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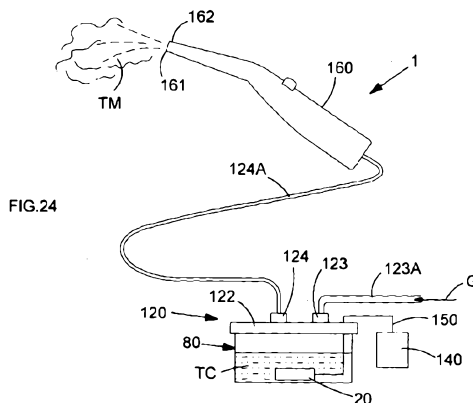
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(54) Title: SURFACE TREATMENT DEVICE AND METHOD



(57) Abstract: Disclosed are devices which generate a mist of a treatment composition, viz, an aerosolized treatment composition which imparts a technical benefit to surfaces, or airspaces, which come into contact with the said aerosolized treatment composition. Also disclosed are methods for the treatment of surfaces utilizing the devices of the invention.

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SURFACE TREATMENT DEVICE AND METHOD

The present invention relates to devices directed to devices and methods for
10 delivering treatment compositions to a surface, e.g., an inanimate hard surface or an
inanimate soft surface, and methods for treating such surfaces.

Chemical compositions for providing a technical benefit to a surface are
notoriously old and known to the art. Liquid compositions, which are frequently largely
aqueous in their composition, may be supplied to a surface by any of a number of means
15 including simply pouring a quantity of such a composition of the surface or delivering it
in the form of droplets which are delivered from a dispensing container. Widely used
dispensing containers include pressurized container such as aerosol canisters which
include a quantity of the composition as well as a propellant, as well as nonpressurized
flasks or vessels which are equipped with a manually-pumpable spray head which can be
20 used to dispense the compositions via a nozzle. While such are effective in many
circumstances, they're not without disadvantages. Typically, the delivery rate using an
aerosol canister or a manually-pumpable spray head is effective, but the relatively large
droplets delivered by such means typically quickly saturate a hard or soft surface upon
which they are dispensed. Further, the relatively large individual droplets delivered by
25 such means are also often of a wide range of particle sizes, masses, or diameters which
provide a very low degree of uniformity with regard to the distribution of the average
droplet particle size being delivered. While such as advantageous where a large quantity
of such treatment composition is intended to be relatively quickly delivered or deposited
onto a surface, such is also disadvantageous as the relatively large droplet particle size
30 quickly drops to the surface and provides a limited degree of distribution of the treatment
composition onto a hard or soft surface. Thus, there is a real need in the art for providing
improved methods for the delivery of treatment compositions to surfaces, including hard
or soft surfaces. It is to such a need that the present invention is directed.

Also generally known to the technical arts primarily directed to air treatment, e.g., dispersion of fragrances, perfumes, insecticides, air fresheners, odor neutralizers, into an airspace are various devices for dispensing a liquid composition in the form of dispersed particles. Such include those disclosed in US 7694892 to Feriani, et al.; US 2009/308945
5 to Tollens, et al.; US 2009/272818 to Valpey III, et al.; US 5299739 to Takahashi et al.; which disclose various devices which include a vibrating plate and a wick or capillary for delivery of liquids from a reservoir to the vibrating plate. Further, US 2004/0256487 to Collins, Jr. et al., and US 2005/0103891 to Abergel, et al. and US 6802460 to Hess, et al. disclose spraying devices which include a vibrating plate in direct fluid contact with
10 liquid from a reservoir. US 5297734 discloses various arrangement of vibrating plates supplied with liquids for delivering particulates of the liquid to an airspace. The contents of these US patent documents are herein incorporated by reference.

Notwithstanding these known art devices, further advances are still needed in the art treatment devices and treatment methods.

15 In one aspect of the present invention provides a device which generates a mist of a treatment composition, viz, an aerosolized treatment composition which imparts a technical benefit to surfaces, or airspaces, which come into contact with the said aerosolized treatment composition.

According to a further aspect of the invention, there is provided a method for the
20 treatment of hard surfaces and soft surfaces which method comprises the step of providing a device which generates a mist of a treatment composition, which treatment composition contacts the surface and provides a technical benefit thereto.

According to an additional aspect of the invention, there is provided a method for the treatment of inanimate, nonporous hard surfaces which method comprises the step of
25 providing a device which generates a mist of a treatment composition, which contacts hard surfaces and provides a technical benefit thereto.

According to a further aspect of the invention, there is provided a method for the treatment of soft surfaces, e.g., carpets, rugs, upholstery, curtains and drapes, fabrics, textiles, garments, and the like which method comprises the step of providing a device
30 which generates a mist of a treatment composition, which treatment composition contacts

the soft surfaces and which optionally further also penetrates the surface or surfaces thereof, and which provides a technical benefit thereto.

According to a yet further aspect of the invention, there is provided a method for controlling the incidence of dust mites, or controlling their residual fecal matter which
5 method comprises the step of providing a device which generates a mist of a treatment composition, which treatment composition contacts the surface and provides a technical benefit thereto.

In a further aspect of the invention there is provided a method for denaturing allergens, which method comprises the step of providing a device generates a mist of a
10 treatment composition, which treatment composition contacts the surface and provides a technical benefit thereto.

In a still further aspect of the invention there is provided a method for the delivery of an air treatment composition to an airspace, which method comprises the step of providing a device which generates a mist of a treatment composition, which treatment
15 composition contacts said airspace and provides a technical benefit thereto, e.g., fragrancng, perfuming, odor masking, malodour neutralization, air sanitization, and the like. The method may be practiced within an open airspace, e.g., a larger volume such as a room, public space within the interior of a building, a cabin or compartment within a vehicle, as well as within a closed container or other relatively smaller space, e.g., the
20 interior of a storage cabinet, a closet, a shower stall, a garbage container or refuse bin, and the like.

In a yet further aspect of the invention there is provided a method for the pre-treatment of an article, or the post-treatment of an article treated in a laundry machine for the laundering treatment of fabrics, textiles, garments, and the like which method
25 comprises the step of providing a device which generates a mist of a pre-treatment composition, which mist contacts the aforementioned fabrics, textiles, garments, and the like and which optionally further also penetrates the surface or services thereof, and which provides a technical benefit thereto. Such pre-treatment step or post-treatment step may be practiced directly to said article, or may be practiced utilizing a machine
30 such as a laundry washing machine or a laundry drying machine.

According to a further aspect of the invention there is provided a method for the pre-treatment of an article, or the post-treatment of an article such as a dishware article, treated in an automatic dishwashing machine, which method comprises the step of providing a device which generates a mist of a pre-treatment composition, which said
5 composition contacts dishware e.g., tableware, glassware, cooking utensils, cookware, and the like, and which provides a technical benefit thereto. Such pre-treatment step or post-treatment step may be practiced directly to said dishware article, or may be practiced utilizing a machine such as an automatic dishwashing machine.

According to a still further aspect of the invention, there is provided a method for
10 the application of a treatment composition to a bodily surface, e.g., a dermal surface, or hair surface, which method comprises the step of providing a device which generates a mist of a treatment composition which composition contacts the bodily surface and provides a technical benefit thereto.

In a further aspect of the invention there is provided a method for delivering an
15 inhalable pharmaceutical composition to a an animal patient in need of treatment which method comprises the step of providing a device generates a mist of a treatment composition which comprises at least one pharmaceutically active composition which provides a therapeutic benefit to an animal patient (human, non-human animal especially mammal) which treatment composition is inhaled or ingested by the animal patient.

20 These and further aspect of the invention will be more apparent from a review of the following specification and accompanying drawings.

In one aspect of the present invention provides a device which generates a mist of a treatment composition, also referred to as an aerosolized treatment composition which imparts a technical benefit to surfaces, or airspaces, which come into contact with the
25 said aerosolized treatment composition. According to one embodiment, there is provided a device for aerosolizing a fluid product, which device includes a mist generator, a control circuit for operating the mist generator, a reservoir for the fluid product to be aerosolized, a means for supplying the a mist generator with the fluid product, a housing, and optionally at least one flow directing nozzle or flow directing orifice adapted to direct
30 the flow of a mist generated by the mist generator out from the device.

In a second aspect of the invention the device is divided into two or more parts, which may be interconnected to function to provide a mist of the treatment composition.

In a third aspect of the invention the device is fully hand holdable which generates a mist of a treatment composition.

5 The mist generator means may comprise a vibrating member which includes a metal or ceramic plate; the plate may be solid or porous, or micropierced in the form of a grid or in the form of one or more segments or slots passing through the vibrating member, and a piezoelectric actuator which, when operated, causes vibratory motion in the vibrating member. The mist generator means may be an annular ring of a
10 piezoelectric material which is attached to said vibrating member and spans the annulus, which when activated, causes the said vibrating member to vibrate. The mist generator means may comprise a piezoelectric material which is attached to, adjacent to or abutting a non-vibrating element or member which receives the vibratory motion of the piezoelectric material and transfers the vibratory motion to the said vibrating member.
15 The mist generator means may comprise a piezoelectric material which is attached to, adjacent to or abutting a non-vibrating element or member which receives the vibratory motion of the piezoelectric material and forces the treatment composition through the vibrating member which optionally but not necessarily vibrates; where the mesh or plate does not vibrate the treatment composition is driven through the vibratory member by
20 virtue of the movement of the attached to, adjacent to or abutting a non-vibrating element or member which receives the vibratory motion of the piezoelectric material, e.g. by compression of the treatment composition located between the non-vibrating member and the mesh or plate due to the vibratory motion of the piezoelectric material.

25 The mist generator means may be a tubular piezoelectric material which includes a vibrating member spanning its interior bore between the ends of the piezoelectric material, and/or includes a vibrating member spanning the interior bore at one or more ends thereof, such that when activated the tubular piezoelectric material vibrates or expands/contracts which in turn imparts vibratory motion of the vibrating member(s).

30 The mist generator means may be an electrostatic spray device. The mist generator means may be an ultrasonic nozzle device.

The mist generator means may be a tubular aerosol generator which includes a tube having a first and a second end, a heater arranged relative to the tube for heating the tube, a source of material to be volatilized, the second end of the tube being in communication with the source of material, a valve operatively located between the source of material and the tube, the valve being openable and closeable to open and close communication between the source of material and the first end of the tube, and a pressurization arrangement for causing material in the source of material to be introduced into the tube from the source of material when the valve is in an open position.

The mist generator means may form a part of the device and be permanently affixed thereto. Alternately the mist generator means may be provided as part of a refill unit or refill reservoir which, when inserted or affixed to the device completes the device and enables its use. Further the mist generator means may be user replaceable article or unit which may be removed and/or installed as needed or desired by a user to one or more of the device or the refill unit or refill reservoir. Yet further in any embodiment, the mist generator may be formed of several parts which are required to be assembled in order to form an operating mist generator means, e.g., a piezoelectric actuator may form part of the device and a separate vibrating member form part of a refill unit or refill reservoir which remains inoperative until the device and refill unit or refill reservoir are properly aligned or otherwise installed in the device so permit the interaction between the piezoelectric actuator and the vibrating member which then operates as a mist generator means. Such an embodiment is preferred in that with the replacement of a refill unit or refill reservoir a new vibrating member is provided to the device.

The device includes a controller means for controlling the operation of the mist generator means. The controller means may provide one or more functions. The controller means preferably includes a high frequency generator used to generate a suitable electrical signal for the operation of the mist generator, and particularly a piezoelectric element or device associated therewith. The controller means may include one or more switches, or other input means, e.g., buttons, contacts or switches, which can be established by user of a device according to the invention in order to control the mode of operation of the controller means. The controller means may also include means for controlling the output of the mist generator which may turn the unit off, or suspend its

operation after a metered amount or dose of the treatment composition is dispensed from the device; the amount of the treatment composition may be a user controllable amount, e.g., via a setting, or may be a predetermined metered amount which cannot be changed by the user. The amount of treatment composition delivered by the device may be varied

5 in response to a signal received by the controller means which may respond to an environmental condition of the device. The controller means may also be adapted to receive, and respond to, one or more signal inputs received from one or more sensors associated with the device. For example the controller means may be adapted to receive and respond to signals or conditions relating to the status of any part of the device such as

10 the quantity of treatment composition in a reservoir or refill unit, to the physical orientation of the device, as well as to the frequency of dispensing and/or volume of treatment composition dispensed over a unit time interval. Nonlimiting examples of such responses include to increase or decrease one more of: the volumetric delivery rate of the treatment composition, and/or the frequency of delivery of the treatment composition per

15 unit of time. The controller means may provide one or more output signals which may be transmitted to one or more further elements of the device via suitable conductor means, such as wires, in order to control their operation. The controller means may be programmable and include suitable electronic circuitry for the operation of the device according to one or more programs each having at least one, but preferably a plurality of,

20 discrete programmed steps; typically such includes at least a logic or program controller, e.g., a central processing unit, and system memory for storing one or more programs. The controller means may be a non-programmable circuit, which preferably operates according to specific logic responsive to one or more signal inputs to the controller means. The controller means may comprise a drive circuit in order to provide suitable

25 power and/or signal outputs to the mist generator in order to control its operation in generating a treatment mist from the fluid treatment composition, which may include known-art drive circuits suitable for this purpose. One example of a suitable circuit which may be present within the controller means is a pulse-width-modulation circuit (PWM) comprising a transformer converter and having an input acted on by a

30 piezoelectric element present and the mist generator; such as disclosed in published application US 2009/0121043, the contents of which is herein incorporated by reference.

A further example of a suitable circuit is one which includes a microprocessor controlled variable oscillator for providing variable frequencies to mist generator such that treatment composition is formed into an aerosol of fine droplets. The variable oscillator preferably comprises a digital resistor for adjusting the time of charge and discharge; such a circuit
5 is disclosed in US 7673812, the contents of which are incorporated by reference.

The device may be operated by direct control by a user, e.g., controlling a switch upon the device or alternately, the device may be operated indirectly, e.g., by a remote control unit.

The device may include a power supply source which is integral to the device, e.g., one or more batteries, such that the device is portable, or the device may include
10 means, e.g. wire, for connecting the device to a source of power, e.g., a transformer or electrical mains, supplying electrical power to the controller means. The batteries may be replaceable by the user when they are exhausted. The batteries may be rechargeable batteries which may be replenished by connecting them to a suitable power source. Thus
15 in certain embodiments the device of the invention is fully portable, but in other embodiments the device of the invention or part thereof may be a stationary part which is not necessarily moved or portable when the device is in use. Such includes, e.g., a recharging station, or a part of the device which comprises the fluid reservoir. Further configurations of the device are also possible.

The device may include one or more sensor means. Sensor means may be present to evaluate the state of a condition within the device, e.g., the presence of a treatment composition, or the presence of a suitable refill container. Sensor means may be present to evaluate the state of the environment in which the device is being used, e.g., time of day, degree of brightness near the environment of the device, absence of light, presence
20 of light, a sound sensor, a vibration sensor, a heat sensor, an odor or scent sensor, a
25 pressure sensor, a proximity sensor, and the like.

The device may include a fill level sensor which controls the operation of the device responsive to the amount of liquid present in the device and/or in the reservoir, which may be a removable reservoir.

The device may include one or more orientation sensing means for determining a physical orientation of the device, which for example, can be a level sensor, horizon
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sensor, accelerometer or any other device which can be used to establish the relative position of the device with respect to the horizontal or horizon.

The device may include a reservoir for containing a quantity of the treatment composition, which reservoir may be a integrally formed as part of, or as an element of the device, which is not intended to be removed but rather refilled with the treatment composition when required. Alternately the device may include a removable reservoir which is intended to be removed from the device and replaced when necessary, such as to replenish or to resupply a new quantity of the treatment composition to the device. The reservoir of the device may be adapted to contain a single fluid treatment composition or may be adapted to contain a plurality of fluid treatment compositions. Such a removable reservoir may take the form of cartridge or assembly, or be a part of such a cartridge or assembly. The cartridge may be a single-use cartridge which is not intended to be refilled. The cartridge may include a bag or plenum which may optionally be vented to the atmosphere. The cartridge may be refillable by the user.

The device may include at least one fluid control means for controlling the rate of delivery of a fluid product, viz., a treatment composition, from the reservoir to the mist generator. The fluid control means may form part of the device, or may be part of a removable reservoir, or may be present in both the device and a removable reservoir. The fluid control means may also be formed by cooperative elements, part of which are present on the removable reservoir and part on the device such that, when the cooperative elements are assembled, in conjunction they form a fluid control means. The device may include one, or several fluid control means. Nonlimiting examples of fluid control means include the following: a) one or more capillaries which via capillary effect supply the treatment composition from the fluid reservoir to the mist generator means; b) one or more tubes or channels which provide fluid conduits to supply the treatment composition from the fluid reservoir to the mist generator means; c) one or more pumps, d) direct physical interaction between a vibrating member and the treatment composition, e.g. wherein the treatment composition is supplied to a top surface or bottom surface of the vibrating member during at least a portion of its range of vibratory (or oscillatory) movement, or during the range of vibratory (or oscillatory movement) the vibrating member contacts a quantity of the treatment composition and entrains it within the

vibrating member before expelling it therefrom, such for example may occur wherein a wick or a tube having exposed treatment composition at an end thereof is in near proximity but not in direct contact with a vibrating member; e) by a gravity feed flow of the treatment composition to the mist generator means; f) a manual supply means, e.g.,
5 manual pumping by a user of an element such as a pump or bulb which transfers a quantity of the treatment liquid to the mist generator means; g) an antechamber or cavity which is intermediate the reservoir and the mist generator means which antechamber or cavity is first filled from the reservoir, and the mist generator means is supplied with treatment composition from the antechamber or cavity but not directly from the reservoir.

10 Particularly preferred fluid flow means include c) one or more pumps, including but not limited to: gear pumps, positive displacement pumps, rotary pumps, micropumps, diaphragm pumps, and especially preferably piezoelectric diaphragm pumps such as those presently commercially available from Bartels Mikrotechnik GmbH (Dortmund, Germany). Examples of such piezoelectric diaphragm pumps are disclosed in one or
15 more of the following: WO/2009/059664, the contents of which are herein incorporated by reference. Such number among particularly preferred embodiments of the invention.

The device may include at least one fluid control means for controlling the rate of delivery of a fluid product (treatment composition) from the reservoir to the mist generator. The fluid control means may form part of the device, or may be part of a
20 removable reservoir, or may be present in both the device and a removable reservoir. The fluid control means may also be formed by cooperative elements, part of which are present on the removable reservoir and part on the device such that, when the cooperative elements are assembled, in conjunction they form a fluid control means. The device may include one, or several fluid control means.

25 The device may include an airflow generator means. The airflow generator means may be used to generate a current of air which induces or directs the flow of the atomized treatment composition, and especially as it exits the device. The airflow generator means also entrains the nebulized or mist of the treatment composition and may be used to direct its flow outwardly from the device. However in certain embodiments such further
30 airflow generator means are absent and excluded from the device.

The device may be a single unit which is substantially confined by a housing, or the device may include one or more extensible elements, e.g., a wand connected to the housing of the device which housing contains the mist generator and/or the reservoir. In one embodiment a part of the device contains the reservoir of the treatment composition and the mist generator means, which is connected by a tube through which the atomized treatment composition passes to a further part of the device which includes a flow directing nozzle through which the atomized treatment composition exits the device; the user may position the latter part of the device including the flow directing nozzle in order to direct the flow of the atomized treatment composition onto a hard surface and/or onto a soft surface in order to treat the said surface.

The device may comprise further flow directing elements which cooperative with the flow directing nozzle in order to provide an ancillary flow directing benefit, or which provide means for interactively contacting the surfaces being treated. However in certain embodiments such further flow directing elements are absent and excluded from the device.

The device may further comprise an air-treatment means which is used to provide a volatile material to the ambient environment of the device, which volatile material is supplied to the ambient environment independently of the mist generator means. The air-treatment means may be used to deliver a volatile material, e.g., one or more of fragrances, perfumes, compositions for the control or eradication of airborne insects, odor neutralizing agents, odor masking agents, as well as those which may impart holistic or aromatherapy benefits which is separate from the treatment composition. For example, such a volatile material may be provided in a reservoir comprising a quantity of said volatile material which may form part of or be used with the device. Such a reservoir can take any shape or suitable form, and can be included within the interior of the device, or on the exterior of the device, or may be even be separate from the device but provided as a separate article or element which is separate or separable from the device but intended to be placed in the near proximity of the device. By way of nonlimiting examples, such a reservoir may include a porous material such as a pad or tablet which is impregnated with, or upon which is absorbed a volatile composition useful in providing an air treatment benefit, a gel or a solid composition which also contains a volatile air treatment

composition which may emanate to the ambient environment from the reservoir, or a container which includes a fibrous wick, or pad, or a porous membrane for the delivery of a volatile material to the ambient environment from the reservoir. Alternately the reservoir may contain a quantity of a particulate material in the form of a single body, e.g. plate, or as a plurality of spheres, or beads which function as a reservoir for the volatile composition, and from whence they may be delivered to the ambient environment. Non-limiting examples of such materials include those currently marketed under the tradename Auracell® (ex. Rotuba Extruders) which are based on fragranced cellulosic polymers, as well as PolyIFF® (ex. International Flavors and Fragrances Inc.), as well as Tenite® (ex. Eastman Chemical Co.).

The device of the invention includes a mist generator means for the delivery of a treatment composition which comprises a treatment agent. In certain embodiments the treatment composition may be solely comprised of the treatment agent. The mist generator may be any device which provides for atomization of the treatment composition or which provides for the aerosolization of the treatment composition without directly heating the treatment composition or utilizing a propellant gas or the use of a liquid pump to drive the treatment composition through a nozzle and consequently cause the formation of discrete particles therefrom.

The treatment composition may be provided in a ready to use form, e.g., does not require further dilution with water or other material in order to form the treatment composition to be atomized and dispensed from the device, or alternately may be provided in a concentrated form which requires further dilution with water or other material prior to its being atomized and dispensed from the device.

The mist generator means may be an electrostatic spray device. Electrostatic spray devices impart energy to the treatment composition via a high electrical potential. This energy serves to atomize and charge the treatment composition, creating a spray of fine, charged particles. As the charged particles are carried away from the sprayer, their common charge causes them to repel one another. This has two effects before the spray reaches the target. First, it expands the total spray mist. This is especially important when spraying to fairly distant, large areas. The second effect is maintenance of original particle size. Because the particles repel one another, they resist collecting together into

large, heavier particles like uncharged particles do. Such lessens gravity's influence, and increases the charged particle reaching the intended target surface. As the mass of negatively charged particles approach the target surface, they push electrons inside the target surface inwardly, leaving all the exposed surfaces of the target with a temporary
5 positive charge. The resulting attraction between the particles and the target surface overrides the influences of gravity and inertia. As each particle deposits on the target surface, said spot on the target surface becomes neutralized and no longer attractive. Therefore, the next free particle is attracted to a spot immediately adjacent and the sequence continues until the entire surface of the target surface is covered with particles
10 of the treatment composition. Thus, the use of an electrostatic spray device effectively provides for aerosolization of the treatment composition without requiring direct heating of the treatment composition or without the need for a propellant composition or liquid pump to drive the treatment composition. Such electrostatic spray devices are per se, known in the art and available from commercial sources.

15 The mist generator means may be an ultrasonic nozzle device. Such ultrasonic nozzle devices may be obtained from commercial sources, e.g., Sono-Tek, Inc. (Milton, NY, USA) as well as Sonaer Inc., (Farmingdale, N.Y., USA) as well as being disclosed in published patent applications, US 2009/0254020, and US 2009/0224066, the contents of which are herein incorporated by reference.

20 The mist generator means may be a tubular aerosol generator. Typically such a tubular aerosol generator includes a tube having a first and a second end, a heater arranged relative to the tube for heating the tube, a source of material to be volatilized, the second end of the tube being in communication with the source of material, a valve operatively located between the source of material and the tube, the valve being openable
25 and closeable to open and close communication between the source of material and the first end of the tube, and a pressurization arrangement for causing material in the source of material to be introduced into the tube from the source of material. Such tubular aerosol generators are disclosed in one or more of: US Patent 5743251, US Patent 6234167, US 6491233, US 6501052, US 6516796, US 6568390, US 6640050, US
30 6681998, US 6766220, US 6772757, US 6804458, and US 6883516 the entire contents of each of which are herein incorporated by reference thereto.

In preferred embodiments the mist generator means is a nebulizer means, which is also generally preferred for use. Nebulizer sprayers impart energy to the treatment composition wherein the ultrasonic energy is supplied via a transducer. This energy results in atomization of the treatment composition without requiring direct heating of the treatment composition or without the need for a propellant composition or a manually operated liquid pump to drive the treatment composition. Various types of nebulizers include, but are not limited to: ultrasonic, gas, venturi nebulizers. Such may be obtained from a variety of commercial sources.

Exemplary nebulizer means which are presently commercially available from Kai-Chih Industrial Ltd. (Taiwan) include those disclosed in one or more of US 6854662; a nebulizer and baffle plate assembly as disclosed in US 7229029; piezoelectric and percussion board assembly as disclosed in US 2007/0011940; a block piezoelectric actuator and vibratable plate as disclosed in US 2007/0169775; a vibration member comprising a piezoelectric ceramic actuator and a vibratory plate as disclosed in US 2008/00419272, the contents of each of the foregoing being herein incorporated in their entirety by reference. Further nebulizers and/or mist generators include those known to the art, including those disclosed in one or more of the US patents incorporated by reference and discussed in this patent specification.

