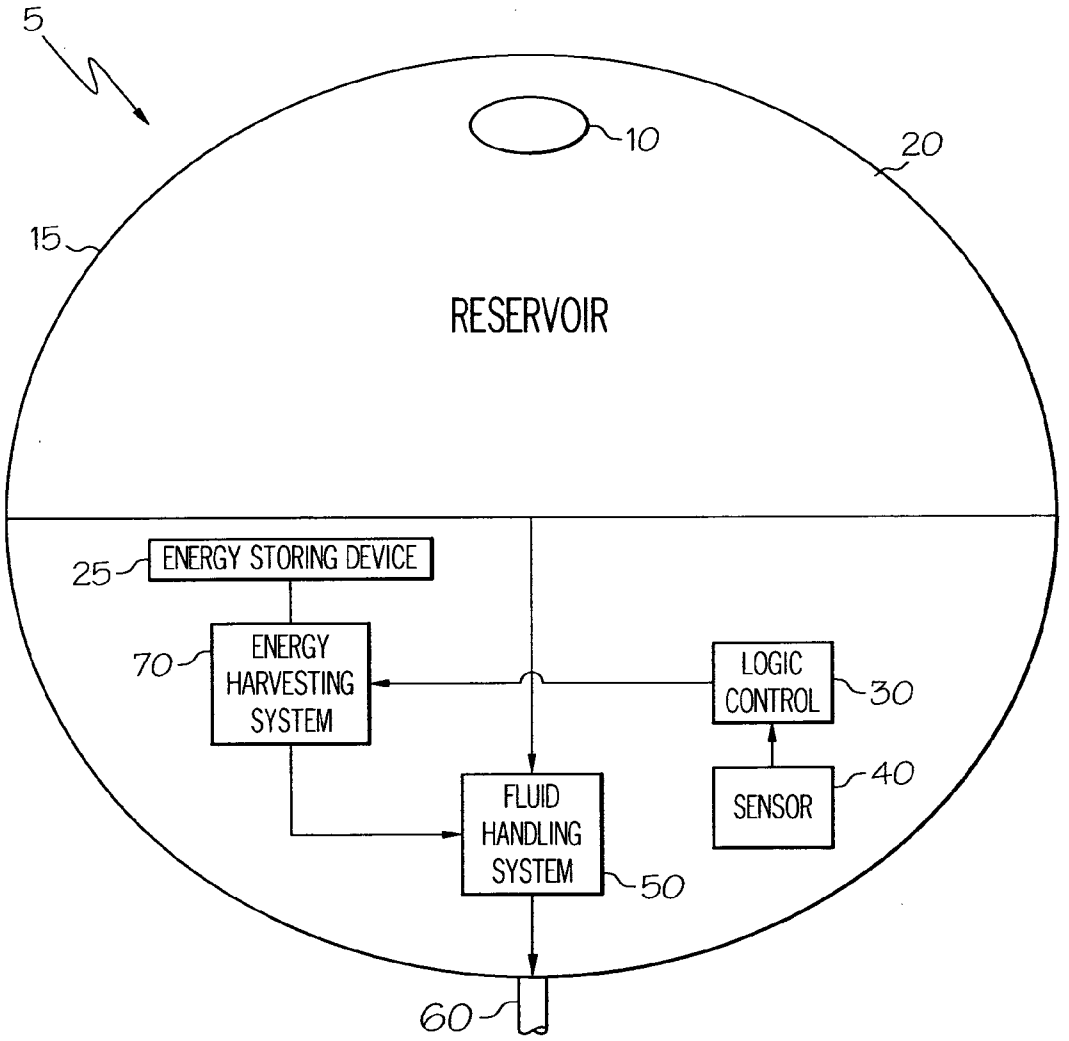

5
10
20
15
RESERVOIR
25
ENERGY STORING DEVICE
70
ENERGY HARVESTING SYSTEM
LOGIC CONTROL
30
SENSOR
40
FLUID HANDLING SYSTEM
50
60

FIG. 1

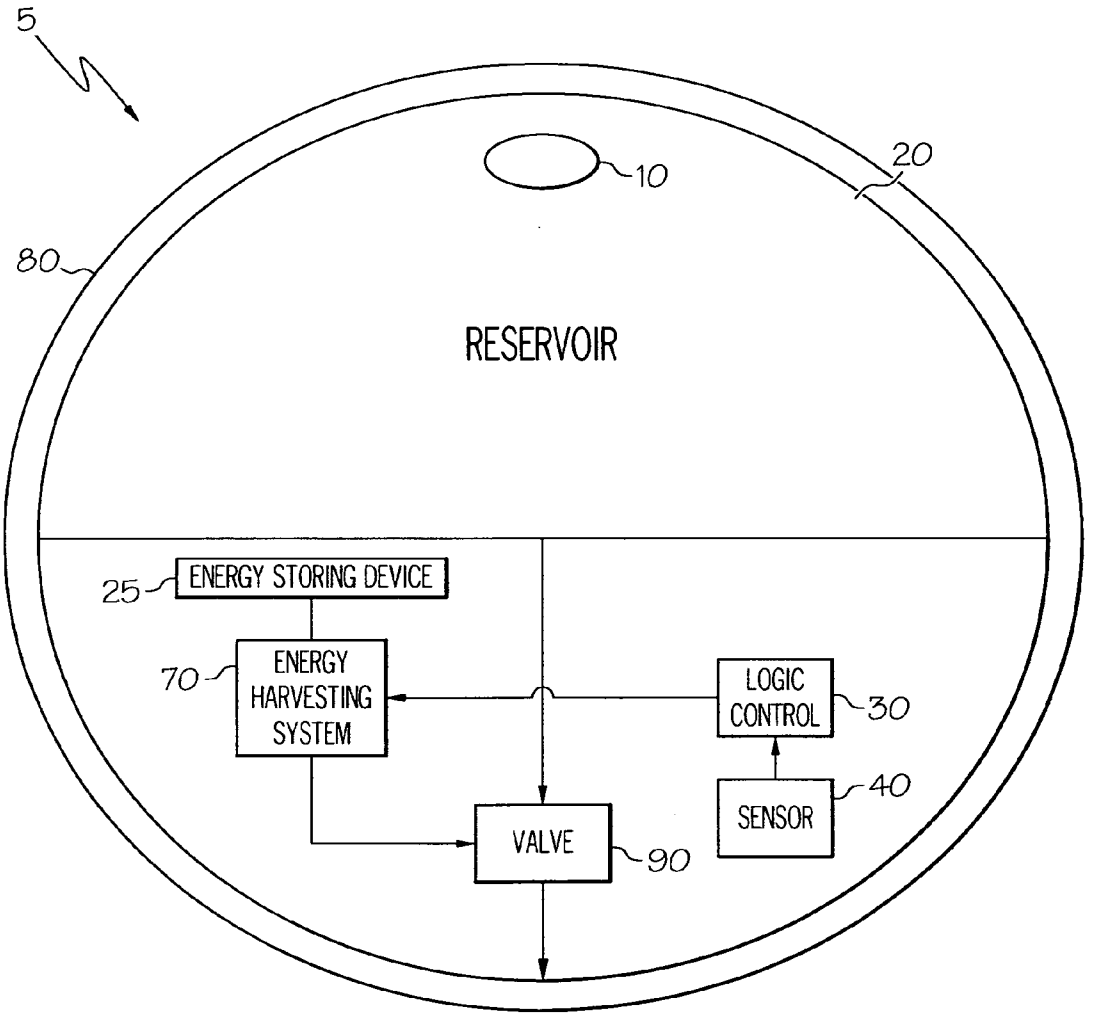

5
10
20
80
RESERVOIR
25
ENERGY STORING DEVICE
70
ENERGY HARVESTING SYSTEM
LOGIC CONTROL
30
SENSOR
40
VALVE
90

FIG. 2

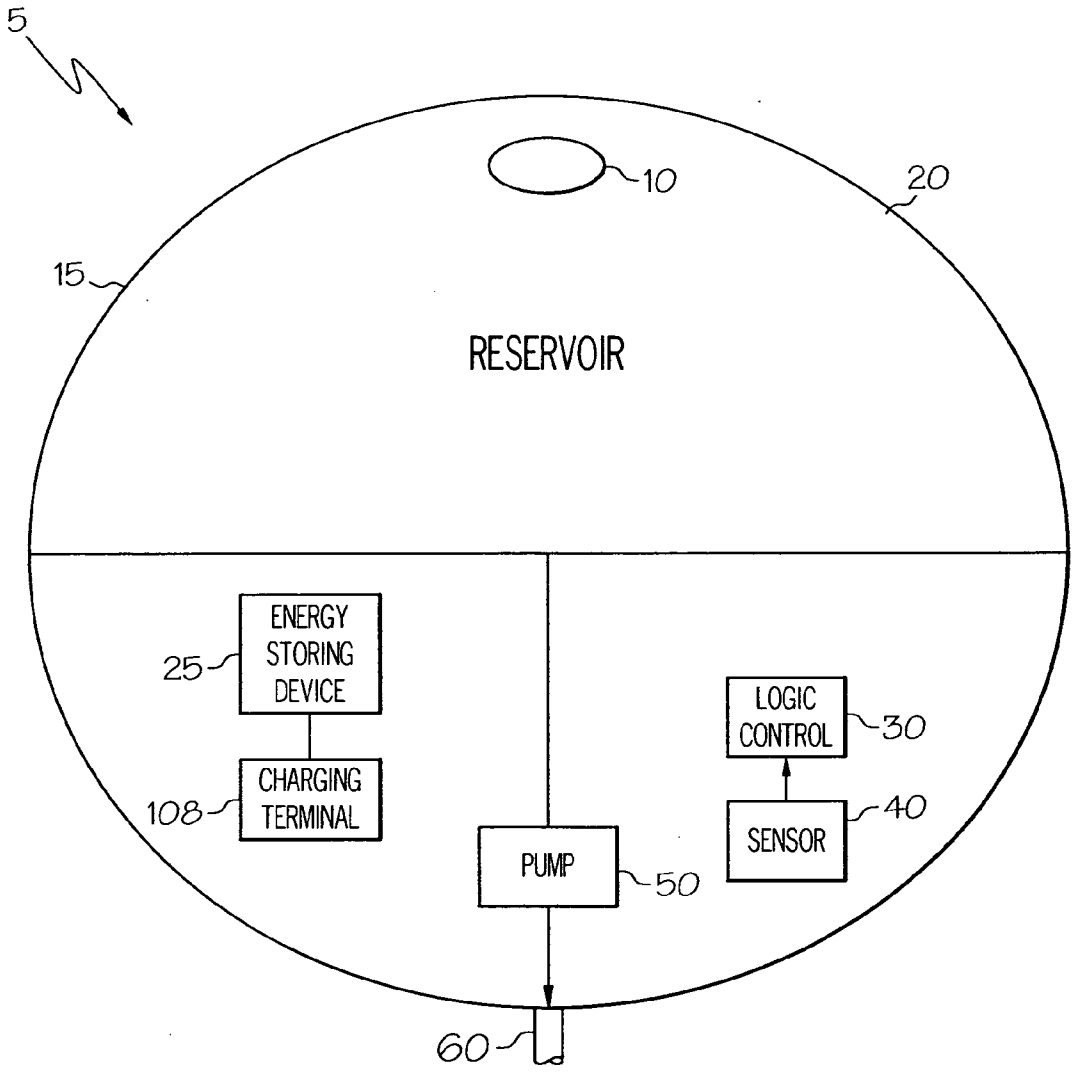

5
10
20
15
RESERVOIR
ENERGY STORING DEVICE
25
CHARGING TERMINAL
108
LOGIC CONTROL
30