The mist generator means is energized from the power source and such causes the grid to vibrate at a high frequency and concurrently to emit a cloud of very fine liquid particles, viz., a mist, which may then be omitted. The very fine liquid particles forming the mist of the treatment composition, alternately referred to as a "treatment mist" typically have an average diameter which may be of relatively wide distribution, e.g., from about 0.25 microns to about 500 microns, however it is preferred that the particle size distribution of the fine liquid particles fall within the range of about 5 to about 300 microns, and especially preferably fall in the range of between about 10 to about 100 microns. Preferably the preponderance (> 75%, preferably >85%, especially preferably >95%) of the very fine liquid particles forming the mist of the treatment composition is in the range of about 5 – 75 microns, and preferably about 10 – 50 microns. In certain preferred embodiments, up to about 25%, preferably up to 10% of the very fine liquid particles forming the mist of the treatment composition is in the range of 0.1 – 10

microns, and up to about 25%, preferably up to 15% of the very fine liquid particles forming the mist of the treatment composition is in excess of 100 microns with the remaining at least 50%, but preferably at least 75% of the very fine liquid particles forming the mist of the treatment composition is in the range of 10 - 50 microns, and especially preferably in the range of 10 – 30 microns. Desirably, and in order of increasing preference, not more than about 22%, 20%, 18%, 16%, 15%, 12%, 10%, 9%, 8%, 7%, 6%, 5%, 4%, 3%, 2%, 1% and most preferably essentially none (less than 0.5%) of the very fine liquid particles forming the mist of the treatment composition is in the range of 0.1 – 10 microns, and concurrently and in order of increasing preference, not more than about 22%, 20%, 18%, 16%, 15%, 12%, 10%, 9%, 8%, 7%, 6%, 5%, 4%, 3%, 2%, 1% and most preferably essentially none (less than 0.5%) of the very fine liquid particles forming the mist of the treatment composition is in excess of 50 microns, with the remaining balance to 100% of the very fine liquid particles forming the mist of the treatment composition within 10 microns and 50 microns.

Alternately wherein the device is intended to deliver a treatment composition which is intended to be respirable or more readily absorbed transdermally then the particle size distribution may be directed to delivering having smaller average diameters than discussed above. In such nebulizers, the mist generator means is energized from the power source and such causes the grid to vibrate at a high frequency and concurrently to emit a cloud of very fine liquid particles, viz., a mist, which may then be omitted. The very fine liquid particles forming the mist of the treatment composition, alternately referred to as a “treatment mist” typically have an average diameter which may be of relatively wide distribution, e.g, from about 0.01 microns to about 200 microns, however it is preferred that the particle size distribution of the fine liquid particles fall within the range of about 0.1 to about 50 microns, and especially preferably fall in the range of between about 0.1 to about 25 microns, particularly preferably about 0.1 to about 15 microns. Preferably the preponderance (> 75%, preferably >85%, especially preferably > 95%) of the very fine liquid particles forming the mist of the treatment composition is in the range of 0.1 – 10 microns. Desirably, and in order of increasing preference, not more than about 22%, 20%, 18%, 16%, 15%, 12%, 10%, 9%, 8%, 7%, 6%, 5%, 4%, 3%, 2%, 1% and most preferably essentially none (less than 0.5%) of the very fine liquid

particles forming the mist of the treatment composition are in excess of 10 microns, with the remaining balance to 100% of the very fine liquid particles forming the mist of the treatment composition of 10 microns or less.

In a further preferred embodiment a “bi-modal” distribution of very fine liquid particles are provided by a nebulizer, such that, opposed to many known nebulizers which provide a distribution of very fine liquid particles which are averaged about a median or averaged liquid particle size or liquid particle mass, in said preferred embodiment the nebulizer provides a bi-modal distribution of very fine liquid particles, a first part or proportion of the liquid particles being of a first particle size distribution which are averaged about a first median or first averaged liquid particle size or liquid particle mass, and a second part or proportion of the liquid particles being of a second particle size distribution which are averaged about a second median or second averaged liquid particle size or liquid particle mass. In such embodiments, the average liquid particle size or liquid particle mass of the first median or first particle size distribution is lesser in average or median particle size or mass than the average liquid particle size or liquid particle mass of the second median or second particle size distribution. The provision of such a bi-modal distribution provides for a first part or portion of the liquid particles being of a smaller particle size, preferably having a first median or first averaged liquid particle size in the range of 1 – 10 microns, preferably 1 – 8 microns, yet more preferably between 2 – 7 microns, and a second part or portion of the liquid particles being of a relatively larger particle size, preferably having a second median or second averaged liquid particle size in the range of 10 – 50 microns, preferably 10 – 40 microns, yet more preferably between 10 – 35 microns. Optionally but advantageously, at least 60%, and in order of increasing preference, at least 70%, 75%, 80%, of the particles or mass of the liquid particles present within the first or second proportion are within +/- 35% by mass or size, and in order of increasing preference are within” +/- 30%, +/- 25%, +/- 20%, +/- 15%, +/- 10% of their respective median or average liquid particle size or liquid particle mass. Such provides for a narrowed distribution of the liquid particle sizes or masses delivered by the nebulizer. Further preferably, the mass of the particles delivered in the first part or portion of liquid particles is not more than about 1/2, preferably not more than about 1/4 of the mass of the mass of the particles delivered in

the second part or portion of liquid particles, which have a larger average particle size or mass. Alternately, but preferably, the mass ratio of the particles delivered in the first part or portion of liquid particles to the particles delivered in the second part or portion of liquid particles is in the range of about 1:2, and in order of increasing preference is in the
5 respective mass ratio about: 1:3, 1:4, 1:5, 1:6, 1:7, 1:8, 1:9, 1:10. The delivery of the liquid treatment composition as a bi-modal distribution of very fine liquid particles provides for controlled distribution of the treatment composition wherein a controlled mass, but visually very visible amount or mass, of the liquid treatment composition provided in the a first part or proportion of the liquid particles is delivered concurrently
10 with greater mass of the liquid treatment composition provided in the a second part or proportion of the liquid particles. Such minimizes or reduces the amount of treatment composition which is delivered as smaller, potentially respirable liquid droplets or particles in applications and methods of use where it is intended that these be minimized, which said particles are nonetheless airborne and more buoyant than the greater mass of
15 the treatment composition which is delivered as larger, less potentially respirable liquid droplets or particles of the treatment composition.

Mists of the treatment composition, (interchangeably referred to as a treatment mist,) has several advantages. A first advantage is that it is flowing and somewhat buoyant, which permits for the deposition of the very fine liquid particles on surfaces
20 which are not necessary adjacent to the outlet of a device from whence the mist is released. This may provide for a small degree of airborne drift and permit for improved deposition of the liquid particles as compared to liquids which may be applied via a manually pumped trigger sprayer, or even liquids dispensed from a pressurized aerosol container. In the case of the former, the droplets of a liquid composition dispensed from
25 a manually pumped trigger sprayer typically have larger average droplet sizes than those delivered by such a mist generator, and hence average droplet masses which concurrently transport and bombard a treated surface with greater amounts of a liquid composition per droplet. Such characteristics minimize the aerial buoyancy of the droplets, and when the droplets contact a surface the greater mass of liquid composition tends to much more
30 quickly wet a surface, primarily by adsorption and to a lesser extent by absorption. Thus, both the larger and heavier particle sizes of the such liquid droplets, and their velocity as

they are being released from a manually pumped trigger sprayer typically causes greater amounts of a liquid composition to be dispensed and faster wetting of surfaces. Turning to the latter, delivery of a liquid composition from a pressurized aerosol container typically results in similar delivery characteristics. While a critical selection of the orifice sizes and internal passages of an aerosol canister's spray actuator typically used with such pressurized aerosol container often provides somewhat more selection and control of the average droplet size, still the typical droplets of a liquid composition dispensed from a pressurized aerosol container also typically have larger average particle sizes than those delivered by such a generator, and hence have average droplet masses and greater distribution of average droplet sizes which concurrently transport and bombard a treated surface with greater amounts of a liquid composition per droplet. Such characteristics minimize the aerial buoyancy of the droplets, and when the droplets contact a surface the greater mass of liquid composition tends to much more quickly wet a surface, primarily by adsorption and to a lesser extent by absorption. Further, as the droplets dispensed from a pressurized aerosol container are typically released at a higher linear velocity than even the droplets released from a manually pumped trigger sprayer, such even more so diminishes the likelihood of aerial buoyancy and airborne drift.

The treatment mist emitted from the mist generator in devices according to the invention may provide improved delivery to hard or non-porous surfaces, particularly when such may be associated with articles having three dimensional features, or which themselves have a three-dimensional, e.g., patterned, non-flat planar, or roughened surface. The irregularities in such surfaces may be very effectively treated by providing a mist from a device according to the invention, or according to a process of the invention in the near proximity or adjacent to such a surface, such that the delivered mist is permitted to settle and deposit upon such a three-dimensional surface. The delivery of the mist, which is expected to be airborne for at least a few fractions of a second after being dispensed from a device, will often also exhibit a useful degree of airborne drifting prior to settling upon a treated surface. Such airborne drifting provides for improved coverage of hard surfaces, particularly when such are three-dimensional themselves or are associated with articles having three dimensional features. With regard to the latter, by way of non-limiting example such may be a kitchen countertop or sink from which

may extend a plumbing fixture, e.g., a faucet. Another non-limiting example could be a lavatory appliance, e.g. a toilet, bidet, shower, bathtub, or bathroom sink which also includes elements, e.g., faucets, spouts, drains, handles and the like. The airborne drifting of the mist of the treatment composition is also very useful in delivering the treatment composition to open airspace, e.g., a room, a space within the interior of a building, a vehicle cabin or vehicle compartment, as well as within a closed container e.g., the interior of a storage cabinet, a closet, a shower stall, a garbage container or refuse bin, and the like. The delivery of a treatment composition in the form of an airborne mist of the treatment composition, which may be alternately characterized as a cloud of very fine liquid particles of the treatment composition provides for improved surface deposition on such surfaces, including that of such elements. Due to the airborne nature of this mist or cloud, the dispensed mist or cloud forms an enveloping body or penumbra of very fine liquid particles of the treatment composition which may first surround a surface or article, and then deposit thereon by settling of the very fine liquid particles.

The delivery rates of the devices may vary in order to suit a specific application, e.g., it may be advantageously to have a higher delivery rate of the treatment composition per unit of time (e.g., seconds, minutes, hours, days) for spaces with larger volumes and/or wherein the device is located at a greater distance from the surface or surfaces to be treated, as opposed to closer placement and/or smaller volumes or spaced to be treated. Advantageously the treatment mist dispensed from the device may be delivered at a rate of about 0.5 milliliter/minute to about 100 milliliter/ for most applications and uses. Preferably the delivery rate is from about 1 – 50, more preferably 1 – 25, still more preferably 1 – 10 and particularly preferably about 1 – 5 milliliter/minute.

Optionally but preferably the treatment mist emitted from the mist generator in devices according to the invention may travel along a horizontal surface for a reasonable distance when exiting the device. Preferably the plume of the treatment mist emitted from the mist generator travels up to 60 cm in a lateral or horizontal direction perpendicular to the device, and preferably travels between 1 – 50 cm in such a direction as measured from where it exits the device. Such permits for the travel, distribution and contact of the treatment mist with surfaces having non-planar geometries, e.g., curved

surfaces, as well as travel of the treatment mist to the sides of a surface being treated, including the underside and back sides of a surface being treated.

Further three-dimensional surfaces which are particularly beneficially treated by the use of a device of the invention or by practice of the inventive process are soft
5 surfaces. Such soft surfaces often exhibit a degree of porosity thus permitting for the passage of gases therethrough. Frequently such also have internal spaces or interstices in their construction. Non-limiting examples of such soft surfaces include: textiles, carpets, garments, and the like. The delivery of a treatment composition via a mist or cloud such as described above typically provides improved penetration of the soft surface due to the
10 drifting of, or penetration of such internal spaces or interstices in a soft surface, e.g., the space between fibers in a twisted yarn, the space between adjacent yarns in the pile or nap of a carpet, the space between fibers of a woven or non-woven textile, such that very fine liquid particles of the treatment composition may be transported into the interior of the soft surface prior to such a particle depositing on a surface. Such an effect might be
15 referred to as an injection of the mist of very fine liquid particles of the treatment composition into the three dimensional matrix of a soft surface wherein at least a part of the emitted very fine liquid particles transit to the interior of the soft surface prior to contacting any part of the soft surface itself, and only thereafter come into contact with and are deposited in the soft surface.

20 A further important technical characteristic of the delivery of a treatment composition as an airborne mist of the treatment composition is that typically better surface coverage and a more uniform layer of a treatment composition is deposited on either a hard or soft surface, and thus the actual mass of a treatment composition may be reduced as compared to delivery of the same treatment composition via a manually
25 pumped trigger sprayer or a pressurized aerosol container in order to achieve a comparable technical effect. More simply stated, less of the treatment composition is wasted due to excessive delivery or overspraying than when delivered as a mist or cloud of very fine liquid particles of the treatment composition. Such is beneficial when for example, the delivery of a treatment composition providing a surface cleaning, sanitizing
30 or antimicrobial benefit is desired, or where a film forming polymer is intended to be applied to a surface. In both instances, a more uniform deposition of the treatment

composition may be achieved. A further beneficial effect is better noted when delivering a treatment composition to a porous or soft surface, especially a garment or textile.

Providing a controlled amount of a treatment composition delivered as a mist or cloud of very fine liquid particles provides for minimization of localized delivery of the

5 composition, e.g., as spots or zones of a treated soft surface which may quickly form a wetted or saturated part of the textile or surface which may result in wrinkling or staining of the area to which a composition has been applied, e.g., such as by a trigger sprayer or from a pressurized aerosol canister. In contrast thereto, the small degree of airborne drift of the treatment composition provided as a mist or cloud of very fine liquid particles
10 provide for a more uniform distribution upon and possibly also within the textile or garment and thus permit for a reduction or minimization of the actual mass of the treatment composition which needs to be provided. Such minimized the likelihood of wetting, saturating, staining or wrinkling of a treated soft surface, especially where such is a garment, or a textile article such as: a carpet surface, rug, window treatment such as
15 curtains or drapes, bedding surfaces including sheets, pillows, blankets, bedspreads, bedcoverings, as well as textiles or articles used in bathrooms, e.g., shower curtains, towels, etc. Attendant upon the use of the device of the invention, a treatment composition which provides a cleaning or odor masking or odor neutralization benefit is delivered as a treatment mist, viz, a cloud of very fine liquid particles which is used to
20 treat a garment or textile article in a sufficient amount in order to provided the desired cleaning or odor masking or odor neutralization benefit. Of course two or more of these benefits may be provided in the practice of the process for treating such soft surfaces.

The device of the invention generates a treatment mist of discrete or aerosolized particles of the treatment composition which is used to treat surfaces, including inanimate
25 hard surfaces and inanimate soft surfaces, as well as topical surfaces. The aerosolized form of a treatment composition comprises at least one treatment agent which ultimately contacts a surface being treated after being dispensed from the device of the invention. The treatment agent may be provided as a constituent of a treatment composition comprising further constituents other than the treatment agent, although a treatment
30 composition consisting solely of a treatment agent is not excluded from the scope of the invention.

The treatment composition comprises at least one treatment agent. The treatment composition provides a technical benefit to a hard surface or soft surface being treated. By way of nonlimiting examples such a technical benefit can be one or more of: a cleaning benefit, a disinfecting benefit, a sanitizing benefit, a bacteriostatic effect, an anti-viral benefit, a sporicidal benefit to reduce the presence of, incidence of or regrowth of molds, fungi, spores and the like, an anti-allergen benefit, an anti-acaricidal benefit, an anti-fungal benefit, an anti-resoiling benefit, a limescale removing benefit, a stain removing benefit, an air treatment benefit including but not limited to; fragrancng, odor masking, odor neutralization, an anti-pesticidal benefit, an anti-insecticidal benefit, as well as providing a surface coating to hard surfaces. The treatment composition as applied to hard surfaces and/or soft surfaces may provide a technical benefit which may be transitory or durable, e.g., provide a residual antimicrobial, germicidal or sanitizing benefit such as to reduce the likelihood of the retention, or growth of undesired pathogens (e.g., bacteria, virus, molds) on the treated surface. The treatment compositions may provide a surface coating to hard surfaces and/or to soft surfaces. The treatment composition may also reduce the buildup of biofilms on the treated surface, may reduce the incidence of limescale and/or its buildup after being treated. The treatment composition may provide a surface shine benefit to treated surfaces. The treatment composition may provide an antiresoiling benefit. The treatment composition may deposit a coating on hard surface or soft surface which is hydrophilic in nature or hydrophobic in nature. The treatment composition may provide a surface treatment benefit to improve the tactile benefits thereof, e.g., fabric softening, and the like. The treatment composition may provide an air treatment benefit including but not limited to; fragrancng, odor masking, odor neutralization, air sanitization, an anti-pesticidal benefit, an anti-insectidal benefit. The treatment composition may provide a skin treatment benefit when topically applied to human skin or to any other bodily surface such as hair. The treatment composition may be an inhalable or respirable composition which comprises a medicament, a vitamin, a pharmaceutical preparation, an edible material and the like. Treatment compositions which are formed into treatment mists necessarily comprise an effective amount of one or more treatment agent within the treatment composition such that the desired technical benefit is provided when the treatment mist is

applied to or into a hard surface or soft surface, or supplied in any other means or for any other use.

Prior to being formed into a treatment mist form, the treatment composition is advantageously a flowable liquid at room temperature (20°C) and at normal atmospheric pressure in which the device of the invention finds use. The viscosity of the treatment composition is not necessarily critical, it only being required that it can be atomized in the device out of the invention and delivered as a mist of comminuted or aerosolized particles. Advantageously however the viscosity of the treatment composition falls within the range of about 0 – 2000 cP, preferably between about 0.5 – 1000 cP, and especially preferably between about 0.5 – 500 cP. Especially preferred embodiments of the treatment composition are free flowable liquids, i.e. are "water thin" and thus are readily flowable, as well as being readily pumpable either by mechanical means such as by a pump, or by pressure different means such as within a capillary or narrow diameter tube, and which is also readily easily and effectively atomized by the mist generator means.

Advantageously, the treatment composition includes a large proportion, that is to say at least about 50%wt. of a liquid. In certain preferred embodiments the treatment composition is at least 60%wt., and in order of increasing preference, 70%wt., 80%wt., 90%wt., 95%wt., 97%wt., 98%wt., 99%wt. and to 100%wt. of a liquid. The liquid is preferably a free-flowing liquid at room temperature and normal prevailing atmospheric conditions as noted above. Advantageously, the liquid may be water, or may be one or more non-aqueous solvents, e.g., one or more organic solvents, or may be a mixture or composition comprising both water and one or more further non-aqueous solvents, e.g., one or more organic solvents. The water may be tap water, but is preferably distilled and is most preferably deionized water. By way of non-limiting example exemplary useful organic solvents which may be included in the treatment compositions include those which are at least partially water-miscible such as alcohols (e.g., low molecular weight alcohols, such as, for example, ethanol, propanol, isopropanol, and the like), glycols (such as, for example, ethylene glycol, propylene glycol, hexylene glycol, and the like), water-miscible ethers (e.g. diethylene glycol diethylether, diethylene glycol dimethylether, propylene glycol dimethylether), water-miscible glycol ether (e.g. propylene glycol

monomethylether, propylene glycol mono ethylether, propylene glycol monopropylether, propylene glycol monobutylether, ethylene glycol monobutylether, dipropylene glycol monomethylether, diethyleneglycol monobutylether), lower esters of monoalkylethers of ethylene glycol or propylene glycol (e.g. propylene glycol monomethyl ether acetate), and
5 mixtures thereof. Glycol ethers having the general structure R_a-R_b-OH , wherein R_a is an alkoxy of 1 to 20 carbon atoms, or aryloxy of at least 6 carbon atoms, and R_b is an ether condensate of propylene glycol and/or ethylene glycol having from one to ten glycol monomer units. Of course, mixtures of two or more organic solvents may be used concurrently.

10 One preferred organic solvent which may be included within the treatment compositions is triethylene glycol which is believed to provide odor sanitization or odor neutralizing benefits to an airspace within which culminated particles of triethylene glycol are present. Thus come in certain embodiments where such a technical benefit is desired, the inclusion of triethylene glycol may be considered for its advantageous
15 benefit. When present, it can be included in amounts effective to provide a desired degree of air sanitization. In certain embodiments it is also expressly contemplated that triethylene glycol is the preponderant constituent present, or even the sole constituent present in a treatment composition.

The treatment composition may also include one or more surfactants. The
20 presence of one or more such surfactants which are advantageously included to typically provide for the loosening of soils or other hydrophobic matter which may be present on a surface being treated with the device of the invention.

Anionic surfactants and/or salt forms thereof may form part of the inventive compositions. Non-limiting examples of anionic surfactants include alcohol sulfates and
25 sulfonates, alcohol phosphates and phosphonates, alkyl ester sulfates, alkyl diphenyl ether sulfonates, alkyl sulfates, alkyl ether sulfates, sulfate esters of an alkylphenoxy polyoxyethylene ethanol, alkyl monoglyceride sulfates, alkyl sulfonates, alkyl ether sulfates, alpha-olefin sulfonates, beta-alkoxy alkane sulfonates, alkyl ether sulfonates, ethoxylated alkyl sulfonates, alkylaryl sulfonates, alkylaryl sulfates, alkyl monoglyceride
30 sulfonates, alkyl carboxylates, alkyl ether carboxylates, alkyl alkoxy carboxylates having 1 to 5 moles of ethylene oxide, alkylpolyglycolethersulfates (containing up to 10 moles of

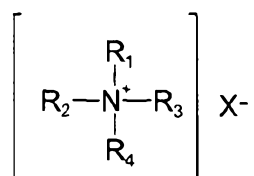
ethylene oxide), sulfosuccinates, octoxynol or nonoxynol phosphates, taurates, fatty taurides, fatty acid amide polyoxyethylene sulfates, acyl glycerol sulfonates, fatty oleyl glycerol sulfates, alkyl phenol ethylene oxide ether sulfates, paraffin sulfonates, alkyl phosphates, isethionates, N-acyl taurates, alkyl succinamates and sulfosuccinates, 5 alkylpolysaccharide sulfates, alkylpolyglucoside sulfates, alkyl polyethoxy carboxylates, and sarcosinates or mixtures thereof. Anionic soaps may also be used in the inventive compositions. Examples of the foregoing anionic surfactants are available under the following tradenames: Rhodapon®, Stepanol®, Hostapur®, Surfine®, Sandopan®, and Biosoft® tradenames.

10 Exemplary useful nonionic surfactants are those which include a hydrophobic base portion, such as a long chain alkyl group or an alkylated aryl group, and a hydrophilic chain portion comprising a sufficient number of ethoxy and/or propoxy moieties to render the nonionic surfactant at least partially soluble or dispersible in water. By way of non-limiting example, such nonionic surfactants include ethoxylated 15 alkylphenols, ethoxylated and propoxylated fatty alcohols, polyethylene glycol ethers of methyl glucose, polyethylene glycol ethers of sorbitol, ethylene oxidepropylene oxide block copolymers, ethoxylated esters of fatty ($C_6 - C_{24}$) acids, condensation products of ethylene oxide with long chain amines or amides, and mixtures thereof. Further useful nonionic surfactants include condensates of alkylene oxides, particularly ethylene oxide 20 with sorbitan fatty acid esters, e.g., polyoxyethylene sorbitan monolaurate, polyoxyethylene sorbitan monopalmitate, and polyoxyethylene sorbitan trioleates. Still further useful nonionic surfactants include alkoxylated alkanolamides, e.g. $C_8 - C_{24}$ alkyl di($C_2 - C_3$ alkanol amide). Examples of the useful nonionic surfactants include materials are available under the Tomadol®, Neodol®, Rhodasurf®, Genapol®, Pluronic® and 25 Alfonic® tradenames. Further useful nonionic surfactants include oxo-alcohol ethoxylates (ex. BASF) under the Lutensol® ON tradename, as well as polyoxyalkylene alkylethers (ex. KAO Group, Japan) available under the Emulgen® tradename. A further useful nonionic surfactants include alkylmonoglycosides and alkylpolyglycosides are prepared generally by reacting a monosaccharide, or a compound 30 hydrolyzable to a monosaccharide with an alcohol such as a fatty alcohol in an acid medium. Various glycoside and polyglycoside compounds including alkoxylated

glycosides and processes for making them are disclosed in U.S. Pat. Nos. 2,974,134; 3,219,656; 3,598,865; 3,640,998; 3,707,535, 3,772,269; 3,839,318; 3,974,138; 4,223,129 and 4,528,106 the contents of which are incorporated by reference. Examples of useful alkylglycosides include, for example APG 325 CS Glycoside® which is described as
 5 being a 50% C₉-C₁₁ alkyl polyglycoside, also commonly referred to as D-glucopyranoside, (ex. Henkel KGaA) and Glucopon® 625 CS which is described as being a 50% C₁₀-C₁₆ alkyl polyglycoside, also commonly referred to as a D-glucopyranoside, (ex. Henkel).

The treatment compositions may include one or more amphoteric surfactants,
 10 specifically the following: derivatives of secondary and tertiary amines having aliphatic radicals that are straight chain or branched, and wherein one of the aliphatic substituents contains from about 8 to 18 carbon atoms and at least one of the aliphatic substituents contains an anionic water-solubilizing group, e.g., a carboxy, sulfonate, or a sulfate group. Non-limiting examples of compounds falling within this description include:
 15 sodium 3-(dodecylamino)propionate, and sodium 3-(dodecylamino)propane-1-sulfonate. Further exemplary useful amphoteric surfactants include sarcosinates and taurates, amide sulfosuccinates, and betaines including phosphobetaines. Exemplary betaines include dodecyl dimethyl betaine, cetyl dimethyl betaine, and dodecyl amidopropyldimethyl betaine.

20 The treatment composition may also comprise one or more cationic surfactant constituents, especially preferably one cationic surfactants which provide an appreciable germicidal benefit. Non-limiting examples of preferred cationic surfactant compositions which may be included in the treatment compositions are those which provide an appreciable germicidal benefit, and especially preferred are quaternary ammonium
 25 compounds and salts thereof, which may be characterized by the general structural formula:



where at least one of R₁, R₂, R₃ and R₄ is a alkyl, aryl or alkylaryl substituent of from 6 to 26 carbon atoms, and the entire cation portion of the molecule has a molecular weight of at least 165. The alkyl substituents may be long-chain alkyl, long-chain alkoxyaryl, long-chain alkylaryl, halogen-substituted long-chain alkylaryl, long-chain alkylphenoxyalkyl, arylalkyl, etc. The remaining substituents on the nitrogen atoms other than the abovementioned alkyl substituents are hydrocarbons usually containing no more than 12 carbon atoms. The substituents R₁, R₂, R₃ and R₄ may be straight-chained or may be branched, but are preferably straight-chained, and may include one or more amide, ether or ester linkages. The counterion X may be any salt-forming anion which permits water solubility or water miscibility of the quaternary ammonium complex. Preferred quaternary ammonium compounds which act as germicides according to the foregoing formula are those in which R₂ and R₃ are the same or different C₈-C₁₂alkyl, or R₂ is C₁₂-₁₆alkyl, C₈₋₁₈alkylethoxy, C₈₋₁₈alkylphenoethoxy and R₃ is benzyl, and X is a halide, for example chloride, bromide or iodide, or is a methosulfate anion. The alkyl groups recited in R₂ and R₃ may be straight-chained or branched, but are preferably substantially linear.