SENSOR
40
PUMP
50
60

FIG. 3

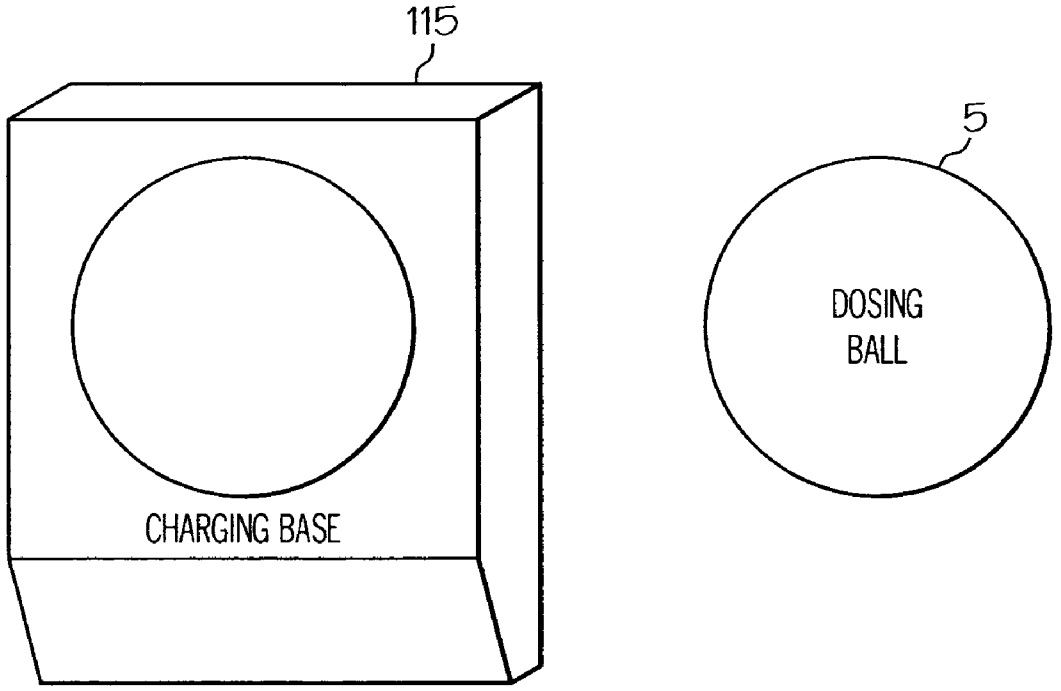


FIG. 4

FABRIC ARTICLE TREATING DEVICE AND SYSTEM

FIELD OF THE INVENTION

[0001] 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 for dispensing a benefit composition employing a self-contained housing and reservoir.

BACKGROUND OF THE INVENTION

[0002] Fabric article treating methods and/or apparatus have been evolving over the past twenty years. An ongoing need exists 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 apparatus. To date, various dosing devices have been utilized to distribute a benefit agent onto fabric articles. One example of such a device, is a fabric softener ball, wherein the ball contains a reservoir holding a certain amount of the benefit agent to be dispensed onto the fabric articles while in a fabric article drying appliance. These devices typically have no interior sensors or electronics to decide when to dispense the fabric article treating composition Moreover, due to the particularly high heat environment present in a fabric article drying appliance, devices that employ batteries to help power interior sensor or electronics have drawbacks, since the high heat environment of a dryer typically drains the batteries quickly of their charge and can even lead to destruction of the batteries in the device. As such, it would be advantageous to provide a fabric article treating device which can be inserted into a fabric article drying appliance, wherein the fabric article treating device is adapted to dispense the benefit compositions to the fabric article in the fabric article drying appliance at optimum times.

SUMMARY OF THE INVENTION

[0003] 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 which are capable of operating in a high temperature environment, such as a fabric article drying appliance, and contain the ability to dispense the benefit compositions at the optimum time to the fabric articles in the fabric article drying appliance.

[0004] One embodiment of the present invention is a fabric article treating device. The device comprises: a housing with at least one reservoir configured to contain benefit composition; an energy harvesting system, wherein the energy harvesting system is adapted to convert mechanical or thermal energy into electrical energy; an energy storing device, wherein the energy storing device is adapted to store electrical energy from the energy harvesting system; a fluid handling system, wherein the fluid handling system is adapted to transport benefit composition from the reservoir to fabric in a fabric article drying appliance; and a control unit, wherein the control unit is adapted to control dispensing of benefit composition from the device.

[0005] Another embodiment of the present invention is a fabric article treating device. The device comprises: a housing with at least one reservoir configured to contain benefit composition; an energy storing device comprising a capacitor; a fluid handling system, wherein the fluid handling system is adapted to transport benefit composition from the reservoir to fabric in a fabric article drying appliance; and a control unit, wherein the control unit is adapted to control dispensing of benefit composition from the device.

[0006] Yet another embodiment of the present invention is method for treating a fabric article comprising delivering a benefit composition from the fabric article treating device of claim **1**. The method comprises drying the fabric article in a fabric article drying appliance. During the drying of the fabric article, a benefit composition is delivered from the fabric article treating device to the fabric article. In addition, during the drying of the fabric article, electrical energy is harvested from mechanical or thermal energy and stored in the energy storing device.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed that the same will be better understood from the following description taken in conjunction with the accompanying drawings in which:

[0008] FIG. **1** is a schematic illustration of an exemplary fabric article treating device according to a first embodiment of the present invention;

[0009] FIG. **2** is a schematic illustration of an exemplary fabric article treating device according to a second embodiment of the present invention;

[0010] FIG. **3** is a schematic illustration of an exemplary fabric article treating device according to a third embodiment of the present invention; and

[0011] FIG. **4** is a schematic illustration of an exemplary fabric article treating device according to a fourth embodiment of the present invention.

[0012] 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

[0013] 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.

Definitions

[0014] All percentages, ratios and proportions herein are on a weight basis unless otherwise indicated. Except as otherwise noted, all amounts including quantities, percentages, portions, and proportions, are understood to be modified by the word "about", and amounts are not intended to indicate significant digits. Except as otherwise noted, the articles "a", "an", and "the" mean "one or more".

[0015] As used herein, "comprising" means that other steps and other ingredients which do not affect the end result can be added. This term encompasses the terms "consisting

of" and "consisting essentially of". The compositions and methods/processes of the present invention can comprise, consist of, and consist essentially of the essential elements and limitations of the invention described herein, as well as any of the additional or optional ingredients, components, steps, or limitations described herein.

[0016] The phrase "fabric article treating system" as used herein means a fabric article treating device which may be discrete in relation to the fabric article drying appliance and/or a portion of it may be integrated into the fabric article drying appliance.

[0017] "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.

[0018] As used herein, the term "benefit composition" refers to a composition used to deliver a benefit to a fabric or article. Non-limiting examples of materials and mixtures thereof which can comprise the benefit composition include: water, softening agents, crispening agents, perfume, water/stain repellents, refreshing agents, antistatic agents, antimicrobic agents, durable press agents, wrinkle resistance agents, odor resistance agents, abrasion resistance agents, solvents and combinations thereof. The benefit composition may comprise a liquid, a powder, a suspension, or a gas 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. One exemplary preservative is Dantoguard Plus™ (dimethylol-5,5-dimethlyhydantoin) commercially available from Lonza (Fairfield, N.J., USA).

[0019] FIG. **1** illustrates an exemplary fabric article treating device **5** according to one embodiment of the present invention. The fabric article treating device **5** comprises a housing **15**, wherein the housing comprises at least one reservoir **20** for containing a benefit composition, an energy harvesting system **70**, wherein the energy harvesting system **70** is adapted to convert mechanical or thermal energy into electrical energy; and an energy storing device **25**, wherein the energy storing device **25** is adapted to store electrical energy from the energy harvesting system **70**. The device **5** further comprises a fluid handling system **50**, wherein the fluid handling system is adapted to transport the benefit composition from the reservoir **20** to the laundry in the appliance. The device also comprises a control unit **30**, wherein the control unit is adapted to control dispensing of benefit composition from the device. For example, in one exemplary embodiment, the controller determines the optimum conditions at which to dispense benefit composition from the device. In another embodiment, the controller further activates the fluid handling system to begin dispensing the benefit composition.