Particularly useful quaternary germicides include compositions which include a single quaternary compound, as well as mixtures of two or more different quaternary compounds. Such useful quaternary compounds are available under the BARDAC®, BARQUAT®, HYAMINE®, LONZABAC®, and ONYXIDE® trademarks, which are more fully described in, for example, *McCutcheon's Functional Materials* (Vol. 2), North American Edition, 1998, as well as the respective product literature from the suppliers identified below. When one or more cationic surfactants which provide an appreciable germicidal benefit are present, they may be present as a co-antimicrobial agent, with a further antimicrobial agent described hereinafter. When one or more cationic surfactants which provide an appreciable germicidal benefit are present, preferably anionic surfactants and further optionally, amphoteric surfactants are omitted from the treatment compositions of the invention. Other surfactants, although not specifically disclosed herein but known to the art may also be used within the treatment compositions of the present invention.

The treatment of the compositions may also include one or more fluorosurfactants. Preferred fluorocarbon surfactants include the anionic salts of

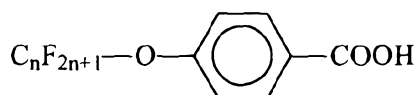
perfluoroaliphaticoxybenzene sulfonic acids and the anionic salts of linear perfluoroalkyl-oxybenzoic acids. Examples of the former class of fluorocarbon surfactants can be represented by the following formula:



5

where R_f is a perfluoroaliphatic group of from about 5 to about 15 carbon atoms, preferably from about 8 to 12 carbon atoms in the aliphatic group which may be an alkyl group or alkenyl group, and A is a cation such as an alkali metal, ammonium or amine.

Examples of the latter class of fluorocarbon surfactants can be represented by the
10 formula:



wherein n is a number of from about 2 to about 16 and m is a number from about 3 to about 34.

15

Other suitable fluorocarbon surfactants are:

- (a) $R_f\text{CH}_2\text{CH}_2\text{SCH}_2\text{CO}_2\text{M}$ wherein R_f is $\text{F}(\text{CF}_2\text{CF}_2)_n$ and n is from about 3 to about 8 and M is alkali metal (e.g., sodium or potassium) or ammonium;
- (b) $\text{C}_n\text{F}_{2n+1}\text{SO}_3\text{M}$ wherein $\text{C}_n\text{F}_{2n+1}$ is a straight chain fluorocarbon radical, n is from about 8 to about 12 and M is alkali metal or ammonium;
- (c) $\text{C}_n\text{F}_{2n+1}\text{SO}_3\text{M}$ wherein $\text{C}_n\text{F}_{2n+1}$ is a straight chain fluorocarbon radical, n is from about 8 to about 12 and M is an alkali metal cation;
- (d) $R_f\text{CH}_2\text{CH}_2\text{O}(\text{CH}_2\text{CH}_2\text{O})_n\text{H}$ wherein R_f is a straight chain $\text{F}(\text{CF}_2\text{CF}_2)_n$ radical and n is from about 3 to about 8;
- (e) $R_f(\text{OCH}_2\text{CH}_2)_n\text{OR}_f$ wherein R_f is a branched chain radical of the formula C_8F_{15+} , $\text{C}_{10}\text{F}_{19}$ or $\text{C}_{12}\text{F}_{23}$ and n is from about 10 to about 30; and
- (f) $R_f(\text{OCH}_2\text{CH}_2)_m\text{OR}$ wherein R_f is a branched chain radical of the formula C_8F_{15+} , $\text{C}_{10}\text{F}_{19}$ or $\text{C}_{12}\text{F}_{23}$, m is from about 2 to about 20 and R is C_1 to C_3 alkyl.

25

Fluorinated hydrocarbon surfactants are available from numerous commercial sources as trademarked products. Examples are ZONYL fluorosurfactants from E.I. duPont de Nemours & Co., FLUORAD fluorosurfactants from 3M Company, e.g., FLUORAD FC-129 ($R_f\text{SO}_2\text{N}(\text{C}_2\text{H}_5)\text{CH}_2\text{CO}_2^-\text{K}^+$, where R_f is $\text{C}_n\text{F}_{2n+1}$ and n is about 8),
 5 and MONOFLORE fluorocarbon surfactants from I.C.I. Americas, Inc. one or more such a fluorinated hydrocarbon surfactants maybe included in the treatment compositions and any desired for effective amount.

The treatment compositions may comprise further antimicrobial agents other than the one or more cationic surfactants described above. Such an antimicrobial agent is/are
 10 one or more compounds other than cationic surfactants which provide an appreciable germicidal benefit, viz., cationic germicide, described above. Such an antimicrobial agent desirably provides an effective antimicrobial benefit to a treated surface, other than a cationic germicide, preferably such that the treatment composition delivered by the device of the invention exhibits at least 3 log₁₀ kill efficacy, preferably at least 4 log₁₀ kill
 15 efficacy at 60 seconds contact time of at least two, preferably at least three and most preferably at least four of microorganisms selected from the group consisting of: *S. aureus*, *E. coli*, *P. aeruginosa* and *E. hirae*, desirably according accepted and standardized testing protocols for the evaluation of antimicrobial efficacy of a composition applied to a hard surface, soft surface, or a dermal surface, i.e. a human or animal epidermis.

20 The antimicrobial agent may include one or more of: pyrrhionones such as zinc pyrrhionone, halohydantoinins such as dimethyldimethylol hydantoin, methylchloroisothiazolinone/methylisothiazolinone sodium sulfite, sodium bisulfite, imidazolidinyl urea, diazolidinyl urea, benzyl alcohol, 2-bromo-2-nitropropane-1,3-diol, formalin (formaldehyde), iodopropenyl butylcarbamate, chloroacetamide, methanamine,
 25 methyldibromonitrile glutaronitrile, glutaraldehyde, 5-bromo-5-nitro-1,3-dioxane, phenethyl alcohol, o-phenylphenol/sodium o-phenylphenol, sodium hydroxymethylglycinate, polymethoxy bicyclic oxazolidine, dimethoxane, thimersal dichlorobenzyl alcohol, captan, chlorphenenesin, dichlorophene, chlorbutanol, glyceryl laurate, halogenated diphenyl ethers such as 2,4,4-trichloro-2-hydroxy-diphenyl ether
 30 (Triclosan®) and 2,2-dihydroxy-5,5-dibromo-diphenyl ether, phenolic antimicrobial compounds such as mono- and poly-alkyl and aromatic halophenols, such as p-

chlorophenol, methyl p-chlorophenol, 4-chloro-3,5-dimethyl phenol, 2,4-dichloro-3,5-dimethylphenol, 3,4,5,6-tetrabromo-2-methylphenol, 5-methyl-2-pentylphenol, 4-isopropyl-3-methylphenol, para-chloro-meta-xyleneol, dichloro meta xyleneol, chlorothymol, and 5-chloro-2-hydroxydiphenylmethane, resorcinol and its derivatives, bisphenolic compounds such as 2,2-methylene bis (4-chlorophenol) and bis (2-hydroxy-5-chlorobenzyl)sulphide, benzoic esters (parabens), halogenated carbanilides such as 3-trifluoromethyl-4,4'-dichlorocarbanilide (Triclocarban), 3-trifluoromethyl-4,4-dichlorocarbanilide and 3,3,4-trichlorocarbanilide.

The antimicrobial agent may include one or more of: biguanides such as polyhexamethylene biguanide, p-chlorophenyl biguanide; 4-chlorobenzhydryl biguanide, 1,6-bis-(4-chlorobenzylbiguanido)-hexane (Fluorhexidine®), halogenated hexidine including, but not limited to, chlorhexidine (1,1'-hexamethylene-bis-5-(4-chlorophenyl biguanide) (Chlorohexidine®), as well as salts of any of the foregoing, e.g. polyhexamethylene biguanide hydrochloride.

The treatment compositions of the invention may also comprise one or more organic or inorganic acids which may be used to adjust the pH of the treatment composition to a target range or level, and/or to impart an antimicrobial benefit. The acids may be one or more of a water soluble inorganic acids, mineral acids, or organic acids, with virtually all such known materials contemplated as being useful in the treatment compositions. By way of non-limiting example useful inorganic acids include mineral acids, hydrochloric acid, phosphoric acid, sulfuric acid, and the like.

In certain embodiments, the inventive compositions comprise one or more organic acids which also provide an antimicrobial benefit. Exemplary organic acids are those which generally include at least one carbon atom, and include at least one carboxyl group (–COOH) in its structure. Derivatives of said organic acids are also contemplated to be useful. Exemplary organic acid include linear aliphatic acids such as acetic acid; dicarboxylic acids, acidic amino acids, and hydroxy acids such as glycolic acid, lactic acid, hydroxyacrylic acid, alpha-hydroxybutyric acid, glyceric acid, malic acid, tartaric acid and citric acid, as well as acid salts of these organic acids. Of these, citric acid, sorbic acid, acetic acid, boric acid, formic acid, maleic acid, adipic acid, lactic acid, malic acid, malonic acid, glycolic acid, salicylic acid and/or derivatives thereof, e.g., salicylic

acid derivatives such as esters of salicylic acid, such as ethylhexyl salicylate, dipropylene glycol salicylate, TEA salicylate, salicylic acid 2-ethylhexylester, salicylic acid 4-isopropyl benzylester, salicylic acid homomenthylester are preferred. Of course mixtures of one or more acids are contemplated as being useful.

5 The treatment composition may comprise one or more polyols as well, especially preferably where such one or more polyols are present within the treatment composition in amounts which are effective in imparting a sanitizing or disinfecting benefit to surfaces upon which the treatment compositions are applied. By way of non-limiting example, preferred are polyols containing from 2 to about 6 hydroxyl groups. Preferred polyols are
10 water soluble. Specific, though non-limiting examples of polyols include: ethylene glycol, propylene glycol, glycerol, diethylene glycol, triethylene glycol, dipropylene glycol, tripropylene glycol, hexylene glycol, butylene glycol and when present, the polyols should be present in a sufficient concentration such the antimicrobial constituent of which they form at least a part, provides an effective sanitizing or disinfecting benefit
15 to surfaces being treated with the treatment compositions.

 The treatment composition may comprise a peroxygen compound which may be essentially any compound containing a dioxygen (O--O) bond. Dioxygen bonds, particularly bivalent O--O bonds, are readily cleavable, thereby allowing compounds containing them to act as powerful oxidizers. Non-limiting examples of classes of
20 peroxygen compounds include peracids, peracid salts, and peroxides such as hydrogen peroxide. The peroxygen can be any aliphatic or aromatic peracid (or peroxyacid) that is functional for disinfectant purposes in accordance with embodiments of the present invention. While any functional peroxyacid can be used, peroxyacids containing from 1 to 7 carbons are the most practical for use. These peroxyacids can include, but not be
25 limited to, peroxyformic acid, peroxyacetic acid, peroxyoxalic acid, peroxypropanoic acid, perlactic acid, peroxybutanoic acid, peroxy-pentanoic acid, peroxyhexanoic acid, peroxyadipic acid, peroxy-citric, and/or peroxybenzoic acid. Exemplary peracid salts include permanganates, perborates, perchlorates, peracetates, percarbonates, persulphates, and the like. Exemplary peroxide compounds include hydrogen peroxide, metal
30 peroxides and peroxyhydrates. The metal peroxides that can be used include, but are not limited to, sodium peroxide, magnesium peroxide, calcium peroxide, barium peroxide,

and/or strontium peroxide. Other salts (for example sodium percarbonate) have hydrogen peroxide associated therewith are also considered to be a source of hydrogen peroxide, thereby producing hydrogen peroxide in situ.

The treatment compositions of the invention may also include an oxidizing agent which may be a halogen bleach. Preferably, the oxidizing agent is a halogen bleach source which may be selected from various hypohalite-producing species, for example, bleaches selected from the group consisting of the alkali metal and alkaline earth salts of hypohalite, haloamines, haloimines, haloimides and haloamides. All of these are believed to produce hypohalous bleaching species in situ. Preferably, the oxidizing agent is a hypohalite or a hypohalite generator capable of generating hypohalous bleaching species. Hereafter, the term "hypohalite" is used to describe both a hypohalite or a hypohalite generator, unless otherwise indicated. Preferably, the hypohalite oxidizing agent is a hypochlorite or a generator of hypochlorite in aqueous solution, although hypobromite or a hypobromite generator is also suitable. Representative hypochlorite generators include sodium, potassium, lithium, magnesium and calcium hypochlorite, chlorinated trisodium phosphate dodecahydrate, potassium and sodium dichloroisocyanurate and trichlorocyanuric acid. Organic bleach sources suitable for use include heterocyclic N-bromo and N-chloro imides such as trichlorocyanuric and tribromocyanuric acid, dibromocyanuric acid and dichlorocyanuric acid, and potassium and sodium salts thereof, N-brominated and N-chlorinated succinimide, malonimide, phthalimide and naphthalimide. Also suitable are hydantoins, such as dibromodimethyl-hydantoin and dichlorodimethyl-hydantoin, chlorodimethylhydantoin, N-chlorosulfamide (haloamide) and chloramine (haloamine). When present, advantageously the hypohalite oxidizing agent is an alkali metal hypochlorite, an alkaline earth salt of hypochlorite, or a mixture thereof.

The treatment composition of the invention may include a treatment agent which provides an anti-static or surface softening benefit to a surface, particularly a textile or fibrous surface being treated. Coming into consideration as treatment agents for providing a fiber, textile or fabric softening benefit are one or more compounds which are known to the art as fabric softener compounds. By way of non-limiting example such include all the current commercial quaternary long-chain softeners, and preferably at least

partially unsaturated esterquats. Exemplary suitable fabric softeners include fabric softening compounds which are cationic, water insoluble quaternary ammonium compounds comprising a polar head group and two long hydrocarbyl moieties, preferably selected from alkyl, alkenyl and mixtures thereof, wherein each such hydrocarbyl moiety
5 has an average chain length equal to or greater than C₁₂, preferably greater than C₁₄, more preferably greater than C₁₆. More preferably still, at least 50% of each long chain alkyl or alkenyl group is predominantly linear. A preferred overall chain length is about C₁₈, though mixtures of chain lengths having non-zero proportions of lower, e.g., C₁₄, C₁₆ and some higher, e.g., C₂₀ chains may be desired. The cationic softener can suitably be
10 distearyl dimethyl ammonium chloride or unsaturated analogs thereof, but preferably the selected quaternary ammonium fabric softener is biodegradable. Such a property is common to many commercial esterquat fabric softeners such as di(tallowyloxyethyl)dimethyl ammonium chloride. In a preferred embodiment, the fabric softening compound is a quaternary ammonium esterquat compound having two C₁₂₋₂₂
15 alkyl or alkenyl groups connected to a quaternary ammonium moiety via at least one ester moiety, preferably two such ester moieties. Of course mixtures of two or more fabric softener compounds.

The treatment compositions of the invention may also include a treatment agent which provides an air treatment technical benefit. By way of nonlimiting examples, such
20 include fragrances, perfumes, compositions for the control or eradication of airborne insects, odor neutralizing agents, odor masking agents, as well as those which may impart holistic or aromatherapy benefits.

A fragrance may form part of the treatment composition, and which may be based on natural and synthetic fragrances and most commonly are mixtures or blends of a
25 plurality of such fragrances, optionally in conjunction with a carrier such as an organic solvent or a mixture of organic solvents in which the fragrances are dissolved, suspended or dispersed. Typically, a fragrance is derived from one or more raw materials which may be divided into three main groups: (1) the essential oils and products isolated from these oils; (2) products of animal origin; and (3) synthetic chemicals.
30 By way of non-limiting example, natural fragrances as well as certain essential oils include the extracts of blossoms (lily, lavender, rose, jasmine, neroli, ylang-ylang), stems

and leaves (geranium, patchouli, petitgrain), fruits (anise, coriander, caraway, juniper), fruit peel (bergamot, lemon, orange), roots (nutmeg, angelica, celery, cardamon, costus, iris, calmus), woods (pinewood, sandalwood, guaiac wood, cedarwood, rosewood), herbs and grasses (tarragon, lemon grass, sage, thyme), needles and branches (spruce, fir, pine, dwarf pine), resins and balsams (galbanum, elemi, benzoin, myrrh, olibanum, opoponax). Animal raw materials, for example civet and beaver, may also be used. Typical synthetic perfume compounds are products of the ester, ether, aldehyde, ketone, alcohol and hydrocarbon type. Examples of perfume compounds of the ester type are benzyl acetate, phenoxyethyl isobutyrate, p-tert.butyl cyclohexylacetate, linalyl acetate, dimethyl benzyl carbinyl acetate, phenyl ethyl acetate, linalyl benzoate, benzyl formate, ethylmethyl phenyl glycinate, allyl cyclohexyl propionate, styrallyl propionate and benzyl salicylate. Ethers include, for example, benzyl ethyl ether while aldehydes include, for example, the linear alkanals containing 8 to 18 carbon atoms, citral, citronellal, citronellyloxyacetaldehyde, cyclamen aldehyde, hydroxycitronellal, lillal and bourgeonal. Examples of suitable ketones are the ionones, .alpha.-isomethylionone and methyl cedryl ketone. Suitable alcohols are anethol, citronellol, eugenol, isoeugenol, geraniol, linalool, phenylethyl alcohol and terpineol. The hydrocarbons mainly include the terpenes and balsams. However, it is preferred to use mixtures of different perfume compounds which, together, produce an agreeable fragrance. Other suitable perfume oils are essential oils of relatively low volatility which are mostly used as aroma components. Examples are sage oil, camomile oil, clove oil, melissa oil, mint oil, cinnamon leaf oil, lime-blossom oil, juniper berry oil, vetiver oil, olibanum oil, galbanum oil, labolanum oil and lavandin oil. When present such a fragrance constituent may be present in the treatment composition in any effective amount. Advantageously, the fragrance or perfume is present in amounts of from about 0.00001%wt. to about 50%wt. based on the total weight of the treatment composition of which they form a part, although, due to the mode of delivery of the mist generator means to which does not impart thermal degradation of such a constituent, its inclusion in even higher amounts to about 100%wt. of the treatment composition are also contemplated as being possible and indeed advantageous in certain embodiments of the invention.

The treatment composition of the invention may include one or more holistic constituents, particularly may include one or more essential oils which are selected to provide a so-called "aromatherapy benefit" to the user. Such essential oils are frequently extracted from naturally occurring botanical sources such as flowers, stems, leaves, roots and barks of aromatic plants. While essential oils may be used singly, it is also common to utilize blends of essential oils in order to provide a conjunctive aroma benefit, and possibly a therapeutic benefit as well. Similarly to fragrance compositions which may also include one or more essential oils, frequently, due to their potency, essential oils are often supplied dispersed in a liquid carrier such as in one or more organic solvents in which the essential oils are dissolved or dispersed. Preferred essential oils providing an aromatherapy benefit include one or more selected from chamomile oil, lavender oil, lavender oil, grapefruit oil, lemon oil, lime oil, mandarin orange oil, orange flower oil and orange oil. When present, these one or more essential oils providing an aromatherapy benefit are present in any effective amount, advantageously are present in amounts of from about 0.00001%wt. to about 50%wt. based on the total weight of the treatment composition of which they form a part, although, due to the mode of delivery of the mist generator means to which does not impart thermal degradation of such a holistic constituent or essential oils, their inclusion in even higher amounts to about 100%wt. of the treatment composition are also contemplated as being possible and indeed advantageous in certain embodiments of the invention. It is to be understood that these one or more essential oils providing an aromatherapy benefit may be used with or without the optional fragranting constituent recited previously and alternately, may be used wholly or partially in place of said fragranting constituent.

To maintain or establish a desired pH of a treatment composition, the use of one or more pH buffers is contemplated. The treatment compositions according to the invention optionally but desirably include an amount of a pH adjusting agent or pH buffer composition. Such compositions include many which are known to the art and which are conventionally used. By way of non-limiting example pH adjusting agents include phosphorus containing compounds, monovalent and polyvalent salts such as of silicates, carbonates, and borates, certain acids and bases, tartrates and certain acetates. Further exemplary pH adjusting agents include mineral acids, basic compositions, and organic

acids, which are typically required in only minor amounts. By way of further non-limiting example pH buffering compositions include the alkali metal phosphates, polyphosphates, pyrophosphates, triphosphates, tetraphosphates, silicates, metasilicates, polysilicates, carbonates, hydroxides, and mixtures of the same. Certain salts, such as the
5 alkaline earth phosphates, carbonates, hydroxides, can also function as buffers. It may also be suitable to use as buffers such materials as aluminosilicates (zeolites), borates, aluminates and certain organic materials such as gluconates, succinates, maleates, and their alkali metal salts. Desirably the compositions according to the invention include an effective amount of an organic acid and/or an inorganic salt form thereof which may be
10 used to adjust and maintain the pH of the treatment compositions of the invention to the desired pH range. Particularly useful is citric acid and metal salts thereof such as sodium citrate which are widely available and which are effective in providing these pH adjustment and buffering effects.

The treatment compositions of the invention may also include one or more
15 alkanolamines which in addition to providing an improved cleaning benefit may also be used to concurrently adjust the pH of the treatment composition. By way of nonlimiting examples such include monoalkanolamines, dialkanolamines, trialkanolamines, and alkylalkanolamines such as alkyl-dialkanolamines, and dialkyl-monoalkanolamines. The alkanol and alkyl groups are generally short to medium chain length, that is, from 1 to 7
20 carbons in length. For di- and trialkanolamines and dialkyl-monoalkanolamines, these groups can be combined on the same amine to produce for example, methylethylhydroxypropylhydroxylamine. One of skill can readily ascertain other members of this group.

The treatment compositions of the invention may also comprise one or more
25 hydrotropes, preferably one or more anionic hydrotrope compounds. Exemplary hydrotropes include, e.g., , benzene sulfonates, naphthalene sulfonates, C₁-C₁₁ alkyl benzene sulfonates, naphthalene sulfonates, C₅-C₁₁ alkyl sulfonates, C₆-C₁₁ alkyl sulfates, alkyl diphenyloxide disulfonates, and phosphate ester hydrotropes. The hydrotropic compounds of the invention are often provided in a salt form with a suitable counterion,
30 such as one or more alkali, or alkali earth metals, such as sodium or potassium, especially sodium. However, other water soluble cations such as ammonium, mono-, di- and tri-

lower alkyl, i.e., C₁₋₄ alkanol ammonium groups can be used in the place of the alkali metal cations. Exemplary alkyl benzene sulfonates include, for example, isopropylbenzene sulfonates, xylene sulfonates, toluene sulfonates, cumene sulfonates, as well as mixtures thereof. Exemplary C₅-C₁₁ alkyl sulfonates include hexyl sulfonates, 5 octyl sulfonates, and hexyl/octyl sulfonates, and mixtures thereof. Particularly useful hydrotrope compounds include benzene sulfonates, o-toluene sulfonates, m-toluene sulfonates, and p-toluene sulfonates; 2,3-xylene sulfonates, 2,4-xylene sulfonates, and 4,6-xylene sulfonates; cumene sulfonates, wherein such exemplary hydrotropes are generally in a salt form thereof, including sodium and potassium salt forms.

10 According to a further aspect of the invention, there is provided a method for the treatment of hard surfaces and soft surfaces come which method comprises the step of providing a device which generates a mist of a treatment composition, which treatment composition contacts the surface and provides a technical benefit thereto.

According to an additional aspect of the invention, there is provided a method for 15 the treatment of inanimate, nonporous hard surfaces which method comprises the step of providing a device which generates a mist of a treatment composition, which contacts said hard surfaces and provides a technical benefit thereto. Typically, the treatment compositions delivered by the device according to this method comprise one or more solvents such as water and/or organic solvents, and one or more further constituents 20 especially one or more surfactants or other materials which provide a disinfecting, sanitizing, or antimicrobial benefits to the treated surfaces. Typically, the technical benefits provided are one or more of: cleaning benefit, a disinfecting benefit, a sanitizing benefit, a bacteriostatic effect, an anti-viral benefit, a sporicidal benefit to reduce the presence of, incidence of or regrowth of molds, fungi, spores and the like, an anti- 25 allergen benefit, an anti-acaricidal benefit, an anti-fungal benefit, an anti-resoiling benefit, a surface treatment benefit to improve the appearance thereof, e.g., surface shine and the like, an air treatment benefit including but not limited to; fragrancing, odor masking, odor neutralization, air sanitization, an anti-pesticidal benefit, an anti-insectidal benefit as well as providing a surface coating to hard surfaces. By way of non-limiting 30 example, hard surfaces include surfaces composed of refractory materials such as: glazed and unglazed tile, brick, porcelain, ceramics as well as stone including marble, granite,

and other stones surfaces; glass; metals; plastics e.g. polyester, vinyl; fiberglass, Formica®, Corian® and other hard surfaces known to the industry. Further hard surfaces which are to be denoted are those associated with kitchen environments and other environments associated with food preparation, including cabinets and countertop surfaces as well as walls and floor surfaces especially those which include refractory materials, plastics, Formica®, Corian® and stone. Still further hard surfaces include flooring surfaces, e.g., wood, tile, glass, ceramic, cement surfaces, grout, linoleum, carpets, rugs, and the like.