[0020] In one exemplary embodiment, the device further comprises one or more sensors **40** in electrical communication with the control unit **30**. One exemplary sensor comprises a temperature sensor, which is adapted to determine the temperature of the air within the fabric article drying appliance. Another exemplary sensor comprises a humidity sensor, which is adapted to detect the humidity in the air in the fabric article drying appliance.

[0021] In one exemplary embodiment, the energy harvesting system **70** comprises an electro-active polymer in electrical communication with the energy storing device **25**, wherein the electro-active polymer is adapted to convert mechanical energy into electrical energy. United States Patent Application Publication US2004/0008853 discloses various electro-active polymer devices which can be utilized in the present invention. The transformation between electrical and mechanical energy for the energy harvesting system is based on one or more active areas of the electro-active polymer. Electro-active polymers are capable of converting mechanical energy into electrical energy and vice versa. In some cases, an electro-active polymer may change electrical properties (for example, capacitance and resistance) with changing mechanical strain. Materials suitable for uses in electro-active polymers in the energy harvesting system of the present invention may include any substantially insulating polymer or rubber (or combinations thereof) that deforms in response to a electrostatic force or whose deformation results in a change in electrical field. Exemplary electro-active polymers include those disclosed in U.S. Patent Application Publication US2004/0008853. Other exemplary materials suitable for use as electro-active polymers include silicone elastomers, acrylic elastomers such as VHB4910 acrylic elastomer as produced by 3M Corp. of St. Paul, Minn., polyurethanes, thermoplastic elastomers, copolymers comprising PVDF, pressure-sensitive adhesives, fluoroelastomers, polymers comprising silicone and acrylic moieties, and the like. Polymers comprising silicone and acrylic moieties may include copolymers comprising silicone and acrylic moieties, polymer blends comprising a silicone elastomer and an acrylic elastomer, for example.

[0022] Materials used as an electro-active polymer may be selected based on one or more material properties such as high electrical breakdown strains, a low modulus of elasticity (for large or small deformations), a high dielectric constant, etc.

[0023] As electro-active polymers of the present invention may deflect at high strains, electrodes attached to the polymer should also deflect without compromising mechanical or electrical performance. The electrodes are attached to the polymer to receive electrical energy from the polymer and transport the electrical energy to the energy harvesting system. Generally, electrodes suitable for use with the present invention may be of any shape or material provided that they are able to supply a suitable voltage to, or receive a suitable voltage from, an electro-active polymer. The voltage may be either constant or varying over time. In one embodiment, the electrodes adhere to the surface of a polymer. Electrodes adhering to the polymer in one exemplary embodiment are compliant and conform to the changing shape of the polymer. Correspondingly, the present invention may include compliant electrodes that conform to the shape of an electro-active polymer to which they are attached. One skilled in the art will appreciate that certain electrode materials may work particularly well with certain polymers, and may not work well for others.

[0024] In one exemplary embodiment, the energy harvesting system **70** further comprises an accentuation device. The

accentuation device is adapted to enhance the amount of mechanical energy that is applied to the electro-active polymer. As one skilled in the art will appreciate, various devices can be utilized to enhance the amount of mechanical energy that is applied to the electro-active polymer. For example, the accentuation device may comprise one or more stainless-steel balls which are adapted to move about in the housing and to enhance the amount of mechanical energy that is applied to the electro-active polymer. In one exemplary embodiment, the fabric article treating device is placed in the fabric article drying appliance with fabric articles to be dried. During the drying cycle, the fabric article treating device may be tumbled throughout the fabric article appliance device. While not being limited to a theory, it is believed that the tumbling action will cause the electro-active polymer in the fabric article treating device to have a mechanical force imparted to it and as such generate electrical energy. In one embodiment, the fabric article treating device comprise one or more accentuation devices in addition to the electro-active polymer. In one exemplary embodiment, the accentuation device increases the mechanical force applied to the electro-active polymer. Other exemplary accentuation devices include, but are not limited to, mini-hammers, beads, pellets, balls, and the like.