According to a further aspect of the invention, there is provided a method for the treatment of soft surfaces, e.g., fabrics, textiles, garments, and the like which method comprises the step of providing a device which generates a mist of a treatment composition, which treatment composition contacts the aforementioned fabrics, textiles, garments, and the like and which optionally further also penetrates the surface or services thereof, and which provides a technical benefit thereto. Similar to the above, the treatment compositions delivered by the device according to this method comprise one or more solvents such as water and/or organic solvents, and one or more further constituents especially one or more surfactants or other materials which provide a disinfecting, sanitizing, or antimicrobial benefits to the treated surfaces. Typically, the technical benefits provided are one or more of: fragrancng, perfuming, odor neutralizing, malodor treating or masking, cleaning, sanitization, disinfection, textile or fabric softening, antiwrinkling such as of garments or textiles, as well as providing a treatment or a coating of a film forming composition to the treated soft surface, e.g, application of a fluoropolymer surfactant containing treatment composition to particularly to resist subsequent staining of such treated surfaces, including garments, textiles, upholstery, carpeted surfaces, rugs, as well as threads and fibers used in the production of such soft surfaces, and the like.

According to a yet further aspect of the invention, there is provided a method for controlling the incidence of dust mites, and or controlling their residual fecal matter, as well as denaturation of allergens, e.g., “der-p” and “der-f” allergens, which method comprises the step of providing a device which generates a mist of a treatment composition, which treatment composition contacts the surface and provides a technical

benefit thereto. The treatment compositions delivered by the device according to this method comprise typically may comprise one or more solvents such as water and/or organic solvents, and one or more further constituents especially one or more of: organic acids and in particular lactic acid, citric acid, surfactants, essential oils and enzymes.

5 According to a further aspect of the invention there is provided a method for the treatment of medical instruments, e.g., surgical instruments, dental instruments, or other instruments to be used in medical procedures which come into direct contact with parts of the human body and which require periodic cleaning, disinfection, sanitization or sterilization which method comprises the step of providing a device which generates a
10 mist of a treatment composition, which treatment composition contacts said medical instruments and provides a cleaning, disinfection, sanitization or sterilization benefit to the treated medical instruments.

 In a still further aspect of the invention there is provided a method for the delivery of an air treatment composition to an airspace, which method comprises the step of
15 providing a device which generates a mist of a treatment composition, which treatment composition contacts said airspace and provides a technical benefit thereto. Typically, the technical benefits provided are one or more of: fragrancing, perfuming, odor neutralizing, malodor treating or masking, air sanitization. The treatment compositions delivered by the device according to this method comprise one or more solvents such as
20 water and/or organic solvents, and one or more further constituents.

 In a yet further aspect of the invention there is provided a method for the pre-treatment or post-treatment of an article to be treated in a laundry machine for the cleaning treatment, e.g., dry cleaning, or laundering treatment, e.g., aqueous laundering of fabrics, textiles, garments, and the like which method comprises the step of providing
25 a device which generates a mist of a treatment composition, which composition contacts the aforementioned fabrics, textiles, garments, and the like and which optionally further also penetrates the surface or services thereof, and which provides a technical benefit thereto.

 In a further aspect of the invention there is provided a method for the delivery of
30 an air treatment composition to an enclosed airspace, which method comprises the step of providing a device which generates a mist of a treatment composition, which treatment

composition contacts said enclosed airspace and provides a technical benefit thereto, e.g.,
fragrancing, perfuming, odor masking, malodour neutralization, air sanitization, and the
like. Examples of such enclosed airspaces include larger or open airspaces, e.g., a larger
volumes such as a room, public space within the interior of a building, a cabin or
5 compartment within a vehicle, as well as within a closed container or other relatively
smaller space, e.g., the interior of a storage cabinet, a closet, a shower stall, a garbage
container or refuse bin, and the like. The delivery of a mist of a treatment composition
which provides a fragrancing, odor masking, perfuming, odor neutralization, disinfecting,
sanitizing, or other technical benefit to the interior of a container for collecting and
10 storing wastes, garbage or refuse, including rigid containers such as cans, drums, bins,
baskets and the like or flexible containers such as bags, envelopes and the like is a
contemplated and preferred embodiment of the invention.

According to a further aspect of the invention there is provided a method for the
pre-treatment or post-treatment of an article, such as a dishware article, to be treated in an
15 dishwashing process, e.g., a manual dishwashing process, or in an automatic dishwashing
machine, which method comprises the step of providing a device which generates a mist
of a treatment composition, which said composition contacts dishware e.g., tableware,
glassware, cooking utensils, cookware, and the like, and which provides a technical
benefit thereto. Typically, the treatment compositions delivered by the device according
20 to this method comprise one or more solvents such as water and/or organic solvents, and
one or more further constituents especially one or more surfactants or other materials
which provide a disinfecting, sanitizing, or antimicrobial benefits to the treated surfaces.
Typically, the technical benefits provided are one or more of: cleaning, sanitization,
disinfection, surface treatment, such as by providing a coating of a film forming
25 composition to the treated hard surface particularly to resist subsequent staining of such
treated surfaces.

According to a still further aspect of the invention, there is provided a method for
the application of a treatment composition to a bodily surface, e.g., a dermal surface, or
hair surface, which method comprises the step of providing a device which generates a
30 mist of a treatment composition which composition contacts the bodily surface and
provides a technical benefit thereto. Exemplary bodily surfaces include the epidermis,

e.g., hands, arms, legs, face, scalp as well as other body areas. Typically, the treatment compositions delivered by the device according to this method comprise one or more solvents such as water and/or organic solvents, and one or more further constituents especially one or more surfactants or other materials which provide a disinfecting, sanitizing, antimicrobial benefits, deodorization, fragrancng, perfuming, skin nourishment, skin conditioning, wound treatment benefit to the treated bodily surfaces. In a preferred method, an anti-acne or skin cleansing composition is applied to a bodily surface, preferably to skin surfaces of the head, face and neck, in order to provide a treatment composition which may provide an anti-acne or skin cleansing benefit. A treatment composition providing an anti-acne benefit may comprise an effective amount of salicylic acid or other anti-acne active constituent or composition which may remediate the incidence thereof.

In a yet further aspect of the invention there is provided a method for the delivery of a depilatory composition to a skin upon which hair growth may be present, which method includes the step of supplying a depilatory composition or a composition containing a depilatory constituent, e.g. thioglycolic acid, to the skin surface.

In a still further aspect of the invention there is provided a method for the delivery of a nebulized or atomized fluid treatment composition, viz., a "treatment mist" to a surface, or to an enclosed cavity, volume, or space. By way of nonlimiting examples, such enclosed interiors, cavity, volume, or other enclosed space include a way of example: body cavities, e.g., buccal cavity; the enclosed interior of rooms, buildings and the like; being closed interior of vehicles such as cars, buses, trucks, aircraft, boats and ships and the like; the enclosed interior of the storage lockers, cabinets, closets, boxes and the like.

In a yet further aspect the present invention provides a device and a method for the delivery of a mist of a treatment composition which provides a pesticidal, mitocidal, viricidal, antimicrobial or sanitizing benefit by delivery of a mist of a treatment composition from the device of a a nebulized or atomized fluid treatment composition which treatment composition comprises one or more constituents which provide a pesticidal, mitocidal, viricidal, antimicrobial or sanitizing benefit.

Reference is now made to the drawings, which illustrate various embodiments of the invention, including certain preferred embodiments of the invention. In the accompanying figures, like elements are indicated using like numerals throughout the figures.

5 Figure 1 depicts an embodiment of a mist generator means 20 which comprises a vibrating plate 22, here formed of a micro-perforated metal screen or sheet having a plurality of microperforations 21 passing therethrough. The vibrating plate 22 is generally circular, and includes a peripheral piezoelectric element 24. Although depicted in the embodiment that the piezoelectric element is at the peripheral edge 26 of the
10 vibrating plate 22 and is affixed thereto, it is to be understood that the piezoelectric element 24 may be affixed to any part of the vibrating plate 22 and is not necessarily required to be at the periphery thereof. Further illustrated on the figure are a pair of electrical current carrying means 40, or, namely a pair of wires which supply an electrical current from the circuit control means (not shown) which acts to operate the mist
15 generator means 20 by inducing the vibrations within that the vibrating plate 22 which acts to pump the mist TM of the treatment composition from the vibrating plate 22 as is indicated by reference arrows "TM" .

 Figure 2 depicts an alternative embodiment of a mist generator means 20 which also comprises a vibrating plate 22, however in the present embodiment to series of
20 segments 23 pass through the vibrating plate. Reference is made to US 7229028, the entire contents of which are herein incorporated by reference, which also illustrates such elements. Similarly, a piezoelectric element 24 is similarly illustrated at the peripheral age 26 of the vibrating plate 22 and is likewise affixed to thereto. Also illustrated is current carrying means 40, namely a pair of wires are also illustrated for providing means
25 to transmit an electrical current to the piezoelectric element 24 from the circuit control means (not shown) to induce vibrations within the mist generator means 20 so to pump a treatment composition in the form of a mist TM in the direction of the reference arrows TM.

 Figures 2A, 2B and 2C depict embodiments of a mist generator means 20 of
30 different configurations which are adapted to provide a bi-modal distribution of liquid droplets or particles, viz., a treatment mist of the treatment composition. The

embodiment presented on Fig. 2A is similar in most respects to the embodiments according to Figs. 1 and 2, but differ in that the vibrating plate 22 formed of a micro-perforated metal screen or sheet comprises a first series of microperforations 21A passing therethrough and a second series of microperforations 21B passing therethrough, which
5 are of different configurations or sizes, e.g., cross section or diameters, the microperforations of each series being of different configurations or sizes, e.g., cross section or diameters than those of the other or different series. Treatment composition being nebulized by the mist generator means 20 is provided as a treatment mist having a bi-modal distribution of liquid droplets or liquid particles. The embodiment of Fig. 2B
10 illustrates a further embodiment of a mist generator means 20 having a rectangular configuration, and includes a vibrating plate 22 formed of a micro-perforated metal screen or sheet comprises a first series of microperforations 21A passing therethrough, a second series of microperforations 21B passing therethrough, and a third series of microperforations 21C passing therethrough, the microperforations of each series being
15 of different configurations or sizes, e.g., cross section or diameters than those of another series; treatment composition being nebulized by the mist generator means 20 is provided as a treatment mist having a three-modal distribution of liquid droplets or liquid particles. The embodiment of Fig. 2C illustrates a further embodiment of a mist generator means 20 having a rectangular configuration, and includes a vibrating plate 22 formed of a
20 micro-perforated metal screen or sheet comprises a first series of microperforations 21A passing therethrough, and a second series of microperforations 21B passing therethrough; the microperforations of each series being of different configurations or sizes, e.g., cross section or diameters than those of another series; treatment composition being nebulized by the mist generator means 20 is provided as a treatment mist having a bi-modal
25 distribution of liquid droplets or liquid particles.

It is to be understood however the in many useful embodiments the mist generator means 20 comprises a vibrating plate 22 which includes only a single series of microperforations 21 passing therethrough which are all similarly sized, such as in the embodiments illustrated in Figs. 1 and 2, which depict eminently suitable mist generator
30 means 20 which may be used in any embodiment of the invention, and which provide a treatment mist TM having a unimodal particle distribution.

Figures 3A, 3B and 3C illustrate in a more detailed, cross-sectional view the operation of a portion of a vibrating plate 22 under normal operating conditions. Typically, when an appropriate electrical current is passed through the piezoelectric element 24, such induces the configuration, or the expansion and contraction of the piezoelectric element 24. The vibrating plate 22, at least a part of which is mechanically, chemically, or otherwise physically bonded to at least a part of the piezoelectric element 24 similarly vibrates but to due to the more flexible nature of the vibrating plate 22, an oscillatory pattern is introduced in to the vibrating plate 22. Where the vibrating plate 22 is generally circular in nature and is bound on its periphery to the piezoelectric element 24, as is disclosed in Figures 1 and 2, typically a rippling waveform, which extends from the periphery and towards the center of the vibrating plate 22 manifests itself. However when the vibrating plate 22 is generally rectangular, or is bonded on only one of its sides or one of its ends to piezoelectric element 24, a typically rippling waveform which extends from the point of connection between vibrating plate 22 and the piezoelectric 24 is manifested. The latter is due to the fact that wherein the parts of the vibrating plate 22 are not mechanically bound, such provides for more freedom of movement of the vibrating plate 22 at such points thereon. Nonetheless, in such a configuration, the waveform induces flexure of the vibrating plate 22 such that during the passage of a wave, or part of a waveform across any point of the vibrating plate 22, the region surrounding such a point will bend either upwardly, or downwardly with respect to the same point, as compared to the condition of the same point when the vibrating plate 22 is in a static state. Figures 3A, 3B and 3C illustrates a cross-sectional view of a small section of a vibrating plate 22 in various states of operation. Figure 3A illustrates a cross-sectional view of a small section of a vibrating plate 22 in such a static state. As is visible thereon, the vibrating plate 22 includes a series of microperforations or channels 25 passing therethrough, which optionally but preferably have a slightly wider diameter or width of channel entries 25a at the bottom face 22a of the vibrating plate 22, and slightly narrower diameter or width of channel exits 25b at the top face 22b of the vibrating plate 22. Such is believed to improve the pumping action of the treatment composition being transferred through the vibrating plate 22 when it operates as part of the mist generator means 20. Turning now to Fig. 3B, the same portion of the vibrating

plate 22 is illustrated in the condition as being a “trough” of a portion of the waveform during the oscillation of the vibrating plate 22. Depicted are also pair of microdroplets “MD” of the treatment composition which are present at the passage entries 25a at the bottom face 22a of the vibrating plate 22. Such for example may be formed by the presence of a treatment composition beneath the vibrating plate 22, such as when supplied in a liquid form. Turning now to Fig. 3C, the same portion of the vibrating plate 22 is illustrated in the condition as it being at a “peak” of a portion of the waveform during the oscillation of the vibrating plate 22. As is visible thereon, the direction of flexure of the vibrating plate is now reversed with respect to that as illustrated on Fig. 3C, and as it is in an outwardly bowed direction perspective thereto, the passage exits 25b have a somewhat increased width or diameter as compared to one of the vibrating plate 22 was in the trough position, via., as per Fig. 3B or even when in a static position, as per Fig. 3A. Concurrently, the diameter or width of the passage entries 25a at the bottom face 22a of the vibrating plate 22 are reduced as compared to one of the vibrating plate 22 was in the trough position, via., as per Fig. 3B or even when in a static position, as per Fig. 3A, and such causes the microdroplets MD of the treatment composition to be expelled outwardly from the vibrating plate 22 in the direction of reference arrows TC. In such a manner, pumping of a liquid composition, here the treatment composition of the invention can be achieved across the thickness of the vibrating plate 22.

It is however to be noted that while the provision of pumping across the thickness of the vibrating plate 22 provides an excellent means of atomizing the treatment composition and thereby providing a treatment composition in a form of a mist, it is foreseen that the treatment composition can alternately be supplied directly to the top face 22b of the vibrating plate 22, and due to the vibratory oscillation of the vibrating plates 22, microdroplets MD of the treatment composition are also formed without necessarily passing through the vibrating plate 22 as described immediately above.

Figure 4 depicts a further embodiment of a vibrating plate 22 of the invention, similar in several respects to the embodiments illustrated on Figs. 1 and 2. Thereupon is illustrated a mist generator means 20 which comprises a vibrating plate 22, here formed of a bowl shaped micro-perforated metal screen or sheet. The vibrating plate 22 is generally circular, and includes a peripheral piezoelectric element 24. A portion of the

bottom face 22a is in contact with the surface of, or is partially immersed with the treatment composition TC, here in the form of a liquid. When operating, the mist generator means 20 pumps microdroplets of the treatment composition outwardly from the interior of the bowl shaped vibrating plate 22, upwardly and outwardly in the direction of reference arrows TM.

Figure 5 depicts a further embodiment of a mist generator means 20 according to the invention. In the depicted embodiment, there is provided a vibrating plate 22, here formed of a bowl shaped micro-perforated metal screen or sheet which is generally circular and includes a peripheral piezoelectric element 24. A portion of the bottom face 22a is in contact with a surface of, or partially immersed with the treatment composition TC, here in the form of a column of flowing liquid supplied by a fluid conduit 30, here a circular tube. The treatment composition TC flows out from the open end 32 of the tube 30 and maintains a meniscus or layer of the treatment composition at this open end 32. When operating, the mist generator means 20 pumps microdroplets MD of the treatment composition outwardly from the interior of the bowl shaped vibrating plate 22, upwardly and outwardly in the direction of reference arrows TM, as during part of its oscillation, the vibrating plate 22 comes into contact with the treatment composition TC and pumps it through and outwardly from the vibrating plate 22 in the manner described previously. The quantity of the treatment composition which exits the tube 30 can be recirculated to resupply the vibrating plate 22 or alternately, can be collected or drained off and discarded. In this manner, by control of the operating characteristics of the mist generator means 20, and the rate at which the treatment composition TC is supplied, the use of a capillary or wick as a fluid transport means can be omitted or excluded from the device.

Fig. 6 depicts an alternative embodiment of a mist generator means 20 according to the invention. The mist generator means 20 comprises a piezoelectric element 24 and a vibrating plate 22, here formed of a micro-perforated metal screen or sheet which is generally rectangular in configuration. In the present embodiment, only one end of the vibrating plate 22 is bonded to piezoelectric element 24, and during operation of the mist generator means 20 a typically rippling waveform which extends from the proximal end 22P of the vibrating plate 22 along its length to its distal end 22D, is manifested. The

latter is due to the fact that as parts of the vibrating plate 22 are not mechanically bound, particularly in the distal end 22D such provides for more freedom of movement of the vibrating plate 22. In the illustrated embodiment, while the vibrating plate 22 is generally rectangular it also is bent thus to define 3 interconnected parts, a proximal end part 27D, an intermediate part 27I, and a distal end part 27D. In the depicted embodiment, the proximal end part 27P and distal end part 27D all are generally parallel but spaced apart from one another via the intermediate part 27I which is angled to both the proximal end part 27D and distal end part 27D. Here, the angles are approximately equal and approximately between 30 and 45 degrees of arc. Greater, and lesser angles are contemplated than the angles shown in the figure. Further illustrated on the figure are a pair of electrical current carrying means 40, or, namely a pair of wires which supply an electrical current from controller means (not shown) which acts to operate the mist generator means 20 by inducing the vibrations within that the vibrating plate 22 which acts to pump the treatment composition outwardly from vibrating plate 22 as is indicated by reference arrows "TM". As illustrated in this figure, the distal end part 27D of the vibrating plate 22 is in contact with, or immersed in a quantity of the treatment composition TC, here present in the form of a liquid. Although not visible in the drawings, the distal end part 27D includes passages or microperforations as discussed with reference to Figs. 1, 2, 2A, 2B or 2C. During operation of the mist generator means 20, oscillation of the vibrating plate 22 pumps microdroplets of the treatment composition outwardly from the vibrating plate 22, in the direction of reference arrows TM. The particle size distribution in the treatment mist TM may be a unimodal distribution, a bimodal distribution, a trimodal distribution or any other distribution.

Figure 7 illustrates a further embodiment of a mist generator means 20 similar in some respects to the embodiment depicted on Fig. 6. In the present figure, a portion of a rectangular vibrating plate 22 is affixed, attached or bonded to a piezoelectric element 24, and the rectangular vibrating plate 22 extends outwardly therefrom. The vibrating plate 22 has a proximal end part 27P which extends via an intermediate angle to a distal end part 27D which comprises passages or microperforations as discussed with reference to Figs. 1 and 2. Thus the portion of the vibrating plate 22 comprising passages or microperforations is inclined. The treatment composition in the form of a liquid is

supplied by a capillary means 70 here depicted as a porous fibrous element which transfers the treatment composition towards the terminal end 72 of the capillary means 70 from a reservoir containing the treatment composition (not shown). Alternatively, the porous fibrous element can be substituted by a ceramic element, or may be a plurality of
5 thin diameter tubes such as a plurality of thin diameter tubes which may be bundled to form a suitable capillary means 40. During operation, the capillary means 70 transmits the treatment composition word forms a film layer or meniscus at the terminal end 42 where it is retained. During the vibratory movement of the vibrating plate 22, the portion of the vibrating plate 22 comprising the passages or microperforations entrains, and
10 thereafter pumps the treatment composition upward and outward from the vibrating plates 22 in the direction of reference arrows TM.

Figure 8 depicts an embodiment of a part of mist generator means 20 wherein a treatment composition TM is supplied to the vibrating plate 22 as a column of flowing liquid supplied by a fluid conduit 30, here a circular tube, wherein a sufficient amount of
15 the treatment composition is present as a meniscus at the open end of the tube or may overflow. During part of its oscillation, the vibrating plate 22 comes into contact with the treatment composition TC and pumps it through an outwardly from the vibrating plate 22 and in the direction of reference arrows TM

Figure 9A depicts an embodiment of a mist generator means 20 adapted for use
20 with dual sources of the treatment composition. As is visible thereon, a vibrating plate 22 of a generally rectangular configuration comprises a piezoelectric element 24 in its midsection. The vibrating plate 22 has two distal end parts 27D each of which comprises passages or microperforations as discussed with reference to Figs. 1 and 2, 2A, 2B and 2C.

25 The operation of such a mist generator means 20 is more clearly disclosed on the side view presented in Fig. 9B which illustrates the mist generator means 20, and two sources of a treatment composition TC which can be the same or different. A first source of a treatment composition TC is a column of flowing liquid supplied by a fluid conduit 30, here a circular tube, wherein the treatment composition TC is delivered in the manner
30 described in Fig. 8, such that during part of its oscillation, the vibrating plate 22 comes into contact with the treatment composition TC and pumps it through an outwardly from

the vibrating plate 22 and in the direction of reference arrows TM. A second source of a treatment composition is wherein the treatment composition in the form of a liquid is supplied by a capillary means 70 which transfers the treatment composition towards the terminal end 72 of the capillary means 70 from a reservoir containing the treatment composition as discussed with reference to Fig. 9A. During the vibratory movement of the vibrating plate 22, the portion of the vibrating plate 22 comprising the passages or microperforations entrains, and thereafter pumps the treatment composition upward and outward from the vibrating plates 22 in the direction of reference arrows TM. In such an embodiment, a single piezoelectric element 24 and be used to induce vibration into one or more vibrating plates 22 each having one or more regions which comprise passages or microperforations as discussed with reference to Figs. 1 and 2, or a single vibrating plate having one or more regions which comprise comprises passages or microperforations as discussed with reference to Figs. 1 and 2, and consequently can be used to deliver one or more treatment compositions TC, which may be the same or different. For example, one treatment composition may be primarily provided as providing a treatment benefit to a surface, while the other treatment composition may be primarily provided to provide a treatment benefit to an airspace. Also coming into consideration is the provision of treatment compositions from devices according to the invention wherein a first treatment composition TC and a second different treatment composition TC are separately stored in separate reservoirs, but are simultaneously delivered when then coming into contact undergo a chemical reaction when in the form of a mist in order to form a treatment composition providing a technical benefit. Additionally it is contemplated that the vibrating plates 22 may have two or more differently sized or configured series of microperforations of each series being of different configurations or sizes, e.g., cross section or diameters than those of another series, as discussed with reference to Figs. 2A, 2B and 2C. The treatment composition or two different treatment compositions being nebulized by the mist generator means 20 according to Figs. 9A and 9B may be provided as a treatment mist having at least a bi-modal distribution of liquid droplets or liquid particles, but if desired the mist generator means 20 according to Figs. 9A and 9B may also provide a unimodal distribution of liquid droplets or liquid particles.

Figure 10 depicts a further embodiment of a mist generator means 20. Therein, a piezoelectric element 24 is mounted on a bottom face 32A of a transmission element 32T opposite from a top face 32B which is slightly spaced apart but in parallel to a vibrating plate 22. The vibrating plate 22 is mounted via a surrounding mounting frame 34 to a
5 first body element 40A of a portion of the device. The surrounding mounting frame 34 is rigid and does not, per se, introduce any vibratory motion to the vibrating plate 22. This body element 40A comprises a circular bore 42 through which the upper part 32D of the transmission element 32 extends. In this depicted embodiment, the transmission element 32 is a generally circular and symmetrical about a vertical central axis extending through
10 the center of the upper part 32D as well as lower part 32C to form a "stepped cylinder" as depicted. The lower part 32C is partially mounted within a bore 52 of a second body part 50 by a suitable mounting means here a peripheral O-ring 53 which is elastomeric thereby providing a liquid tight seal and yet at the same time permitting for movement of the transmission element 32T along its center axis and in the direction of the vibrating
15 plate 22. A supply of the treatment composition TC is supplied to the circular bore 42 and the vibrating plate 22 via a fluid conduit 60 positioned between the first body element 40 and the second body part 50. Thus, the treatment composition TC may be supplied to the region between the top face 32B and the vibrating plate 22. When the piezoelectric element 24 is actuated, a vibratory motion is induced within the transmission element 32
20 which then oscillates alternately toward and away from the vibrating plate 22. Such motion causes pumping of the treatment composition TC through passages or microperforations present in the vibrating plate 22 such that a mist of the treatment composition TC is formed and expelled outwardly from the vibrating plate 22 in the direction of reference arrows TM. Such motion of the transmission element may also
25 induce vibration in the vibrating plate as well, also causing pumping of the treatment composition TC therethrough and formation of a mist TM of the treatment composition TC. In the foregoing embodiment is to be understood that the reference to the first body part 40A and the second body part 50 need not be necessarily limited to discrete and separate portions of the device but can be a composite or a unitary element having in the
30 appropriate configurations as described with reference to the figure.

Figure 11 illustrates a further embodiment of the mist generator means 20 of the invention, similar in several respects to the embodiment according to prior Fig. 10. Therein, a first body part 40A includes a downwardly sloping circular sidewall 41 at or near the bottom of which is transversely mounted a vibrating plate 22 in a mounting frame 34. The region within the circular sidewall 41 and the vibrating plates 22 defines a weir 43 (or "horn 43" if the mist generator means 20 is inverted or rotated away from the depicted horizontal configuration) within which the treatment composition TC may be supplied or which may be collected. Beneath the vibrating plate 22 is a transmission element 32T in the form of a stepped cylinder, on the underside of which is mounted a piezoelectric element 24. Similarly to Fig. 10, the transmission element 32T is mounted within a circular bore 52 in a second body part 50 via a suitable mounting means, here an elastomeric seal 53 which may be a fitted O-ring which is flexible but provides a liquid tight seal between the lower part 32C of the transmission element 32T and the bore 52. Treatment composition TC is supplied between the transmission element 32 and the vibrating plate 22 via a fluid conduit 60 positioned between the first body element 40A and the second body element 50. When the piezoelectric element 24 is actuated, a vibratory motion is induced within the transmission element 32 which then oscillates alternately toward and away from the vibrating plate 22, causing pumping of the treatment composition TC therethrough and thereby form a mist TM of the treatment composition.