[0025] In another exemplary embodiment, the energy harvesting system comprises a thermoelectric generator in electrical communication with the energy storing device. The thermoelectric generator is adapted to convert thermal energy into electrical energy. Typically, a thermoelectric generator converts heat directly into electricity with no moving parts. As heat moves from the hot air through the thermoelectric module, it causes electrical current to flow. Low power thermoelectric generators work based on the thermoelectric principal and convert thermal energy directly into electrical energy. They can be utilized wherever a temperature difference can be established, and provide a self-sufficient energy source. One exemplary thermoelectric generator utilizes thin film technology. Exemplary thermoelectric generators which may be utilized in the present invention are available from Thin Film Thermoelectric Generator Systems GmbH, of Hale, Germany. The ratio of heat flow to current for a particular material is known as the Peltier coefficient. Its value is closely related to another intrinsic property, the Seebeck coefficient. Thomson (Lord Calvin) established a relationship between the Seebeck and Peltier coefficients and predicted the third thermoelectric effect, the Thomson Effect. This effect relates to the heating or cooling in a single homogeneous conductor when a current passes along it in the presence of a temperature gradient. These three effects are connected to each other by a simple relationship S=H/T.

[0026] When a thermal gradient, T, is applied to a solid, it will be accompanied by an electric field, V, in the opposite direction; this is known as the Seebeck effect. The ratio V/T is defined as the Seebeck coefficient (S), and it is expressed in volts per degree Kelvin, or more often microvolts per degree Kelvin μV/K. The metals best suited for thermoelectric applications have maximum Seebeck coefficients of about 10 μV/K or less, giving generating efficiencies of 1% which are uneconomical as a source of electric power, but enough to be used for temperature sensing, as thermocouples. Metal thermocouples, which generate tens of microvolts per degree temperature difference, are very familiar temperature controlling sensors in domestic refrigerators and central heating systems. Over the past few years, there has been renewed interest in the field of thermoelectrics accompanied by the development of synthetic semiconductors that possess Seebeck coefficients of hundreds of microvolts and provide a useful amount of electrical power.

[0027] A thermoelectric generator is a heat engine which utilizes the electrons in the thermoelements as the working fluid rather than a gas or vapor. A thermogenerator (TEG) consists of a p-type and n-type piece of thermoelectric material which generates electric current upon exposure to a temperature difference. These pieces are arranged electrically in series and thermally in parallel. By means of combining a p-type and n-type semiconductor, voltage and therefore electrical power are generated. Because the thermopower, S, has the opposite sign for p-type and n-type materials, contributions from both pieces are added to nearly double the generator voltage as that of a single element. For an efficient energy conversion, high electrical and low thermal conductivity, s and k, respectively are desired, in addition to a high thermopower. Exemplary thermogenerators include low power thermogenerators commercially available from Hi-Z Technology, Inc. of San Diego, Calif. under the model name HZ-2 Thermoelectric Module.

[0028] In one exemplary embodiment, the energy storage device **25** comprises a capacitor. A capacitor has two terminals and it is adapted to store electrons. Inside the capacitor, the terminals are connected to two metal plates separated by a dielectric. The dielectric can be air, paper, plastic or other material that does not conduct electricity and keeps the plates from touching each other. As one skilled in the art will appreciate, the plate on the capacitor that attaches to the negative terminal of the energy harvesting system accepts electrons that are generated by the energy harvesting system **70**, alternatively, the plate on the capacitor that attaches to the positive terminal of the energy harvesting system **70** loses electrons.

[0029] In another exemplary embodiment, the energy storing device **25** comprises a high temperature battery. As one skilled in the art will appreciate, a high temperature battery has been constructed to be able to adapt to extended temperature ranges and harsh operating conditions.

[0030] High temperature batteries may comprise lithium. Exemplary high temperature batteries include Model Nos. BR1225A, BR1632A, BR2330A, and BR2477A from Panasonic Corporation of North America (Elgin, Ill.). These exemplary high temperature batteries have a wide operation temperature range from −40° C. to approximately 125° C.

[0031] In one exemplary embodiment as illustrated in FIG. **3**, the fluid handling system **50** comprises a pump **50** and a nozzle **60**, wherein the pump **50** is adapted to discharge the benefit composition to the laundry through the nozzle **60** and wherein the pump **50** is in electrical communication with the energy storing device **25** and the control unit. Dispensing 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 nozzles 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 the nozzle is a pressure swirl atomizing nozzle made by Seaquist Perfect Dispensing, of Cary, Ill. under Model No. DU-3813.

[0032] In another exemplary embodiment illustrated in FIG. **2**, the fluid handling system **50** comprises a valve **90** and transfer medium **80**, wherein the valve is in electrical communication with the energy storing device **25** and the control unit **30**, and wherein the valve **90** is adapted to dispense the benefit composition to the laundry through the transfer medium **80** without utilizing a pump. The transfer medium **80**, in one exemplary embodiment comprises one or more porous members which allow the benefit composition to permeate out away from the transfer medium to the fabric articles in the laundry device. Exemplary transfer mediums comprise a semi-permeable membrane, a wicking layer or a soft foam structure. As one skilled in the art will appreciate, any type of transfer medium may be utilized which allows the benefit composition to pass through the transfer medium to be dispensed to the fabric articles in the fabric article drying device. In another exemplary embodiment, the energy harvesting system **70** comprises a piezo device which is in electrical communication with the energy storing device. The piezo device is adapted to convert mechanical energy into electrical energy and store the electrical energy in the energy storing device. One exemplary piezo device is commercially available from PAR Technologies, LLC, located in Hampton, Va.