Figure 12 illustrates a further embodiment of the mist generator means 20 of the invention, similar in several respects to the embodiment according to prior Figs. 10 and 11. In the embodiment depicted, and first body part 40A includes a bore 42 passing the therethrough. A vibrating plate 22 is mounted via a peripheral mounting frame 34 transversely across a portion of the bore 42. Treatment composition TC is supplied to the underside of the vibrating plate 22 via a fluid conduit 60 where it contacts the bottom face 22a of the vibrating plate 22. On the opposite side of the vibrating plate 22 is mounted a transmission element 32T. The transmission element 32T is in the form of a stepped cylinder, having a piezoelectric element 24 mounted at one end thereof, and at the opposite end thereof is an extended pin 35 which is in physical contact with the top face 22b of the vibrating plate 22. While not shown, the transmission element 32T may

be suitably mounted by appropriate mounting means such that its pin 35 can oscillate into, and away from the vibrating plate 32 when the piezoelectric element 24 is actuated. Due to this physical contact between the pin 35 and the vibrating plate 22, a vibratory or oscillatory motion is induced within the vibrating plate 22, causing pumping of the treatment composition TC therethrough and thereby a mist TM of the treatment composition is formed..

Figure 13 depicts an alternative form of a mist generator means 20 useful in devices of the invention. Reference is made to US 20070169775, and US 20090121043 the entire contents of which are herein incorporated by reference. A first body part 40A includes an atomizing chamber 45, herein defined by a weir 43 and a base 44 within which is present a piezoelectric element 24 and a vibrating plate 22, here formed of a micro-perforated metal screen or sheet which is generally rectangular in configuration, which elements are described with reference to Fig. 6. A supply of the treatment composition TC enters the atomizing chamber 45 via fluid conduit within the first body part 40, and when the piezoelectric element 24 is actuated, the vibrating plate 22 vibrates or oscillates, thereby forming a mist TM of the treatment composition which is expelled outwardly from the atomizing chamber 45. The atomizing chamber 45 may be any part of the device within which the treatment composition TM is converted by means of the action of the mist generator means 20 into a treatment mist TM; further embodiments of atomizing chambers are disclosed in the further figures.

Figure 14 depicts a further alternative form of the mist generator means 20 useful in devices of the invention. A vibrating plate 22 which is bonded, mounted, or otherwise affixed to a peripheral piezoelectric element 24 generally is depicted in either of Figs. 1 or 2, is positioned slightly above the base 44 of a weir 43 present within a first body part 40 of the device. A fluid conduit 60 supplies a quantity of the treatment composition TC to the top face 22b of the vibrating plate 22. A small gap may exist between the bottom face 22a of the vibrating plate 22 and the base 44 thereby defining a base cavity 46. When the piezoelectric element 24 is actuated, the vibratory motion within the vibrating plate 22 causes the formation of a mist TM of atomized particles of the treatment composition TC within the atomizing chamber 45 which are expelled therefrom. Thus, the figure illustrates that the treatment composition TC need not necessarily be pumped

through the vibrating plate in order to atomize the treatment composition TC.

Advantageously, any liquid or fluid treatment composition TC which may collect within this base cavity 46 was ultimately atomized by the vibratory motion within the vibrating plate 22 which also exits the atomizing chamber 45.

5 Figure 14A illustrates a further embodiment of a mist generator means 20 useful in devices of the invention. A vibrating plate 22 which however only optionally but preferably includes microperforations 21, 25 passing therethrough as described with reference to Figs. 1, 2, 2A, 2B and 2C, is bonded, mounted, or otherwise affixed to a peripheral piezoelectric element 24 generally is depicted in either of Figs. 1 or 2 is
10 positioned within an atomizing chamber 45 tranversing the weir 43. Parallel and spaced apart from the vibrating plate 22 is a perforated screen element 27 having a plurality of perforations 21 passing therethrough. In operation, the vibrating plate 22 operates to nebulizer the treatment composition into discrete droplets or particles which are directed towards the perforated screen element 27, however only those discrete droplets or
15 particles not in excess of a specific droplet size or particle mass are expelled as a treatment mist TM, while the those discrete droplets or particles TC in excess of a specific droplet size or particle mass are returned to the vibrating plate 22. In this manner a controlled maximum particle size for the discrete droplets or particles of the treatment mist may be established.

20 In the embodiments disclosed in Figures 13 and 14 and 14A, a bore, cavity or other configuration other than a weir with at least one sloping sidewall may be used as part of the atomizing chamber 45 as disclosed in several of the following figures.

 With reference now to Fig. 15, therein is depicted a further embodiment of an atomizing chamber 45 present within the first body part 40A, here a generally circular
25 bore 42 having a base 44 opposite from an open end 48. Above the slightly concave shaped base 44 and mounted transversely across a portion of the bore 42 is a vibrating plate 22 and a piezoelectric element 24 as depicted on Fig. 4. A supply of the treatment composition TC enters the atomizing chamber 45 via fluid conduit and above the
 vibrating plate 22 such that it contacts the top face 22b. When the piezoelectric element
30 is actuated, vibrations are induced within the vibrating plate 22 which causes the formation of a mist TM of atomized particles of the treatment composition TC within the

atomizing chamber 45 which are expelled via the open end 48. Any liquid or fluid treatment composition TC which may collect between the vibrating plate 22 and the slightly concave shaped base 44 is also atomized by the vibratory motion within the vibrating plate 22 and also exits the atomizing chamber 45. Figure 15 also illustrates a sensor means, here a mist sensor means. In the instant embodiment the mist sensor means 71, includes a transmitter unit 71A and a receiver unit 71A mounted transversely from each other across the bore 45 and preferably near the open end 48 thereof. The transmitter unit generates a signals, e.g. such as optical, acoustic, or other signal capable of being received by the receiver unit, and any variations in the quality of the signal being transmitted due to the quantity or quality of the presence of the atomized particles, viz, mist, of the treatment composition passing through the gap between the transmitter unit 71A and receiver unit 72B, as represented by arrow 73 is detected by the receiver unit. An appropriate signal can be transmitted to the controller means (not shown) which may initiate a responsive action by the controller means and one or more further parts of the device. For example, wherein the mist sensor means determines that an insufficient quantity of the atomized particles of the treatment composition are being produced, a signal representative of this state may be transmitted to the controller means which for example may increase the power or alternately increase the frequency signal being transmitted to the piezoelectric elements 24 to thereby increase the rate of its oscillation or vibration, and/or alternately the mass flow rate of the treatment composition TC, such as may be supplied via a pump, may be increased. Alternately, the mist sensor means may also determine if the atomizing chamber 45 is flooded with the fluid form of the treatment composition and upon sending a signal to the control unit representative thereof, the control unit may cause an appropriate response, e.g., shutting down of the device or interrupting the operation of the mist generator 20. Still alternately, the mist sensor means may also determine the absence or presence of the mist of the treatment composition within the atomizing chamber 45, and if the latter is sensed then a representative signal may be sent to the control unit may cause an appropriate response, e.g., shutting down of the device or interrupting operation of the mist generator 20.

Figure 16 illustrates a further embodiment of a portion of a device. A reservoir 80, here in the form of a hollow container 81 containing a quantity of the treatment

composition in a fluid form, preferably in a liquid form, is removably affixed to a first body part 40 of the device. The reservoir 80 includes a cap 82 having passing therethrough a capillary means 70 here, a porous fibrous element which transfers the treatment composition towards the terminal end 72 of the capillary means 40. The body
5 part 40 includes an atomizing chamber 45 similar in most respects to the embodiment depicted on Fig. 13, except that the base of the atomizing chamber is replaced by a portion of the cap 82 which forms a liquid tight seal with the first body part 40. Such also permits for the alignment of the terminal end 72 of the capillary means 70 such that due to capillary forces within the capillary means 40, a quantity of the treatment composition
10 is continually presented to the terminal end 72 from which it may be atomized by the mist generator 20. The atomized particles of the treatment composition form a mist TM which exits via the open end 48 of the atomizing chamber 45. Also depicted is a mist sensor means comprising a transmitter unit 71 and a receiver unit 72 mounted transversely from each other across the bore 45 and preferably near the open end 48 thereof.

15 Figure 17 depicts an embodiment wherein the effect of gravity is used to deliver the treatment composition TC to the mist generator 20. A hollow container 81, viz., a bottle, having an open neck end 83 is inverted and mounted within the first body part 40 such that the treatment composition flows out from the inverted container 81 under the force of gravity. A fluid conduit 60 connects the open neck end 83 with an atomizing
20 chamber 45 containing a an atomizing chamber 45 substantially as described with reference to Fig. 14. Intermediate and in line with the fluid conduit 60 is a fluid control means 90, which may be any device which may impart control over the quantity or quality of the fluid treatment composition passing therethrough. In the simplest embodiment, such can be any valve which can be either manually, but more desirably, is
25 controlled by the controller means (not shown). Appropriate control of the fluid control means 90 may be used to ensure that an optimal supply of the fluid treatment composition TC is transmitted to the atomizing chamber 45 to ensure desired operation of the mist generator 20.

30 Although not illustrated in the depictions, it is to be understood nonetheless that suitable electrical or signal unit conducting means, i.e. wires, may be used to connect the various elements of the mist sensor means, the fluid control means, the controller means,

as well as any other device, elements or parts of the device as may be required, although such is not necessarily illustrated in the figures presented herein.

Figures A1 and A2 illustrate by means of graphical representations preferred treatment mist particle size or particle mass bi-modal distributions. Figure A1 represents the mass distribution or % distribution of the size (in microns) of the discrete liquid droplets being dispensed by a mist generator, during normal steady state operation over a convenient time interval, e.g., 1 or more seconds, or one or more minutes.. As is seen thereon, a greater amount of particles in the range of 0 – 10 microns are dispensed than the amount of particles in the range of 10 – 20 microns, whereas the amount of particles in the successive ranges of 20-30 microns is greater than those dispensed in the prior two ranges. As particle sizes increase to higher ranges, viz., 30 – 40 microns, and 40 – 50 microns, their amounts decrease successively. As can also be seen from Fig. A1, the total mass of the dispensed particles in the range of 0 – 10, is substantially lesser than the total mass of the dispensed particles in the ranges of 20 microns and greater. Figure A2 illustrates two further alternative bi-modal distributions according to preferred embodiments of the invention, here represented as a first bi-modal distribution represented by “C1” (in solid line) and a second bi-modal distribution represented by “C2” (in dotted line). The curves represent the distribution, by %wt. or mass or percentage of respective discrete liquid droplets or particles of the treatment composition present in a treatment mist formed therefrom, as indicated on the y-axis, for droplets within a particular micron size range, as indicated on the x-axis. With reference to line C1, it is seen that the first median or first averaged liquid particle size corresponds to line segment C11, which is approximately at 4 microns with the particle size distribution within the first part of the bi-modal distribution being beneath the curved line C1 to the left and right of the line segment C11, and the second median or second averaged liquid particle size corresponds to line segment C12, which is at approximately 29 microns, with the particle size distribution within the second part of the bi-modal distribution being to the left and right of the line segment and beneath curved line C1. The further bi-modal distribution represented by C2 is similar in many respects but, first median or first averaged liquid particle size corresponds to line segment C21, which is approximately at 5 microns with the particle size distribution within the first part of the bi-modal

distribution being beneath the curved line C2 to the left and right of the line segment C21, and the second median or second averaged liquid particle size corresponds to line segment C22, which is at approximately 22 microns, with the particle size distribution within the second part of the bi-modal distribution being to the left and right of the line segment and beneath curved line C2.

Figures 18A, 18B and 18C illustrate a portion of a device of the invention and an embodiment of an atomizing chamber 45 which is resistant to spillage of the fluid treatment composition contained therein when tipped away from the horizontal, as represented by the line segment "H" in the figures. In Fig. 18A, the atomizing chamber 45 is oriented such that the pair of vibrating plates 22 affixed at one end thereof to a piezoelectric element 24 extend vertically, downwardly into a quantity of the treatment composition TC adjacent to the base 44 of the atomizing chamber 45. In this embodiment, the atomizing chamber 45 is concentric about a center axis running through the center of the base 44 upwardly and through the open end 48 thereof at the opposite end of the atomizing chamber 45, although this is not a necessary requirement. The atomizing chamber 45 extends directed upwardly from its base 44, a generally circular base portion 45A, which extends into an intermediate, outwardly extending bell shaped or frustoconical portion 45B, which extends into a next, reverse bell shaped or frustoconical portion 45C which extends inwardly and merges into the open end 48. As is understood from these figures, the atomizing chamber 45 is in the form of an irregular bore 42 formed within the device. As is seen thereon, these sections define an interior volume of the atomizing chamber 45 which is adapted to contain and at least the part thereof a quantity of the treatment composition TC, and at least a part of the mist generator 20. As is also seen, the interior of the atomizing chamber 45 also has a maximum, transverse cross-section or maximum transverse dimension which in the depicted embodiment, can be defined as extending between opposing points 45X. This maximum transverse dimension is most preferably greater than the maximum transverse dimension of the open end 48. Advantageously, the height or distance between the base 44 is at least 1.1 times, preferably at least 1.2, and in order of increasing preference is at least: 1.3, 1.4, 1.5, 1.7, 2, 2.2, 2.5 times, or even greater than the maximum transverse dimension of the open end 48, which in the depict embodiment can be the distance

between opposing points 48X. in such a manner, a “well shaped” and atomizing chamber 45 can be produced, and which has dimension such that when the device and/or the atomizing chamber 45 is tilted or reoriented from the horizontal, “H”, such as in the orientations depicted on Fig. 18A and 18B, the volume of the treatment composition TC does not spill outwardly, via the open end 48 and out from the device but rather is retained within the atomizing chamber 45. Furthermore, in either such orientation wherein the atomizing chamber 45 is angled with respect to the horizontal, as opposed to the depiction of Fig. 18 wherein the atomizing chamber is perpendicular to the horizontal, at least a part of at least one of the vibrating plates 22 remains in contact with the treatment composition TC such that when the piezoelectric element 24 is energized, the vibrating plate or plates 22 atomized at the treatment composition TC which forms a treatment mist TM which exits via the open end 48 and enters the airflow conduit 100. As the mount 29 of the piezoelectric element 24, as well as the piezoelectric element 24 are configured to allow for the bypass of a stream of gas, preferably air, through the airflow conduit 100 and across the open end 48, the flowing gas represented by arrow 102, entrains the treatment mist 110 which flows towards an outlet (not shown) of the device

It is to be noted that in the foregoing embodiments, while the fluid conduit 60 has been illustrated as being an integral portion of either a first part 40A or second part 50 other device, e.g., as a bore or channel, such as to be understood as being merely by way of illustration as any fluid directing means, including a separate channel, conduit, tubing, or pipe element, capable of transmitting the treatment composition in fluid form so to come in contact with the mist generator 20 is clearly contemplated and may be used in any embodiment of the invention.

Figures 19A, 19B, 19C and 19D illustrate alternate views of a further embodiment of a mist generator 20 mounted in conjunction with an atomizing chamber 45 which has improved resistance to spilling of a treatment composition TC consequent to reorientation, e.g., tilting, or inversion of the atomizing chamber 45 of the device. For the sake of clarity, a fluid conduit 60 has been omitted from the figures but may be present at either as integral part of the first to body part 40A as previously depicted, or it may be a discrete separate element, e.g. as a pipe or tube for supplying the treatment

composition TC into the interior of the atomizing chamber 45, although said element is not shown in this figure. The atomizing chamber 45 has a base 44, a generally perpendicular side wall 45A which can be either a single circular side wall or maybe a plurality of flat or paneled sidewalls, such as would be required for a noncircular atomizing chamber 45, e.g., a square or rectangular shaped atomizing chamber 45. The side wall 45S and terminates at a top 45T, and extends from the side wall 45S to an inner sidewall 45I which is generally perpendicular to the top 45T and extends downwardly or inwardly towards the base 44 therefrom, until the inner sidewall 45I terminates at an inner sidewall base 45K. The inner sidewall 45I may be a single, circular sidewall or maybe a plurality of flat wall sections or panels depending from the top 45T and extending downwardly or inwardly towards the base 45 and terminating at the inner sidewall base 45K. the space defined between the inner sidewall 45I, the top 45T and the sidewall 45A defines a chamber adapt its to contain the treatment composition TC when the atomizing chamber 45 and/or the device or oriented at positions respective to the horizontal, indicated by line segment "H", other than as shown on Fig. 19A. The inner sidewall base 45K is preferably, generally parallel to the base 44 and advantageously defines the bottom of an opening bore section 49, which extends and provides for a passage permitting for the transit of atomized particles of the treatment composition, to pass from within that the interior of the atomizing chamber 45, and outwardly through the open end 48. As is also visible, the mist generator 20 is present, with the piezoelectric element 24 and the depending L-shaped vibrating element 22 mounted such that the portion of the vibrating plate 22 having passages or microperforations as discussed with reference to Figs. 1, 2, 2A, 2B and 2C is in contact with the fluid treatment composition TC. Thus, when the mist generator 20 is caused to operate, the vibrating plate 22 forms a mist of the treatment composition TM which exits upwardly through the opening bore section 49 and outwardly from the open end 48. As is also visible from the figure, the maximum transverse dimension of the opening bore section 49, which in this embodiment is coincident with the dimensions of the open end 48, is determined as the distance between points 48X, which is lesser than the maximum transverse dimension of the atomizing chamber 45, which is determined as the distance between points 45X.

Figures 19B, 19C depict tilted orientations of the atomizing chamber 45 containing a quantity of the treatment composition TC, while Figure 19D depicts an inverted atomizing chamber 45 containing a quantity of the treatment composition TC. As is visible from each of these figures, the quantity of the treatment composition TC is retained within the confines of the atomizing chamber 45, particularly at least partially in chamber 45Z defined by the inner sidewall base 45K, the space defined between the inner sidewall 45I, the top 45T and the sidewall 45A. Such is also depicted by the region between dotted line "V" and the top 45T. In the embodiment according to Fig. 19D where the atomizing chamber 45 is inverted with respect to the horizontal, line segment "H", the quantity of the treatment composition TC is contained within the chamber 45Z. As can be seen from these four figures, the embodiment disclosed provides certain technical advantages. A first advantage is that it is particularly difficult to tilt or reorient the atomizing chamber such that actual spillage of the fluid treatment composition will occur, even upon total inversion of the atomizing chamber 45. A second advantage is that upon the selected placement of the vibrating plate 22 within the atomizing chamber 45 a useful degree of controlled operation responsive to the orientation of the atomizing chamber 45 can be established. For example, when the atomizing chamber 45 is inverted, as depicted on Fig. 19D, the mist generator 20 may operate, but will not generate a mist of the treatment composition TM. When inclined at a steep angle, such as 90° from the horizontal, as depicted on Fig. 19C, the mist generator 20 will also not operate. However, when inclined at a lesser angle with respect to the horizontal as depicted on Fig. 19B, the mist generator 20 will continue to operate and generate a mist TM of the treatment composition. Thus, by an appropriate configuration of the atomizing chamber 45, and the mist generator 20, relative to the overall design of the device, a useful degree of control of mist generation responsive to the orientation of the device can be achieved.

A further embodiment of an atomizing chamber 45 and a mist generator 20 of a simplified construction, but offering a somewhat lesser degree of resistance to spilling of a treatment composition TC consequent to reorientation, e.g., tilting or inversion, of the atomizing chamber 45 of the device is illustrated in Figures 20A, 20B, and 20C. Figure 20A depicts the atomizing chamber 45 in an orientation to be considered "level" with the horizontal, represented by reference line "H", while figures 20B and 20C depict the

atomizing chamber 45 in an orientation can be considered as “tilted” with respect to the horizontal. As visible thereon, the atomizing chamber 45 is defined by a base 44 having an upper lead directing sidewall or sidewall 45, extending up to a top 45T which extends inwardly towards an open end 48. The atomizing chamber 45 has a maximum transverse dimension, here the distance between opposing points 45X, and the open end 48 as a maximum transverse dimension, here the distance between opposing points 48X, which distance is lesser of the two. Also the height of the sidewall or sidewall 45 is less than that of the maximum transverse dimension of the opening however, the maximum transverse direction of the atomizing chamber 45 is preferably at least as great as, or greater than the distance between opposing points 48X. Similarly to the embodiment depicted on Figures 19A – 19D, and mist generator 20 including a piezoelectric device 24 and an L-shaped vibrating plate is mounted with respect to the atomizing chamber 45 such that a portion of the vibrating plate 22 is in contact with the treatment composition TC present within the interior of the atomizing chamber 45. As is seen from each of Figs. 20A, 20B, and 20C the mist generator 20 will continue to operate to deliver a mist of the treatment composition TM when oriented “level” with the horizontal, or inclined with respect to the horizontal. The instant embodiment however, may allow for the escape of a fluid treatment composition TC via the open end 48 if the atomizing chamber 45 is further inclined or inverted with respect to the horizontal.

While not disclosed in prior Figures 18A – 18C, 19A- 19D or 20A-20C, it is to be understood that a mist generator 20 such as disclosed and discussed with reference to Figs. 1, 2, 2A, 2B and 2C may be used in place of the depicted mist generators 20 disclosed on these figures. Mist generators 20 according to Figs. 1, 2, 2A, 2B and 2C may be suitably placed within the interior of the atomizing chamber 35, preferably adjacent with the base 44 thereof. The configuration of the atomizing chamber disclosed in prior Figures 18A – 18C, 19A- 19D or 20A-20C or contemplated to provide similar resistance to spilling of a treatment composition TC consequent to reorientation, e.g., tilting, or inversion of the atomizing chamber 45 of the device.

Figures 20D and 20E depict a preferred embodiment of a mist generator assembly 400 comprising a mist generator means 20 which includes a vibrating plate 22 affixed, bonded to or otherwise mounted on a peripheral piezoelectric element similar in most

respects to embodiments discussed with reference to Figs. 1, 2, 2A, 4, 14A and/or 15, although other mist generator means not specifically disclosed may be adapted for use. In the depicted embodiment, the mist generator assembly 400 includes a first body element 40A having an open end 48 across which spans and is mounted the mist generator means 20, here wherein the peripheral edge 26 of the piezoelectric element 24 is mounted within the bore 42 of the first body element 40A and defines an atomizing chamber 45, and also defines a base cavity 46 within the first body element 40A and rearward of the mist generator means 20. The mist generator means 20 is mounted to the first body element 40A in a liquid, seal-tight manner. Further illustrated on the figure are a pair of electrical current carrying means 40, or, namely a pair of wires which supply an electrical current from the circuit control means (not shown) which acts to operate the mist generator means 20 by inducing the vibrations within that the vibrating plate 22 which acts to pump the mist TM of the treatment composition from the mist generator assembly 400; the means 40 (wires) may pass through a part of the first body element 40A via a suitable perforation, or by any other suitable arrangement of the elements of the mist generator assembly 400. As visible from the side cross-sectional view of Fig 20D, there is also present a fluid conduit 30 which has an open end 32 which extends into the base cavity 46 via a supply bore 31 into which the treatment composition TC is provided from the fluid conduit 30 by any suitable means, e.g., capillary flow, gravity flow but most preferably via pump intermediate the reservoir of the treatment composition and the mist generator assembly 400. In a preferred mode of operation the controller means is operated to control the volumetric flow rate of the pump means used to supply the treatment composition to the base cavity 46, as well as concurrently controlling the operation of the mist generator means 20 and its output such that a satisfactory delivery rate of the treatment mist TM is generated, and concurrently a sufficient amount of the treatment composition TC is supplied to the mist generator assembly 400 such that the an ample supply of the TC is present therein, but at the same time pumping of an excess of the treatment composition TC and “flooding” of the base cavity 46 is desirably avoided. Figure 20E illustrates a bottom plan view of the mist generator assembly 400 illustrating the arrangement of the mist generator means 20, the plate 22 including microperforations 21 passing therethrough.

While the first body element 40A may be formed or fabricated from any suitable material, such as a metal, synthetic polymer, ceramic material, and the like advantageously at least the part of the first body element 40A of the mist generator assembly 400 to which the mist generator means 20 is fixed is at least elastomeric or partially elastomeric in nature. This permits for the mist generator means 20 is mounted to both provide a liquid tight seal and to permit for the motion of the vibrating plate, and further denies passage of any treatment composition present within the base cavity 46 to exit the mist generator assembly 400 except through the microperforations 21 of the screen 22. The advantage of such construction allows for the mist generator assembly 400 used in any variety of orientations as will be described in greater detail in later figures. In particularly preferred embodiments, the first body element 40A of the mist generator assembly 400 and be constructed or formed of a monolithic mass of an elastomeric material such as a rubber, silicone, or other flexible material which can simultaneously be used to mount and retain the mist generator means 20 in the manner depicted. Preferably parts of, or all of the first body element 40A also acts to absorb vibratory shocks emanating from the operating mist generator means 20 to other parts of the device, and/or to be felt by the user of the device.

Figures 20F, 20 G and 20 H illustrate in several views a further preferred embodiment of a mist generator assembly 400 which includes many of the features discussed with reference to prior Figures 20D and 20F. Turning to the cross-sectional depiction provided by Figure 20F, as depicted the mist generator assembly 400 includes a first body element 40A having an open end 48 across which spans and is mounted the mist generator means 20, here wherein the peripheral edge 26 of the piezoelectric element 24 is mounted within the bore 42 of the first body element 40A and defines an atomizing chamber 45, and also defines a base cavity 46 within the first body element 40A and rearward of the mist generator means 20. The mist generator means 20 is mounted to the first body element 40A in a liquid, seal-tight manner. Further illustrated are a pair of electrical current carrying means 40, e.g., a pair of wires which supply an electrical current from the circuit control means (not shown) which acts to operate the mist generator means 20 by inducing the vibrations within that the vibrating plate 22 which acts to pump the mist TM of the treatment composition from the mist generator assembly

400; the means 40 (wires) may pass through a part of the first body element 40A via a suitable perforation, or may otherwise pass outwardly from the mist generator assembly 400 by any other path. For the present within the illustrated embodiment there is also provided a trough 46T within the first body element 40A extending from the base cavity 46 inwardly, that is to say in a direction away from the mist generator means 20 within which, when the mist generator assembly 400 is fully or partially inverted, some of the treatment composition TC may collect within the trough 46T. Optionally, but preferably as shown in the embodiments of Figs. 20F, 20G the mist generator assembly 400 further comprises an overflow conduit 46C which is in fluid communication with the trough 46T such that, any of the treatment composition TC which may be present within the trough 46T may be drawn off, or otherwise exit the mist generator assembly 400 therethrough. Advantageously, the overflow conduit 46C is further connected to a suitable overflow tube 47T which may be used to further direct the exiting treatment composition TC away from the mist generator assembly 400. A fluid conduit 30 having an open end 32 extends into the base cavity 46 of the mist generator assembly 400 into which the treatment composition TC is provided via the said fluid conduit 30 by any suitable means, e.g., capillary flow, gravity flow but again, most preferably is supplied via a pump or pumps intermediate the reservoir of the treatment composition and the mist generator assembly 400. As in the embodiment of Figs. 20D and 20E, preferably the controller means is operated to control the volumetric flow rate of the pump means used to supply the treatment composition to the base cavity 46, of the mist generator assembly 400 as well as concurrently controlling the operation of the mist generator means 20 and its output such that a satisfactory delivery rate of the treatment mist TM is generated, and concurrently a sufficient amount of the treatment composition TC is supplied to the mist generator assembly 400 such that the an ample supply of the TC is present therein, but at the same time pumping of an excess of the treatment composition TC and "flooding" of the base cavity 46 is desirably avoided. In the present embodiment the risk of undesirable flooding of the said device is usually avoided by the action of the overflow conduit 46C connected to the trough 46T, as any excess of the treatment composition TC entering the base cavity 46 at an excessive volumetric flow rate can be shunted away and out from the mist generator assembly 400. Figure 20G illustrates a bottom plan view of

the mist generator assembly 400 illustrating the arrangement of the mist generator means 20, the plate 22 including microperforations 21 passing therethrough, the mist generator means 20 mounted within the bore 42 at the peripheral edges 26 of the plate. Figure 20H illustrates in a perspective view, the base of the mist generator assembly 400, albeit with the depiction of the mist generator means 20 removed for the purposes of clarity in this figure. As visible there from, the trough 46T is concentric and extends around the supply bore 31 through which the treatment composition TC been provided from the fluid conduit 30 passes into the base cavity 46.

Figures 20IA, 20IB, and 20IB depict a mist generator assembly 400 generally as described with reference to Fig. 20F in three different modes of operation of the vibrating plate 22 of the mist generator means 20. In these figures, the mist generator assembly 400 is oriented with respect to the horizontal, which is represented by line "H". In the first of the figures, in Fig. 20I1 there is illustrated a quantity of treatment composition TC as represented by the labeled arrows supplied via the fluid conduit 30 into the base cavity 46. The rate of delivery of the treatment composition TC is controlled such that the volume of the treatment composition TC present within the base cavity 46 does not fill it, and a headspace "HS" above the treatment composition TC within the base cavity 46 is present. The vibrating plate 22 is extended outwardly as shown, and particles of the treatment mist TM are generated. In the next of the figures, in Fig. 20I2, the vibrating plate 22 of the mist generator means 20 is at its intermediate position. In the last of the figures, in Fig. 20I3, the vibrating plate 22 is extended (flexed) inwardly and shown, causing the level of the treatment composition TC within the base cavity 64 to rise slightly, however a sufficient headspace HS exists within the base cavity 64 the mist generator assembly 400 is not flooded and it operates normally.

Figures 20J1, 20J2 and 20J3 depict a mist generator assembly 400 generally as described with reference to Fig. 20F, as well as with reference to Figs. 20I1, 20I2 and 20I3. Similarly to those figures, the vibrating plate 22 is depicted in three different states but oscillates at a different frequency as shown in prior Figs. 20I1, 20I2 and 20I3.. Similarly thereto however, the configuration of plate 22 differs from that of corresponding Figs. 20I1, 20I2 and 20I3 but similar thereto, in each configuration there remains a sufficient headspace HS within the base cavity 64 the mist generator assembly

400 is not flooded and it operates normally. In the embodiments of Figures 20J1, 20J2 and 20J3 the different oscillatory pattern of the vibrating plate 22 provided different pattern of delivery of the mist of the treatment composition TM.

Figures 20K1, 20K2, 20K3, 20K4, and 20K5 respectively to pick the mist generator assembly 400 according to Fig. 20F in five different orientations or, namely in Fig. 20K1 in an upright vertical orientation, viz., 90° upward with respects to the horizontal, in Fig. 20K2 in an upwardly inclined orientation, viz., at approximately 45° with respect to the horizontal, in Fig. 20K3 in a horizontal orientation, viz., at 0° with respect to the horizontal, in Fig. 20K4 in a downwardly inclined orientation, viz. at approximately 45° below, and with respect to the horizontal, and finally in Fig. 20K5, in a downward vertical orientation, 90° below and with respect to the horizontal, each orientation is indicated by the respective line labeled “H” in the figures. Turning first to Fig. 20K1, as visible there from the treatment composition TC is pumped through the fluid conduit 30 into the mist generator assembly 400. Part of the treatment composition TC occupies part of the base cavity 64, while the remainder of the base cavity 64 comprises the headspace HS above the treatment composition TC. As the vibrating plate 22 operates, the mist of the treatment composition TM is formed and exits in a horizontal direction away from the mist generator assembly 400. Any excess treatment composition TC from within the base cavity 64 may exit (in the direction of the arrow labeled “OF”) outwardly from the mist generator assembly 400 via the overflow conduit 46C. In Fig. 20K2, in this inclined orientation, treatment composition TC pumped through the fluid conduit 30 and present within the base cavity 64 occupies part of the base cavity 64, the remaining part of which is unoccupied forms the headspace HS above the treatment composition TC. As a vibrating plate 22 operates, a mist of the treatment composition TM is formed and exits the mist generator assembly 400 downward angled direction. Any excess treatment composition TC from within the base cavity 64 may exit the mist generator assembly 400 in the direction of the arrow labeled “OF” via the overflow conduit 46C. Turning now to Fig. 20K3, in this horizontal orientation, treatment composition TC pumped through the fluid conduit 30 and present within the base cavity 64 occupies part of the base cavity 64, the remaining part of which is unoccupied forms the headspace HS above the treatment composition TC. As a vibrating plate 22 operates,

a mist of the treatment composition TM is formed and exits the mist generator assembly 400 downwardly. Any excess treatment composition TC from within the base cavity 64 may exit the mist generator assembly 400 in the direction of the arrow labeled "OF" via the overflow conduit 46C. Considering now Fig. 20K4, in this downwardly inclined
5 orientation, treatment composition TC pumped through the fluid conduit 30 and present within the base cavity 64 occupies part of the base cavity 64, the remaining part of which is unoccupied forms the headspace HS above the treatment composition TC. As a vibrating plate 22 operates, a mist of the treatment composition TM is formed and exits the mist generator assembly 400 downwardly in an angled direction. Any excess
10 treatment composition TC from within the base cavity 64 may exit the mist generator assembly 400 via the overflow conduit 46C. Now considering Fig. 20K5, in this downward vertical orientation, treatment composition TC pumped through the fluid conduit 30 and present within the base cavity 64 occupies part of the base cavity 64, the remaining part of which is unoccupied forms the headspace HS above the treatment
15 composition TC. As a vibrating plate 22 operates, a mist of the treatment composition TM is formed and exits the mist generator assembly 400 in a horizontal direction. Any excess treatment composition TC from within the base cavity 64 may exit the mist generator assembly 400 via the overflow conduit 46C.

As can now be appreciated following a consideration of the foregoing drawings,
20 the embodiment of the mist generator assembly 400 is relatively insensitive as to its orientation with respect to the environment, and/or with respect to the surface to be treated utilizing a device of the invention, as regardless of its orientation it will remain operative as long as a sufficient quantity of treatment composition TC is present within the interior of the mist generator assembly 400, or namely within the base cavity 64 such
25 that while the vibrating plate 22 of the mist generator means 20 operates, a treatment mist TM can be formed and delivered from the mist generator assembly 400. The provision of the overflow conduit 46C in fluid communication with the base cavity 64, here via the trough 46T (although trough is not required) permits for means of also ensuring that the base cavity 64 is not flooded with excess treatment composition TC. The egress of any
30 excess treatment composition TC may be controlled by the placement of the overflow conduit 46C, and indeed a plurality of overflow conduits 46C is foreseen. Furthermore,

the rate of egress of treatment composition from an overflow conduit 46C may be controlled such as by providing a downstream valve, or other flow controlling or flow directing means (not shown). In such a manner, the controller (not shown) and/or pump (not shown) may be used to control the volumetric supply rate of the treatment composition via the fluid conduit 30, and/or the volumetric egress rate of overflow treatment composition exiting the mist generator assembly 400 such that on the one hand a sufficient quantity of treatment composition TC is present within the base cavity 64 and in contact with the vibrating plate 22 when the mist generator 20 operates, and at the same time an excessive amount of the treatment composition TC is not present within the base cavity 64 such that the undesired flooding of the mist generator assembly 400 and especially the mist generator 20 is avoided irregardless of the orientation of the mist generator means with respect to the horizontal. In such a manner, and providing such an embodiment of a mist generator means 400 and a wide latitude in the control of the direction of the mist of the treatment composition TM can be provided in devices of the invention and methods of the invention. Similarly, it is to be understood that such a benefit may also be provided with a mist generator assembly 400 which does not include an overflow conduit, such as the embodiment of the mist generator assembly 400 depicted in Fig. 20D and 20E. In such an embodiment, careful control of the ingress or supply of treatment composition TC is required in order to provide optimal operating characteristics, and minimize the likelihood of flooding.

Figures 20L1, 20L2 and 20L3 illustrated several alternative views a preferred embodiment of a mist generator assembly 400 similar in most respects to the embodiment of Fig. 20F. As depicted in the cross-sectional view presented in Fig. 20L1, the first body element 40A has mounted therein a mist generator means 20 which abuts against a base cavity 64. A supply fluid conduit 30 extends into the base cavity 64, and an overflow conduit 46C is also in fluid communication with the base cavity 64 via a part of the trough 46T. The mist generator means 20 is in a sealed tight connection with the first body element 40A and is retained therein by a pair of extending lobes 402 which are made of a flexible elastomeric material and, in the embodiment depicted the entire first body element 40A is formed of a flexible or elastomeric material, here are preferably formed of a rubber-like material, which may for example be a rubber, a silicone material,

silicon elastomer, or for that matter any other elastomeric material which provides both structural, and fluid sealing surfaces which can be used to both retain, to form a liquid tight seal between the first body element 40A and the mist generator means 20. Fig. 20L2 illustrates the mist generator assembly 400 and its elements in a perspective view; also visible is a wire cavity "WP" within which the wires 40 (or other electrical current carrying conductors) connected to the mist generator means 20 may exit the mist generator assembly 400. Fig. 20L3 depicts the same as generator assembly 400 in a plan view.

Figure 20M illustrates a representational view of a pair of mist generator assemblies 400, preferably one or more of the mist generator assemblies according to Figures 20D, 20F, 20I1, 20J1, and/or 20L1 affixed to a mounting plate "MP" forming part of the device of the invention. In this figure is shown a pair of fluid control means 90, which may be any device which may impart control over the quantity or quality of the fluid treatment composition passing outwardly from a reservoir 80. The reservoir 80 may be a refillable reservoir, a removable refill package, a cartridge, or any other vessel for containing a quantity of the treatment composition TC. In the depicted embodiment the fluid control means nine your most conveniently a pair of pumps, especially preferably a pair of piezoelectric pumps which can be operated by and controlled by the controller means (not shown) in order to supply controlled amounts of the treatment composition TC to each of the mist generator assemblies 400. The amount of treatment composition supply to each of the mist generator assemblies 400 is not necessarily the same, but can vary in response to input from the controller but, in many operations or operating modes such will be essentially identical. The controller (not shown) operates the fluid control means 90, and did the mist generator assemblies 400 in order to generate plumes of mist of the treatment composition TM which exit the mist generator assemblies 400 via horns or other perforations PP within the mounting plates PM.

Fig. 21 an embodiment a mist generator 20 and an atomizing chamber 45 which is integrally formed within a reservoir 80, here in the form of a rectangular vessel 82 which contains within its interior a quantity of the treatment composition TC. The disclosed embodiments can be refilled by removing a replaceable plug element 83A supplying a quantity of the fluid treatment composition TC to the interior of the vessel 82 when

required. The atomizing chamber 45 is integrally formed as part of the vessel 82. In the depicted embodiment, the atomizing chamber 45 comprises a base 45 which is near to or adjacent to the bottom 84 of the vessel 82. An outwardly tapering, or horn shaped sidewall 45A extends upwardly from the base 44 where it terminates at an open end 48
5 coincident with a top 85 of the vessel 82. A mist generator 20 means comprising a vibrating plate 22 and a piezoelectric element 24, e.g. as depicted in Figs. 1, 2, 2A, 2B and 2C is mounted transverse to the base 44. The dimensions of the passages or microperforations are preferably such that they are sufficiently small such that when the vibrating plate 22 is not activated and does not vibrate, but is at rest or in a static
10 condition, the surface tension of the treatment composition TC is such that it does not flow through the these passages or microperforations. Thus, the static vibrating plate 22 acts as a valve for controlling the flow of the treatment composition. However, when the mist generator 20 operates, a mist of the treatment composition TM is formed by the vibrating plate 22 and passes upward through the atomizing chamber 45 and past the
15 open end 48 where it is entrained by a flowing gas 100, preferably air, moving through the airflow conduit 100. The gas entraining the atomized treatment composition is depicted by arrow 110, which also represents the treatment mist. In the embodiment depicted, as the static vibrating plate 22 acts as a valve controlling the passage of the treatment composition TC from the reservoir 80, it is expected that the embodiment can it
20 be used in virtually any position with little or no risk as to unintended spillage of fluid treatment composition TC from the device. Furthermore, the depicted embodiment is expected to permit operation of the mist generator 20 in any orientation as long as a quantity of the treatment composition TC is in contact with the vibrating plate 22.

Fig. 22 illustrates a further alternative embodiment of elements of a device
25 according to the invention. A reservoir 80 is provided, a hollow container 81 containing a quantity of the treatment composition TC in a fluid form, preferably in a liquid form, is attached to a removably affixed 82 cap. The cap has passing therethrough a capillary means a fluid conduit 60, here a flexible tube and fluid communication with a controllable pump 92 which is in communication with the controller means (not shown)
30 and a suitable power supply source (not shown). The cap 82 also includes a venting valve 83B to permit for the entry of ambient air while the treatment composition TC is

pumped from out of the reservoir 80. The fluid conduit 60 continues to a fluid control means 90 also in communication with the controller means and a power supply source which may be used to ensure that an optimal supply of the fluid treatment composition TC is transmitted to the atomizing chamber 45 to ensure desired operation of the mist generator 20. As visible on the figure, the fluid conduit 60 is separate from the first part 40 and supplies a controlled amount of the treatment composition TC responses to appropriate signal or control input from the controller means, to the mist generator 20. The mist generator 20 in the figure is similar to that depicted in Fig. 14, although it is understood that any other embodiment of a mist generator 20 may be interchangeably used.

Figure 23 depicts a further environment of elements of the device of the invention, which shows a partial view a reservoir 80 here a hollow container 81 closed by a removable cap 82. Integral to the 82 is depicted in cross-section an atomizing chamber 45 containing to a mist generator 20, e.g., in accordance with the embodiments of Fig. 1 or Fig. 2. Passing through portion of the cap supported by a mounting ring 86 is a capillary means 70 whose terminal end 72 is beneath the vibrating plate 22, such that when then the mist generator 20 is operated, the treatment composition present at the terminal end 72 is pumped through the vibrating plate, and atomized to form a treatment mist TM. While not shown, suitable connections, e.g., wires, to the controller means and a power supply means may be provided.

Figure 24 illustrates one embodiment of a device 1 according to the present invention. The device 1 includes a first assembly 120 which includes a quantity of fluid treatment composition TC within a reservoir 80, a mist generator 20 submerged within the treatment composition TC which is attached to a controller means 140 by means of an intermediate wire or wires at 150, over which are also transmitted the power required to drive the mist generator 20. The first assembly 120 is openable via a top cover 122, which has passing therethrough two connector ports, an airflow inlet connector port 123 and a mist output connector port 124. While not depicted in the figure, but represented to by the arrow labeled "G" is an airflow generator means which provides a stream of a gas, preferably air via the airflow tube 123A which generates an elevated pressure within the interior of the vessel 80. The treatment composition in the form of a mist TM present

within the vessel 80 is forced out via the mist tube 124A which directs it to the control handle 160 or control "wand", which has a flow directing nozzle 162 at its a distal end 161 from which the mist of the treatment composition TM emanates. The control handle 160 is gripped by a person and as the mist tube 124A is flexible and separate from the first assembly 120 it can be conveniently used to deliver a quantity of the mist of the treatment composition TM to a desired location.

Fig. 25 illustrates an alternative embodiment of a first assembly 120, which is a self-contained, in that the controller means, power supply source, and airflow generator are contained in the housing 129 forming a part of the first assembly 120, for example, a battery powered blower or fan may be used in providing sufficient pressure within the interior of the reservoir 80 so to cause the flow of the mist of the treatment composition through the mist tube 124A. Such a self-contained first assembly provides for a more portable device 1 according to the invention.

Fig. 26 depicts a device according to the invention which includes the first assembly 120 as generally depicted with reference to Fig. 25, to which is attached a flexible strap 128 which can be used to hang the first assembly 120 from a body part such as a shoulder. The device 1 also includes a control handle 160 connected to the first assembly 120 by an intermediate, flexible mist tube 124A, from which the treatment composition in the form of the mist can be delivered. A control button 163 they be used to control the release the treatment composition from the flow directing nozzle 162.

Fig. 27 illustrates a further embodiment of a device 1 according to the invention wherein in the first assembly 120 is provided on a wheeled cart 125, such as may be desired when a large amount of the treatment composition in the form of the mist is required to be dispensed. The depicted embodiment is similar in most respects to that described on Fig. 26; the figure also illustrates the manner in which a "soft surface" can be treated, here illustrated as a hanging curtain TS. In use, a user merely directs the release of the aerosolized treatment composition, namely the treatment mist TM from the flow directing nozzle 162 of the control handle 160.

Fig. 28 illustrates in a cross-sectional view a simple embodiment of a control handle 160 or control "wand" according to the prior embodiment of Figures 26 and 27. In this view, the mist tube 124 enters through the proximal end 164 of the control handle

160, and extends to a release valve 163A which can be manually controlled by the control button 163, so that when the release valve 163A is in an "open" condition, the mist of the treatment composition flows through a nozzle tube 124B and to the flow directing nozzle 162, from whence the aerosolized or mist of the treatment composition exits. Manual
5 gripping of the control handle 160 they be improved by providing a number of gripping the recesses 164B for cradling one or more fingers of a human operator holding and operating in the control handle 160.

Fig. 29 illustrates a cross-sectional view of a further embodiment of a device 1 in a self-contained and portable assembly. A shaped housing 170 includes at one end a flow
10 directing nozzle 162 which is in communication with the interior of the housing 170, and at the opposite end includes a removable cover 171 through which a reservoir 80 and a power supply source 190, here one or more electrical batteries, may be inserted within the shaped housing 170. Advantageously, an air intake grille 172 is also present in the housing 170 and preferably it is formed at or near the opposite end of the flow directing
15 nozzle. Within the interior of the housing 170 is also located a control circuit means (not shown), and airflow generator, here in the form a blower 200 which is driven by a small electrical motor 202 which is suitably mechanically coupled to the drive shaft (not shown) of the blower 200. A capillary means 70 extends outwardly from the reservoir 80 and is sufficiently proximate to a mist generator 20 such that, upon activation thereof a
20 mist TM of aerosolized treatment composition present within the interior of the reservoir is generated. To facilitate the movement and delivery of the airborne mist of the treatment composition the blower 200 directs a stream of moving air from its outlet 203 and inducing its to flow out from the flow directing nozzle 162 of the device 1. Such a device is portable, and compact, and also practical as frequently one or more treatment
25 operations can be performed without requiring either replenishment or replacement of the reservoir 80, and or replacement or recharging of the one or more batteries 190. Furthermore, as the generation of a mist of the treatment composition is essentially nearly instantaneous with the activation of the mist generator 20, power can be spared in-between surface treatment operations as control button 163 which energizes the control
30 means and consequently the blower 200 and the mist generator 20 need only be used to activate and operate the device 1 when actually treating a surface.

Fig. 29A illustrates a perspective view of a further embodiment of a device 1 in a self-contained and portable assembly. A shaped housing 170 includes a plurality of flow directing nozzles 162 which extend through a mounting plate MP forming part of the housing 170, behind each of which nozzles 162 is mounted a mist generator 20 (which preferably is a mist generating assembly 400). Part of the device 1 is a cartridge shaped reservoir 80 which is fitted into the housing 170. Although not illustrated in the figure, within the housing is also present at least a power supply source, preferably one or more electrical batteries, (rechargeable, or non-rechargeable), control circuit means (not shown), and at least one, but may also be two or more pumps and necessary tubing or other fluid conduits in order to provide for supply of the treatment composition present within the cartridge shaped reservoir 80 to be supplied to each of the mist generator 20 in response to appropriate control signals from the control circuit means which concurrently also operates the mist generator 20. Wherein the mist generator 20 forms part of a mist generating assembly 400, and especially a mist generating assembly 400 which may operate in accordance to the principles outlined in one or more of Figs. 20K1, 20K2, 20K3, 20K4 and 20K5, the device 1 may be operated in a variety of inclinations or orientations with respect to the horizontal as previously described. Such a device 1 is portable, compact, and also practical, as frequently one or more treatment operations can be performed without requiring either replenishment or replacement of the reservoir 80, and or replacement or recharging of the one or more batteries. Furthermore, as the generation of a mist of the treatment composition is essentially nearly instantaneous with the activation of the mist generator 20, and the direction of the directional delivery of the mist of the treatment composition may vary widely, the device 1 is both effective and convenient in use.

Figure 30 depicts a simplified manner of treating a textile surface, here the upholstered surface of a chair TU. A device according to the invention 1, e.g., the embodiment according to Fig. 29 is operated such that the aerosolized treatment composition, namely the mist TM is used to contact the textile surface by appropriate placement of the flow directing nozzle 162 while the device 1 operates. The mist TM not only contacts the surface of the textile, but may also penetrate into and through the textile

to provide a technical benefit, e.g., cleaning, sanitizing, disinfecting, fragranc-
ing, deodorizing, odor neutralizing, anti-allergen, therapeutic, and/or other technical benefit.

Figure 31 depicts a simplified manner of treating a lavatory appliance, here a
toilet bowl TT. A device 1 according to the invention, e.g., the embodiment according to
5 Fig. 29 is operated such that the aerosolized treatment composition, namely the mist TM
is used to contact the textile surface by appropriate placement of the flow directing nozzle
162 while the device 1 operates. The airborne mist TM may be delivered to the interior
of the toilet bowl as depicted, as well as to any of the exterior hard surfaces of the toilet
bowl. The device 1 can be similarly used to treat other nonporous hard surfaces in a
10 similar manner. Due to the airborne nature of the mist TM, typically the mist TM
remains airborne or floats for at least several seconds before evenly depositing upon
surfaces in the locus in which it has been applied.

Figure 32 illustrates a further embodiment of a portable device 1 according to the
invention which is adapted to be used with a refillable reservoir 80 which may be a
15 conventional polymeric bottle 81 containing a quantity of fluid treatment composition
TC. A shaped housing 170 having at one end a flow directing nozzle 162 which is in
communication with the interior of the shaped housing 170 also contains as an airflow
generator and a blower 200 coupled to an electrical motor 202, a power supply source
190, a controller means 220, a controllable pump 92, fluid conduits 60, control button
20 163 and while not illustrated it is to be understood that one or more wires are suitably
used to interconnect and electrical or electrically operable elements of the device 1. The
reservoir 80 may be removed, such as by rotationally disengagement with a portion of the
housing 170. Suitable connectors include, e.g., mating threads, friction fitting, snap
connector fittings, bayonet type fittings, and the like although virtually any liquid
25 connector which may be used comes into consideration. In operation, a user (human)
grasps a portion of the housing 170 and when desired, actuate the controller means 220
which acts to energize and operate the mist generator 20 and to also energize the
electrical motor 202 which drives the blower 200 thereby causing airflow to traverse the
mist generator 20 and entrain the mist TM of atomized air treatment composition which
30 is generated. As necessary, the controller means 220 may energize the controllable pump

92 in order to supply a necessary quantities of the fluid treatment composition TC, withdrawing it from the reservoir 80 and supplying it to the mist generator 20.