[0033] In one exemplary embodiment, the device further comprises one or more sensors **40** in electrical communication with the control unit **30**. In this embodiment, the sensors **40** are adapted to provide information relating to conditions in the appliance to the control unit **30** to help aid the control unit **30** to determine when the optimum conditions exist to dispense the benefit composition to the fabric articles in the fabric article drying appliance. Non-limiting examples of sensors include a motion sensor, a humidity sensor, and/or a temperature sensor. For example, a humidity sensor in communication with the control unit may be used to control the amount of composition being dispensed from the device and also may be utilized to determine the proper environmental conditions during an operational cycle in which the dispensing event should take place. In one exemplary embodiment, the humidity sensor may also be used to maintain a specific humidity by controlling the dispensing of the benefit composition such that optimum 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 may be used. Another exemplary sensor that may be utilized in the present invention is a temperature sensor. One exemplary temperature sensor outputs an analog or digital signal along the electrical conductor that leads back to the control unit. The control unit may comprise instructions that determine when the optimum time is to dispense the benefit composition to the fabric articles in the drying appliance.

[0034] In one exemplary embodiment, the housing **15** comprises a second reservoir for containing an additional benefit composition. In this embodiment, the additional benefit composition may have the same or different composition from the first benefit composition. For example, in one embodiment, the additional benefit composition may contain aroma finishing agents, such as fragrances and other actives that are applied late in the operational drying cycle, whereas the other benefit composition may comprise softening or crispening agents which are applied earlier in the operational drying cycle.

[0035] Another exemplary embodiment of the present invention is illustrated in FIG. **3**. In this embodiment, the fabric article treating device **105** comprises a housing **15** which is adapted to contain a reservoir **20**, an energy storing device **25** a logic control system **30**, one or more sensors **40** and a fluid handling system **50** (pump). The reservoir **20** is adapted to contain a benefit composition. The fluid handling system **50** is adapted to transport the benefit composition from the reservoir to fabric articles in the fabric article drying appliance. The control unit is adapted to determine an optimum time in which to dispense the benefit composition to the laundry through the fluid handling system. In this embodiment, the energy storing device may comprise a rechargeable energy device, or a non-rechargeable energy device. Exemplary energy storing devices comprise high temperature batteries and capacitors. In the rechargeable embodiment, the device **105** may further comprise a charging terminal **108**. The charging terminal is in electrical communication with the energy storing device and is adapted to receive electrical current from an outside source of the device **105** and transfer that electrical energy to the energy storing device **25**. One skilled in the art will appreciate that any means known to charge the energy storing device may be utilized. For example, a power cord may plug into the charging terminal **108** of the device **105**. In another exemplary embodiment, the charging terminal **108** may comprise inductive charging technology and the energy storing device may be charged inductively without a direct physical connection between the charging terminals and an external power source. One exemplary embodiment is depicted in FIG. **4**, in where the device **105** can be placed in an inductive charging base **115** which is adapted to charge the energy storing device **105** without a direct physical connection between the charging terminal and the charging base. This embodiment minimizes the potential for electrical shock or other hazardous issues regarding electricity since the device may be utilized in close proximity to water.

[0036] In one embodiment of the present invention, the housing **15** comprises a sealable opening **10**, wherein the opening **10** is adapted to allow the user to fill the reservoir **20** with a benefit composition. In another alternative embodiment, the reservoir **20** is removable from the device **105**. In this embodiment, the reservoir may be refilled, or the user can just insert new reservoirs containing benefit compositions into the device **105**.

[0037] In one alternative embodiment as illustrated in FIG. **4**, the device **5** further comprises a docking station **115**, wherein the docking station **115** is adapted to hold at least a portion of the housing and to recharge the energy storage device **25**. In addition, the docking station **115** may be adapted to refill the reservoir **20** when depleted of the benefit composition.

[0038] As noted above, the device **5** may comprise a logic control unit **30**. In one embodiment, the controller may be a microcontroller. A suitable microcontroller is manufactured by MicroChip, of Chandler, Ariz. under the Part No. PICI 6LS876-04/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), and on-board read only memory (ROM), which comprises electrically programmable nonvolatile 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 an RC circuit could be used instead of a clock circuit, if desired. The clock circuit provides 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 programming interface using a communication link, such as an RS-232 communication link. This port allows the user to alter the program information of the controller, such as dispensing options, etc.

[0039] 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, ROM or digital and analog input/output (I/O). Moreover, a sequential processor may be used to control the fabric article treating device **5**, or alternatively, a parallel processor architecture or logic state machine architecture could be used. Furthermore, the controller **30** 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 dependent upon the model of the fabric article treating devices 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. It will also be understood that discreet digital logic could be used instead of any type of microprocessor or 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 in the various sensors that are provided with the fabric article treating device.

[0040] It will be understood that the present invention can be readily used in other types of fabric article drying appliances, 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 apparatuses 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 term "dryer" or "drying apparatus" or "fabric article drying appliance" may include a "dry cleaning" process or apparatus, which may or may not literally involve the step of drying. The term "fabric article drying appliance" as used herein, also refers to any fabric treating apparatus that utilizes moving air directly upon one or more fabric articles, a non-limiting example of which includes a clothes dryer and modifications thereof. Such apparatuses 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 applied to 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 dispensed within the drying chamber, so that certain fabric items do not receive a very large concentration of the benefit composition while other fabric articles receive very little of the benefit composition.

[0041] 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.

[0042] 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 broad 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:

a housing with at least one reservoir configured to contain benefit composition;

an energy harvesting system, wherein the energy harvesting system is adapted to convert mechanical or thermal energy into electrical energy;

an energy storing device, wherein the energy storing device is adapted to store electrical energy from the energy harvesting system;

a fluid handling system, wherein the fluid handling system is adapted to transport benefit composition from the reservoir to fabric in a fabric article drying appliance;

and a control unit, wherein the control unit is adapted to control dispensing of benefit composition from the device.

2. The device of claim 1, wherein the energy harvesting system comprises an electro-active polymer in electrical communication with the energy storing device, wherein the electro-active polymer is adapted to convert mechanical energy into electrical energy.

3. The device of claim 1, wherein the energy storing device comprises a capacitor.

4. The device of claim 1, wherein the energy storing device comprises a high temperature battery.

5. The device of claim 1, wherein the energy harvesting system comprises a thermoelectric generator in electrical communication with the energy storing device, wherein the thermoelectric generator is adapted to convert thermal energy into electrical energy.

6. The device of claim 1, wherein the fluid handling system comprises a pump and a nozzle, wherein the pump is adapted to discharge benefit composition to fabric through the nozzle; and wherein the pump is in electrical communication with the energy storing device and the control unit.

7. The device of claim 1, wherein the fluid handling system comprises a valve and transfer medium, wherein the valve is in electrical communication with the energy storing device and the control unit; and wherein the valve is adapted

to dispense benefit composition to fabric through the transfer medium without utilizing a pump.

8. The device of claim 1, wherein the reservoir is adapted to contain from about 20 to about 500 milliliters of benefit composition.

9. The device of claim 1, wherein the energy harvesting system comprises a piezo device in electrical communication with the energy storing device, wherein the piezo device is adapted to convert mechanical energy into electrical energy and store the electrical energy in the energy storing device.

10. The device of claim 1, further comprising one or more sensors in electrical communication with the control unit, wherein the sensors are adapted to provide information relating to at least one condition in the appliance to the control unit, and wherein the information is utilized at least in part to control dispensing of benefit composition from the device

11. The device of claim 10, wherein at least one of the sensors comprises a temperature sensor.

12. The device of claim 10, wherein at least one of the sensors comprises a humidity sensor.

13. The device of claim 1, wherein the housing comprises a second reservoir configured to contain additional benefit composition.

14. The device of claim 1, wherein the control unit is configured to send a signal to the fluid handling system to dispense benefit composition at a predetermined condition.

15. A fabric article treating device comprising:

a housing with at least one reservoir configured to contain benefit composition;

a high temperature energy storing device comprising a capacitor;

a fluid handling system, wherein the fluid handling system is adapted to transport benefit composition from the reservoir to fabric in a fabric article drying appliance;

and a control unit, wherein the control unit is adapted to control dispensing of benefit composition from the device.

16. The device of claim 15, wherein the fluid handling system comprises a pump and a nozzle, wherein the pump is adapted to discharge benefit composition to fabric through the nozzle; and wherein the pump is in electrical communication with the capacitor and the control unit.

17. The device of claim 15, wherein the fluid handling system comprises a valve and transfer medium, wherein the valve is in electrical communication with the capacitor and the control unit; and wherein the valve is adapted to dispense benefit composition to fabric through the transfer medium without utilizing a pump.

18. The device of claim 1, wherein the housing comprises a sealable opening adapted to allow a user to fill the reservoir with a benefit composition.

19. The device of claim 15, wherein the housing comprises a sealable opening adapted to allow a user to fill the reservoir with a benefit composition.

20. The device of claim 15, further comprising a docking station, wherein the docking station is adapted to hold the housing and to recharge the high temperature energy storing device.

21. The device of claim 2, wherein the energy harvesting system further comprises an accentuation device, wherein the accentuation device is configured to increase the mechanical energy applied.

22. A method for treating a fabric article comprising delivering a benefit composition from the fabric article treating device of claim 1, the method comprising:

drying the fabric article in a fabric article drying appliance;

during the drying of the fabric article in the fabric article drying appliance, delivering a benefit composition from the fabric article treating device to the fabric article; and

during the drying of the fabric article in the fabric article drying appliance, harvesting electrical energy from mechanical or thermal energy and storing the electrical energy in the energy storing device.

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