Figure 33 depicts and a cross-sectional view, a side of a further embodiment of a portable device 1 according to the invention. The device 1 comprises a refillable
5 reservoir 80 which is intended to be supplied as a bottle 81 containing a quantity of a treatment composition in fluid form, which is removably attachable via a screw type connector fitting or an integral cap 82 within the housing 170 (illustrated in dotted lines for sake of clarity). Fluid treatment composition is withdrawn from the interior of the bottle 81 via a fluid conduits 60 which is connected to a controllable pump 92 operated
10 by a controller means (not shown) present within the housing 170, and it is supplied in a metered manner via a further common with 60 which is used to supply a mist generator 20. The mist generator 20 may be similar to any of the types heretofore described, but advantageously may be according to the embodiments discussed with reference to Figs. 1, 2, 2A, 2B or 2C. The mist generator means 20 is included in the construction of the
15 atomized chamber 45, having dimensions approximately similar to the atomizing chamber discussed with reference to Fig. 21. Again, other embodiments and configurations of the atomizing chamber 45 as well as of the mist generator 20 may be incorporated in a device 1 according to the invention, including but not limited to the depicted device of the present figure. Downstream of the mist generator 20 is also
20 present a transmitter unit 71 and a receiver unit 72 mounted transversely from each other across the bore 45A of the atomizing chamber 45 and preferably near the open end 48 thereof, and may operate in a manner as described previously with reference to Fig. 15. Also present is a blower 200, which includes an integrated electric motor within its hub, and which may be used to force a current of air to flow through the airflow conduit 100,
25 wherein it entrains a quantity of the treatment composition which is an atomized or nebulized by the mist generator 20, which particles exit via the open end 48, and carries this airborne mist TM of the treatment composition outwardly from the device 1 via exit of the flow directing nozzle 162. To facilitate the handling of the device 1, a portion thereof may include recesses 164B for cradling one or more fingers of a human operator
30 holding and operating in the control handle 160. Further included in the control handle 160 is a control button 163 used to control the release the treatment composition from the

flow directing nozzle 162, by controlling the operation of the controller means which in turn regulates the operation of the controllable pump 92, blower 200 and the mist generator 20. The controller means may also receive a signal input from the receiver 72 which relates to one or more conditions relevant to the operation of the device 1, e.g., the mass flow rate of the atomized treatment composition, and/or the particle size or particle size distribution of the atomized particles passing between the transmitter 71 and the receiver 72, and exiting via the open end 48. Such conditions may be represented by a suitable signal which is returned as feedback to the controller means which may then be used to transmit appropriate control signals and/or alter power being supplied to relevant elements of the device 1, e.g., the mist generator 20, controllable pump 92 or blower 200, so to modify the operating characteristics thereof so to return the operating parameters of the device 1 to a desired state or states of operation. Power to the device 1, and to elements thereof, particularly the controller means 168, blower 200, controllable pump 92 and mist generator 20 may be supplied by one or more batteries 190 present within the housing 170. It is of course realized that an external power supply source, such as a direct connection via one or more wires to a power source, such as wall mains, or via an intermediate electrical transformer for controlling the voltage or current being supplied to the device are also contemplated in place of, or in addition to the batteries 190 in the depicted embodiment. The device 1 may also include rechargeable batteries 190. Of course, a similar substitution can also be made for other devices 1 according to the invention although, the use of batteries are preferred as improving the portability of a device 1 and facilitating its ease of use by consumer.

Figure 34 illustrates an external side view, as well as partial cross-sectional view of the device 1 depicted on Fig. 34. In the cross-sectional view is shown the interrelationship between an auxiliary nozzle 240 and the flow directing nozzle 162 of the device 1. In the current embodiment, the connector end 242 is dimensioned to be slightly larger than the maximum dimension of the flow directing nozzle 162 such that it can be slipped over, and form a releasable or friction fit therebetween. The discharge end 244 of the auxiliary nozzle 240 is open, and in the embodiments shown is generally bell-shaped. Such a configuration can be used, for example, to provide a quantity of the treatment missed to a small locus on a surface. Coming into consideration is the spot treatment of a

textile or other porous surface, such as upholstery, fabrics, garments, and the like, were it is desired to deliver a quantity of the treatment composition within a region which can be encompassed by the discharge end 244. The discharge end 244 can be placed adjacent to, or even in contact with a surface being treated. In the case of a soft or porous surface, retention of the discharge end 244 for a short interval of time may improve the delivery of the treatment mist upon, and into the soft surface so that the atomized treatment composition passes into the interior of the soft surface and may even pass through the other side thereof to the substrate or article supporting the soft surface. The bell shaped auxiliary nozzle 240 controls and the limits of the tendency of the airborne treatment composition in the form of the mist to drift but is retained by the confines of the nozzle 240.

Figures 35A, 35B, 35C and 35D electric further alternative embodiments of auxiliary nozzles 244 which may also be utilized in a similar manner with a device 1 as described with reference to Fig. 34.

The auxiliary nozzle 246 of Fig. 35A includes a similarly dimensioned connector end 242 adapted to be removably joined to a portion of the flow directing nozzle 162, which extends to an outlet end 244 which has a smaller opening than the connector end 242. Such an embodiment provides for a degree of collimating and concentrating the atomized treatment composition exiting the flow directing nozzle 162 and prior to exiting the outlet end 244 of the exiting nozzle 246. Such a configuration can be advantageously used wherein a small space or contracted area is to be treated. For example, such may include the proximity or region around fixtures on a lavatory or kitchen surface, such as the faucets and their handles, bathtubs, shower stalls, window treatments such as curtains, venetian blinds, as well as utensils such as eating or cooking utensils, tools or instruments, including medical and dental instruments.

The auxiliary nozzle 246 depicted on Fig. 35B also includes a connector end 242 configured to be removably affixed to a portion of the flow directing nozzle 162 of a device 1, and at the opposite end thereof extends to a fan shaped outlet end 244. Such a configuration can be used to provide a laminar-like delivery of the atomized treatment composition exiting the device 1. Such can advantageously be used, for example, for the treatment of generally planar horizontal or vertical surfaces, e.g., hard surfaces such as

kitchen or lavatory countertops, cabinets, walls, as well as soft surfaces, e.g., hanging curtains or drapes, blankets, bedsheets, pillows, mattresses, mattress covers, upholstery on chairs, sofas, and other seating surfaces including those found within the home, commercial environments, as well as in vehicles such as cars, trucks, buses, boats and aircraft. A further embodiment of an auxiliary nozzle is depicted on Figure 35C. The auxiliary nozzle 250 similarly includes a connector end 242 adapted to be removably joined to a portion of the flow directing nozzle 162, which extends to an outlet end 244 which is coincident with a generally planar support plate 252 which is adapted to removably bear thereon a pad or wipe article 254. The pad or wipe 254 can be any article or material which can provide a useful contacting or surface abrasive effect, e.g., “scrubbing”, to a surface being treated utilizing the device 1. Coming into consideration are microfiber wipes or pads, scrubbing pads, sponges, wipes formed of fibrous or non-fibrous materials including woven and nonwoven wipe articles which can be formed from synthetic, natural, or blended fibers, textiles, as well as brushes, and the like. While such can be integrally formed and form a permanent part of the support plate 252, conveniently such are removable and replaceable, and it may be disposable articles such as the embodiment depicted on Fig. 35C. Furthermore the pad or wipe article 254 may be pre-treated with a chemical composition other than the treatment composition; the use of a different treatment composition may provide an ancillary benefits or a synergistic benefit when the treatment composition present in the pad or wipe article 254 comes in contact with the atomized treatment composition TC (provided as a treatment mist TM) by the device 1 which flows through the auxiliary nozzle 250 and exits via the outlet end 244 where it comes into contact with the chemically pre-treated pad or wipe 254 present. Optionally come but desirable lay in many instances of the support plate 252 comprises one or more grip elements 256 which is used to retain and/or position the pad or wipe 254 which is removably attached to the support plate 252.

Fig. 35D depicts in a cross-sectional view a still further embodiment of an auxiliary nozzle 258, which includes a connector end 242 adapted to be removably joined to a portion of the flow directing nozzle 162, which extends to an interior cavity 260 having a plurality of outlets 245, here is series of holes 245 which permit for the release of the atomized treatment composition via the holes at the base of bristles 247. In the

embodiment, the interior cavity 260 terminates at a hemispherical section 262, after transiting from a generally cylindrical section 264 adjacent to the connector end 242 however, other configurations are also contemplated is being useful. The present configuration is illustrated provides for a series of bristles 247 which extends in both
5 cylindrical and hemispherical directions which may be advantageous for the cleaning of certain surfaces, e.g., toilet bowls, as well as other flat or curved surfaces.

Figure 36 depicts a further embodiment of a device 1 according to the invention, configured as a portable self-contained article. The device 1 comprises a housing 170, a flow directing nozzle 162, and openable cover part 173 which can be hinged, or
10 removable and replaceable, in place of a control button 163 a slideable switch 163A, and one or more status indicator means 167 which in the present embodiment is a plurality of light emitting diodes. The slideable switch 163A is movable between two or more positions, and in its most simplest form operates only as an "on" and "off" switch, but preferably includes a least one or more intermediate settings. The one or more
15 intermediate settings can be used to establish various operating parameters of the device 1, such as controlling the rate of delivery of the mist of the treatment composition, timer means to automatically engaged, and disengage operation of the device 1 at one or more preselected intervals of time and thereby providing for unattended operation of the device 1, or other operating parameters. Similarly, the status indicator means 167 may be other
20 than light emitting diodes, and can be any visually discernible, audio discernible, tactile discernible indicators which provide information regarding the status of the device including the operating status of the device 1 to a user. For example, the status indicator means 167 may be a small LCD or LED panel which are properly displays symbols relevance to the operating status of the device, such as pictographs, icons, written words,
25 numerical indicators, and the like.

An interior embodiment of the device of Fig. 36 is presented in the cross-sectional view of Fig. 37. As is seen thereon, the housing 170 contains within its interior an embodiment a mist generator 20 and an atomizing chamber 45 which is integrally formed within a reservoir 80, here in the form of a rectangular vessel 82 which contains within its
30 interior quantity of the treatment composition TC, similar in most respects to that described with reference to Fig. 21. The rectangular vessel 82 may be inserted within the

housing 170 via the removable cover 171. The open end 48 of the atomizing chamber 45 opens within the airflow conduit 100, which adds no one ends includes a radial electrical fan 201, and at the other end terminates in a flow directing nozzle 162. An air intake grille 172 is also present in the housing 170. The controller means 168 controls the

5 operating characteristics of the device 1, and in particular the operating parameters of the fan 201, and the mist generator 20. Power may be supplied to the device via one or more electrical batteries 190 which may be located beneath the cover part 173 of the housing 170. The device further includes orientation sensing means 169 for determining a physical orientation of the device, which for example, can be a level sensor, horizon

10 sensor, accelerometer or any other device which can be used to establish the relative position of the device 1 with respect to the horizontal or horizon. Advantageously, the orientation sensing means 169 provides appropriate signals indicative of the degrees of arc of "tilt" while that the device 1 with respect to the horizontal or horizon which signals may be transmitted via appropriate signal or power transmission means, e.g., wires (not

15 shown) to the controller means 168. The controller means may responds to the ease and received signals in order to control the operating characteristics of the device 1, e.g., shutting off one or more parts of the device as an excessive degree of tilting incensed, or if the device 1 is suddenly dropped or overturned. Other operative characteristics of the device including but not limited to fan rotational speed, as well as operative

20 characteristics of the mist generator 20 can also be independently or simultaneously controlled by the controller means 168, which may include one or more electronic components containing a hardware circuit, or a logic processor, or central processing unit which may operates the device 1 responsive to a preset program, which can be stored in a volatile but preferably non-volatile memory means present on the controller card. The

25 controller means 168 may operate according to one preprogrammed mode of operation, or might alternately operate according to two or more preprogrammed modes of operation which can be selected by appropriate placement of the slideable switch 163A. Further, the operative status of the device can be indicated by the status indicator means 167.

30 An alternate interior embodiment of the device of Fig. 36 is presented in the cross-sectional view of Fig. 38. The depicted embodiment is similar in several regards to

that of prior Fig. 37. In the present embodiment however, a self-contained blower motor 200 is included, which supplies airflow into the airflow conduit 100. The mist generator 20 is similar to the embodiment discussed with reference to Fig. 13. Fluid treatment composition TC is contained within the interior of the vessel 82, and the quantity of the treatment composition TC can be replenished via removal of the plug 83A. The fluid conduit 60 communicates from within the interior of the vessel 82, and a controllable pump 92 which is controlled by the controller means 168. A controllable pump 92 supplies a quantity of the fluid treatment composition when necessary to the mist generator 20. The mist generator 20 is similar to, and works similarly to the embodiment discussed with reference to Fig. 13. The operation of the mist generator 20 is also controlled by the controller means 168. The mist of the treatment composition TM is entrainment in the airflow generated by a blower 200, and is directed outward from the device 1 via the flow directing nozzle 162. Necessary electrical power is supplied to components of the device 1 via batteries 190. Necessary interconnections between electrically operated or operable components of the device are supplied via suitable signal and/or power transmission means, e.g., wires (which are not shown in the figure for purposes of clarity). The device further includes orientation a pair of sensing means 169, 169 for determining a physical orientation of the device, which for example, can be a level sensor, horizon sensor, accelerometer or any other device which can be used to establish the relative position of the device 1 with respect to the horizontal or horizon. The pair of sensing means 169, 169 may be oriented perpendicular to each other within the device 1 such that signals indicative of "up or down tilting" of the device with respect to the horizon, e.g., in a first vertical reference plane traversing along the length of the airflow conduit 100, as well as signals indicative of "side to side tilting" of the device with respect to the horizon, e.g., and a second vertical reference plane perpendicular to the first reference plane traversing along the length of the airflow conduit 100. Such provides for improved signal inputs with regard to the position of the device 1 relative to its operating environment.

A further, alternative interior environment of the device of Fig. 36 is depicted in the cross-sectional view of Fig. 39. The depicted embodiment is similar in several regards to those of prior Figs. 37 and 38. In this embodiment, the airflow generator

means comprises an aerosol canister 230 containing a propellant or a pressurized gas, having an actuator 231 held in a seal-tight relationship with a controlled valve means 232, responsive to an appropriate signal input from the controller means 168 is actuated to release a quantity of the propellant or pressurized gas from the aerosol canister 230 into the airflow conduit 100. Such a release may be periodic, or continuous during the operation of the device. The control valve means 32 may be any device which provides this operative function, and for example may be a simple solenoid which operates as a plunger to operate the actuator 231, or may be an electrically operated solenoid valve such as disclosed in one or more of patents US 7100889, US 6328279, US 5356111, the entire contents of which are herein incorporated by reference. The released gas from the aerosol canister 230 entrains the mist of the treatment composition TM generated by the mist generator 20. A controllable pump 92 supplies, via fluid conduits 60, quantities of treatment composition TM contained within the vessel 82 to the mist generator 20. The mist generator 20 is generally disclosed with reference to the embodiment discussed with reference to Fig. 13. The vessel 82, and the aerosol canister 230 be supplied as part of a refill cartridge 87 which is removable from, and replaceable into the interior of the housing 170 via a removable cover 171. A further, similar removable cover 171 may also be present to allow for the replacement of the one or more batteries 190 used to provide electrical power to components of the device 1. The device may also further include one or more sensing means 169.

A yet further, alternative interior environment of the device of Fig. 36 is depicted in the cross-sectional view of Figure 39A. The depicted embodiment is similar in several regards to those of prior Figs. 37, 38 and 39 and includes common features thereto. In the current embodiment, a portion of the reservoir 80 comprises a vertically disposed mist generator 20, which may be as those described with reference to Figs. 1, 2, or 2A, which is vertically disposed such that one side of the vibrating plate 22 is in direct contact with the quantity of the treatment composition TC present in the reservoir 80. The reservoir 80 may be refilled via a removable and replaceable plug 83A. While operating, the vibrating plate 22 of the mist generator means 20 produces a treatment mist TM which enters the airflow conduit 100 wherein it is entrained by a flow of air being generated by a blower 200, such that the mist of treatment composition TM is directed outwards of the

device 1 where it exits via the flow directing nozzle 162. The embodiment of the device 1 shown in the figure illustrates an embodiment wherein a pump for supplying the fluid treatment composition to the mist generator 20 is not needed.

An alternative embodiment of a further device 1 according to the invention is depicted on Figures 40, 41 and 42. The depicted embodiment is directed to a portable device 1 which is placeable in a stationary position and operated to generate and provide a mist of the treatment composition TM in the area or proximity of the device 1. With reference first to the cross-sectional view of Fig. 40, the device includes a housing 170 including a removable cover part 173 which provides access for replacement of a vessel 80 containing a quantity of the fluid treatment composition TC. The vessel 80 is inverted, and includes a cap 82 which incorporates within its construction a controllable drip valve 93 which is responsive to appropriate signals from the controller means 168. The drip valve 93 provides a measured release out of the fluid treatment composition TC into the mist generator 20 which is placed directly beneath such that, fluid treatment composition TC in pinching thereon is atomized and forms a mist of the treatment composition TM. Beneath the mist generator 20 is positioned a radial electrical fan 201 which provides airflow within the housing 170. Air enters the housing 170 via the grille 172, is accelerated by the fan 201, and the increased pressure forces the mist of the treatment composition TM out from the interior of the housing 170 via the exit orifices 162A, which function as flow directing nozzles of prior embodiments. As is visible, a plurality of louver shaped, exit orifices 162A are present on the periphery of the housing 170 which provides a downward, multi-directional flow of the treatment the midst TM. The device 1 may also include within the housing 170 a power supply source such as one or more batteries 190 although such may be substituted by an alternative power source, e.g., a wired connection to electrical mains, or to an electrical transformer. The depicted embodiment also includes an embodiment of an air-treatment means 270 which is used to provide a volatile material to the ambient environment of the device, which volatile material is supplied to the ambient environment independently of the mist generator means. In the current embodiment the air-treatment means 270 comprises a capsule 272 having a plurality of perforations 274 passing therethrough, containing a fibrous pad 276 impregnated with a fragrance composition. The fragrance composition volatilizes within

the capsule 272 exiting via the plurality of perforations 274 wherein the airspace in the proximity of the device 1 is treated by the volatilized fragrance composition.

Figure 41 illustrates one mode and environment of operation of the device 1. As is his will thereon, the device 1 is placed upon the surface of a kitchen countertop "K", and operated to generate and provide a mist of the treatment composition TM which, once exiting the exit orifices 162A is airborne and may waft outwardly from the device 1. The mist of the treatment composition TM comes into contact with the horizontal top surface of the kitchen countertop "KT", the generally perpendicular vertical kitchen countertop backsplash "KB", and may also drift over downwardly from the kitchen countertop K and contact the face of the kitchen cabinets "KD" positioned beneath. The airborne mist to the treatment composition TM ultimately settles and coalesces upon these contacted surfaces and can provide a technical benefit thereto, e.g., clean, sanitizing, disinfecting, order masking, odor neutralizing, etc.

Figure 42 illustrates an alternate mode and environment of operation of the device 1. The device 1 is placed within the interior of a cavity, here a sink "KS", operated to generate and provide a mist of the treatment composition TM which, once exiting the exit orifices 162A is airborne and may fill the cavity of the sink KS. Due to the typically greater density of the mist of the treatment composition TM as opposed to the surrounding air of the ambient environment, said mist TM is prone to be primarily retained within the confines of the cavity of the KS and ultimately settles and coalesces within the cavity of the sink KS. The settled mist TM provides a technical benefit thereto, e.g., clean, sanitizing, disinfecting, order masking, odor neutralizing, etc. to the sink KS, as well as any articles positioned within the sink cavity, e.g., tableware, cooking utensils, dishes, and the like.

Figure 43 illustrates an embodiment of a device 1 according to the invention, used to treat the interior and the contents, e.g., dishware, utensils, etc., of an automatic dishwashing machine 320. Conveniently the device 1 is placed within a rack 322 of the machine 320 and may be used prior to a dishwashing cycle, during a dishwashing cycle, or after a dishwashing cycle to release a treatment mist TM therefrom.

While not illustrated it is contemplated that the device of the invention may be used to treat the interior and contents of a clothes washing machine as well as a clothes

dryer and the device may be used prior to a clothes washing or drying cycle, during a clothes washing or drying cycle, or after a clothes washing or drying cycle to release a treatment mist TM therefrom.

Figure 44 illustrates a further embodiment of a device according to the invention,
5 here used to treat the interior of a shower stall 340. Herein, the device 1 is suspended from a shower head supply tube 342 by a suitable hanger means. The device 1 further includes an air-treatment means 270. The device 1 may be operated to dispense a mist of treatment composition to the shower stall 340.

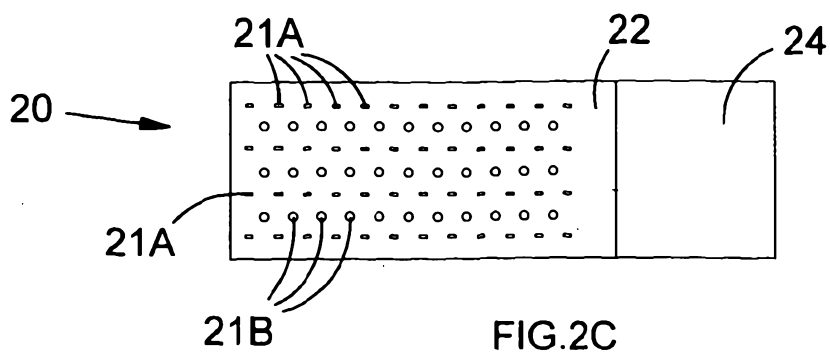
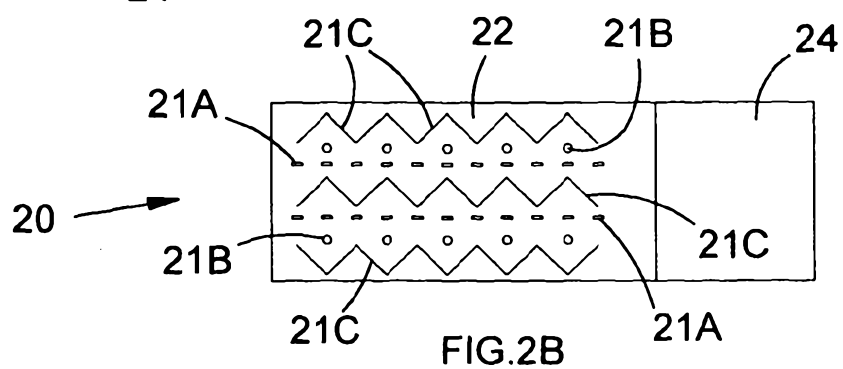
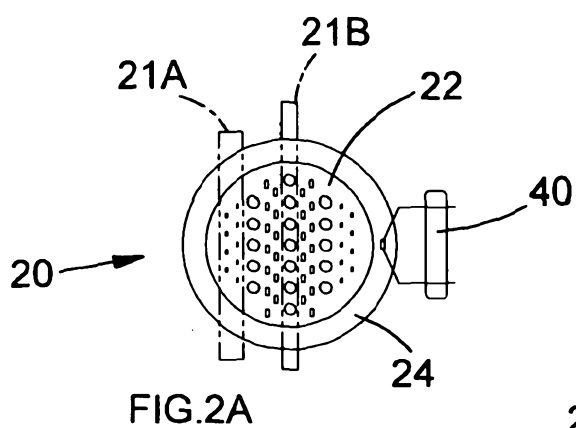
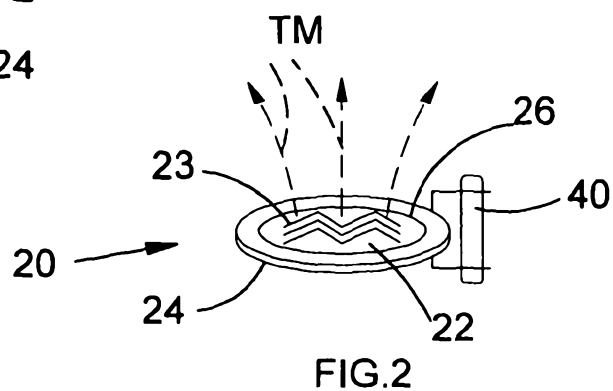
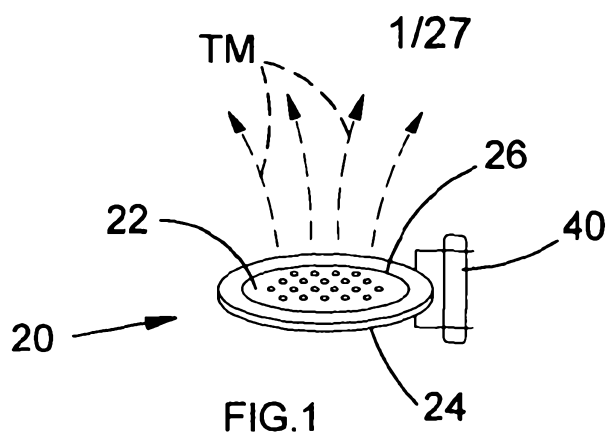
Figure 45 depicts a still further embodiment of a device 1 according to the
10 invention, here mounted on the interior 362 near the opening 364 of a waste receptacle 360. In use, the cover 366 of the waste receptacle 360 is optionally but preferably closed, and the device 1 is operated to release a treatment mist to the interior waste receptacle.

Is naturally to be understood that the embodiments discussed in the foregoing figures are by way of illustration and not by way of limitation. It is also to be clearly
15 understood that various elements presented in the disclosed embodiments may be substituted in the place of like or similar elements in different embodiments. Particularly, it is foreseen in fact different forms of mist generators 20 can be substituted in different embodiments of devices 1 presented herein.

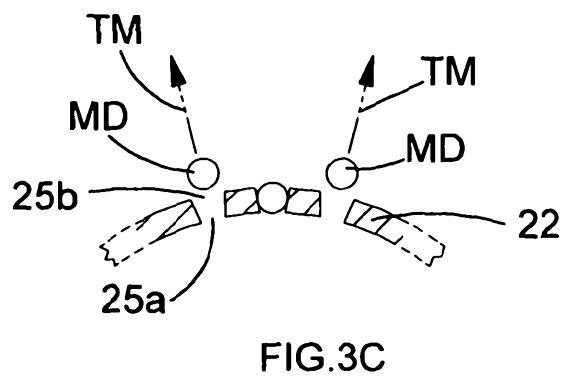
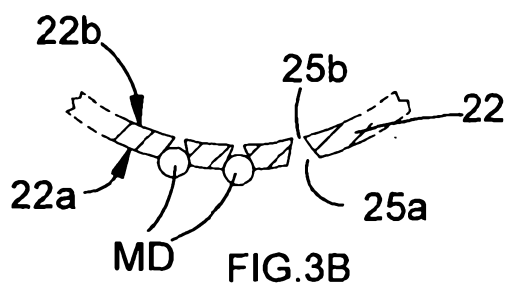
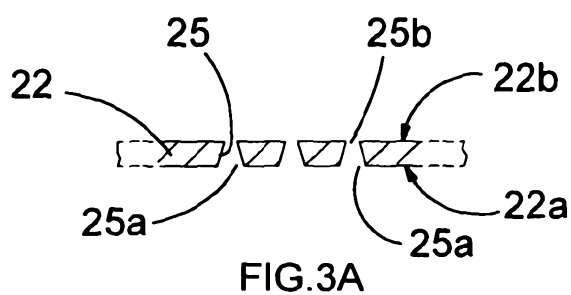
20

Claims:

- 5 1. A device which generates a mist of a treatment composition, viz, an aerosolized treatment composition which imparts a technical benefit to surfaces, or airspaces, which come into contact with the said aerosolized treatment composition.
2. A method of treating a surface using a device according to claim 1.



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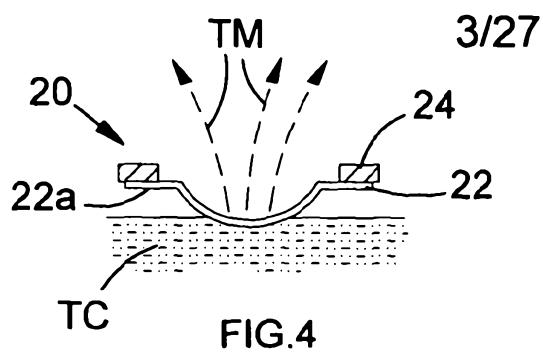


FIG.4

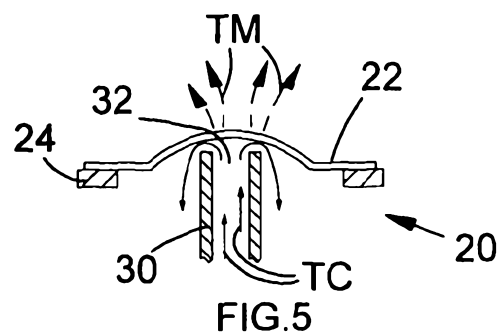


FIG.5

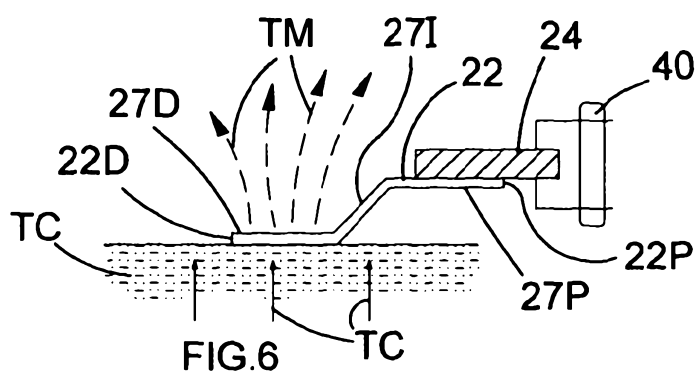


FIG.6

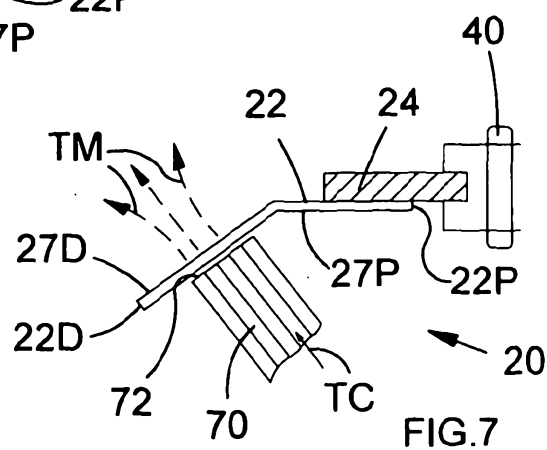


FIG.7

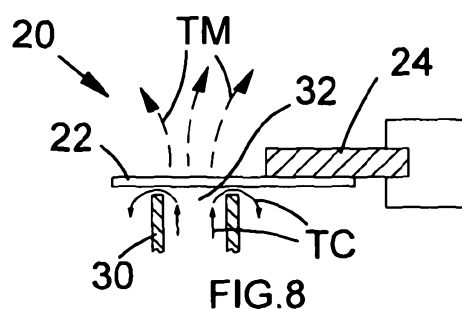


FIG.8

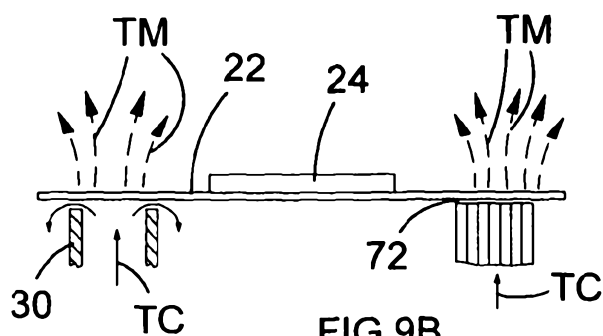


FIG.9B

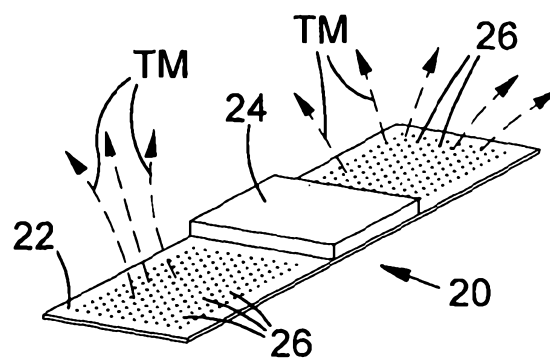
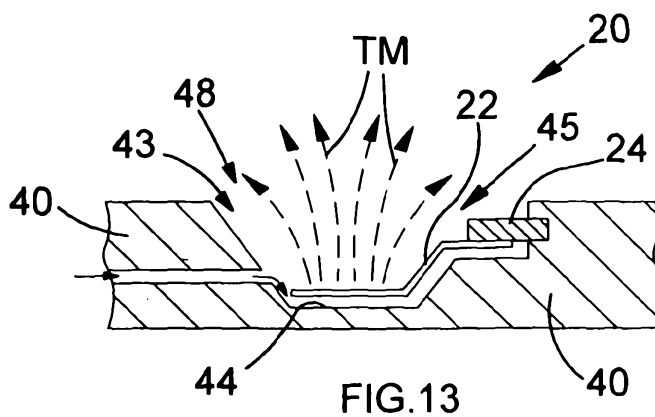
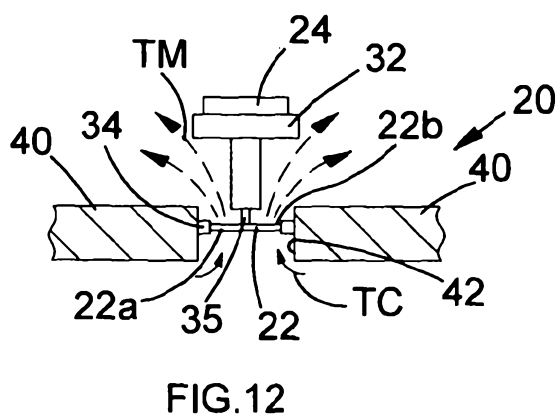
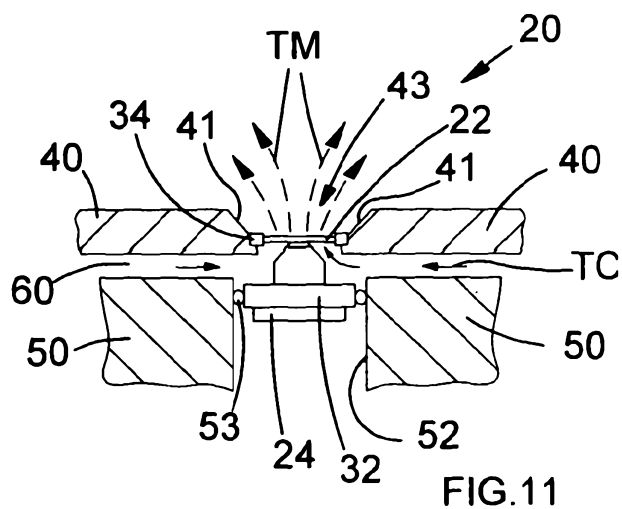
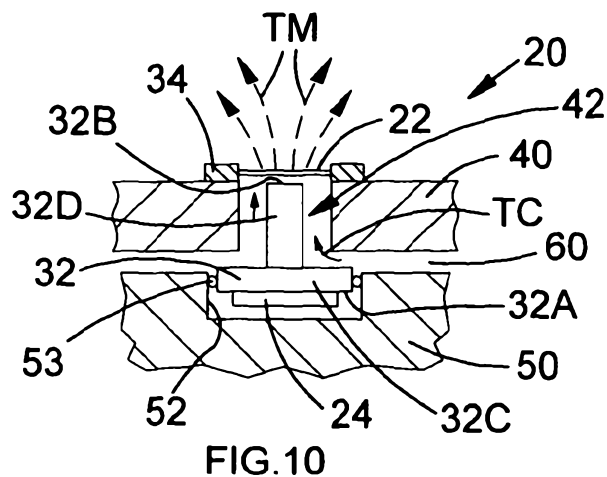


FIG.9A

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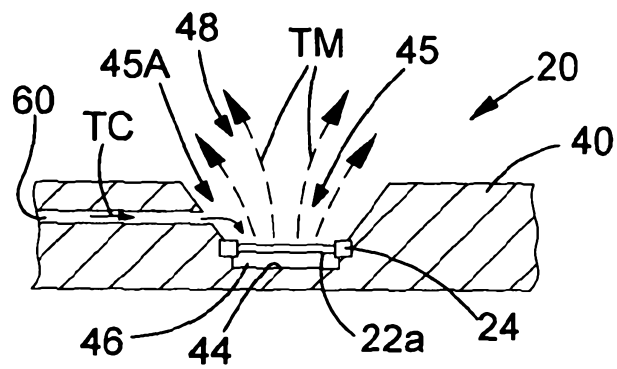


FIG.14

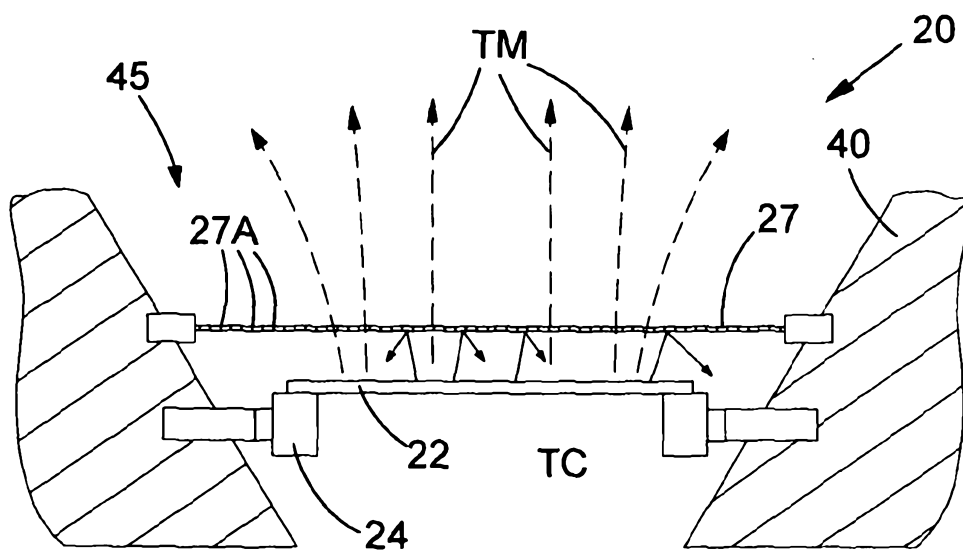


FIG. 14A

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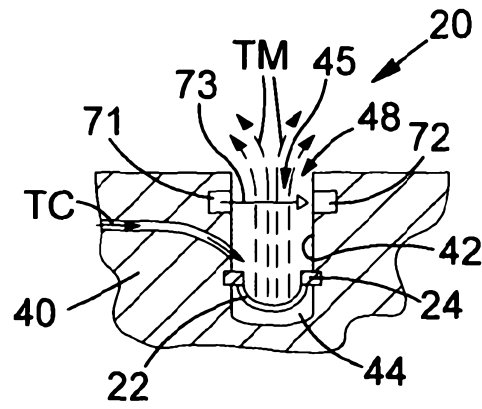


FIG. 15

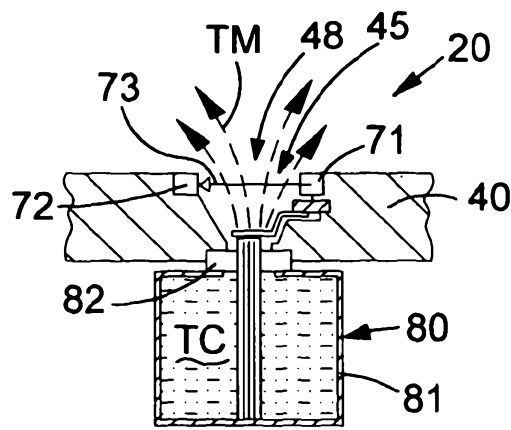


FIG. 16

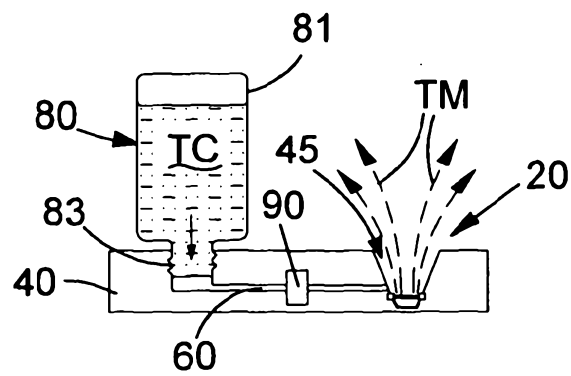


FIG. 17

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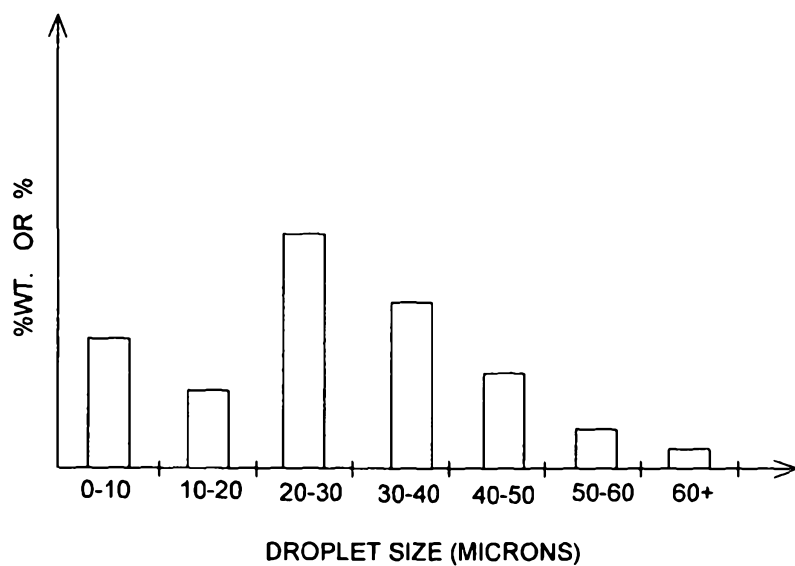


FIG.A1.

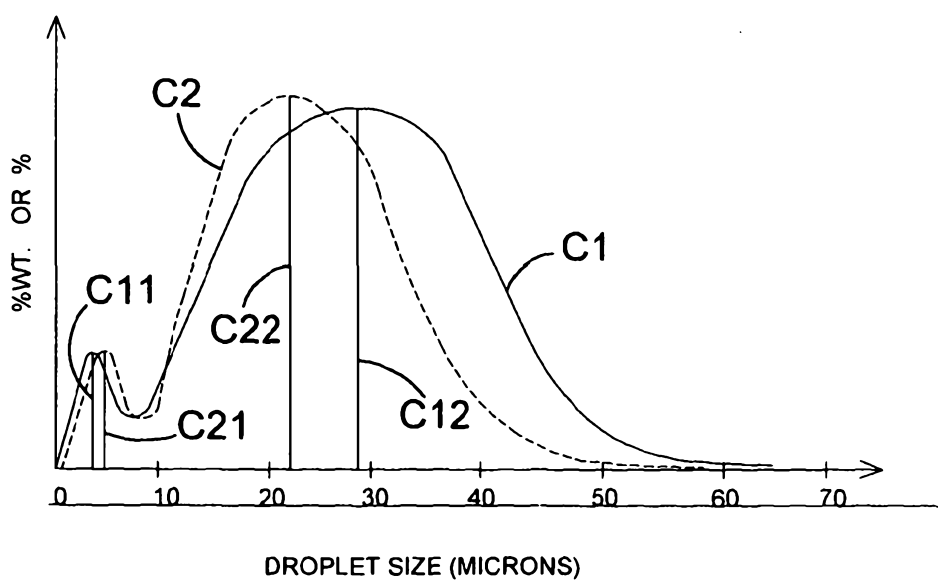
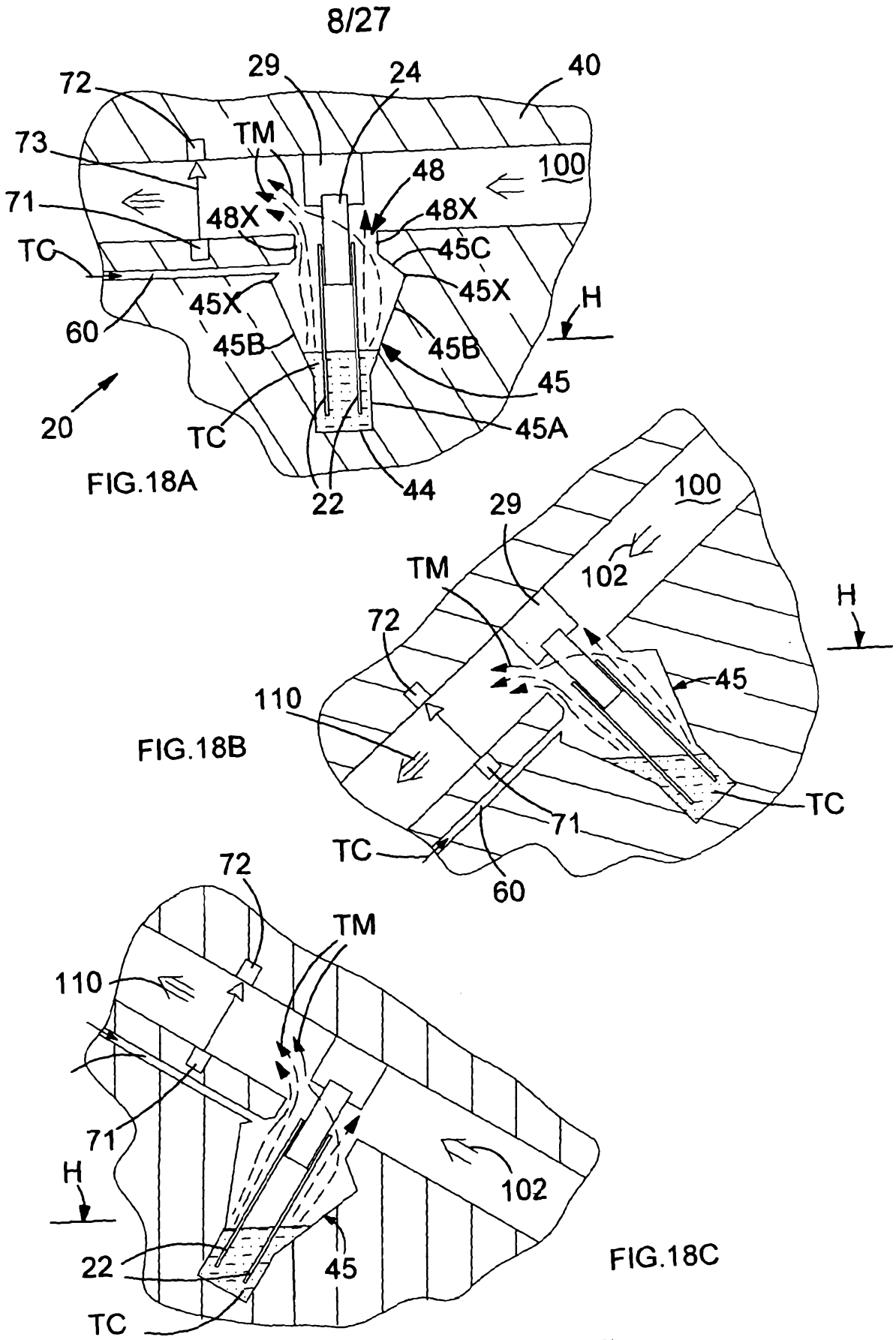


FIG.A2



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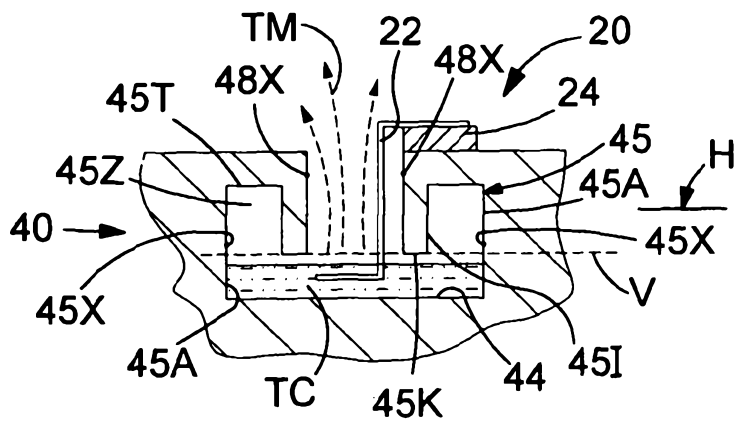


FIG. 19A

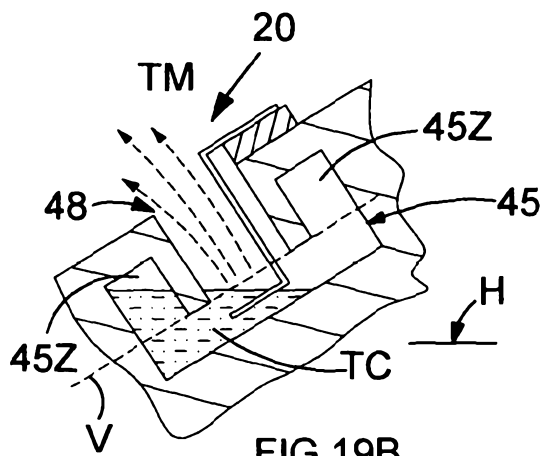


FIG. 19B

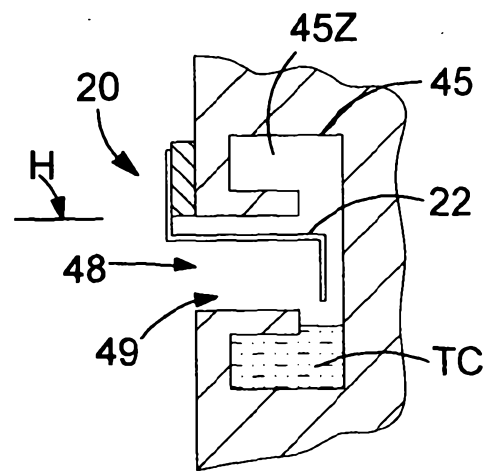


FIG. 19C

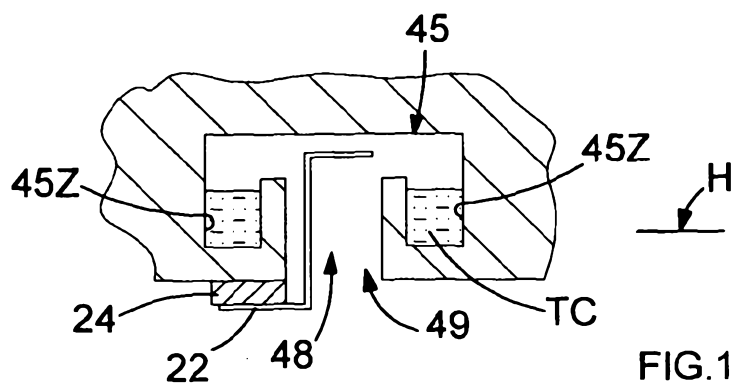
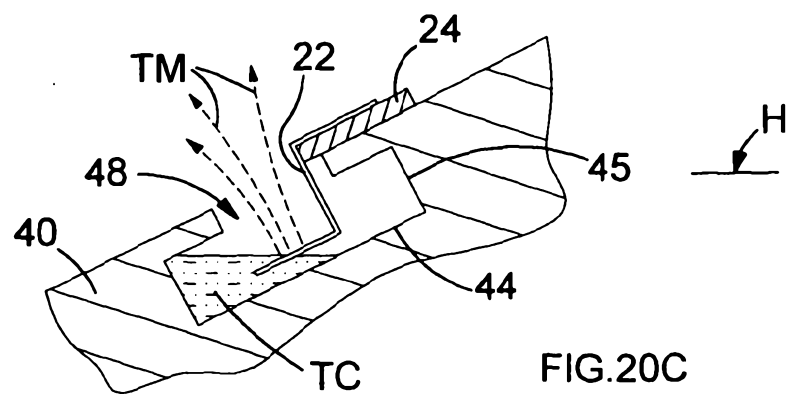
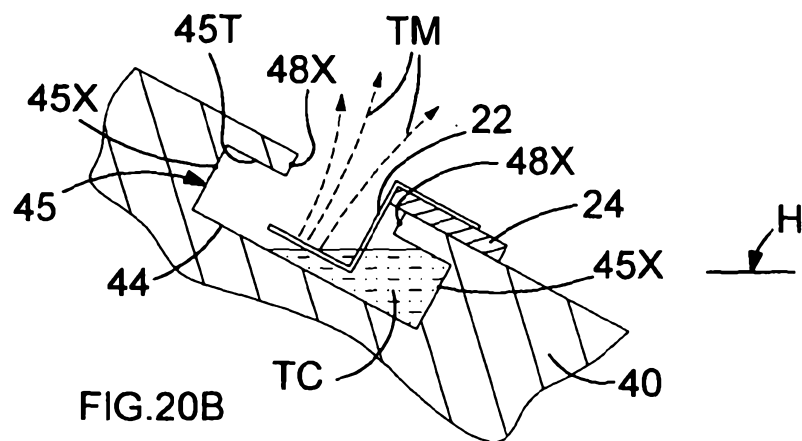
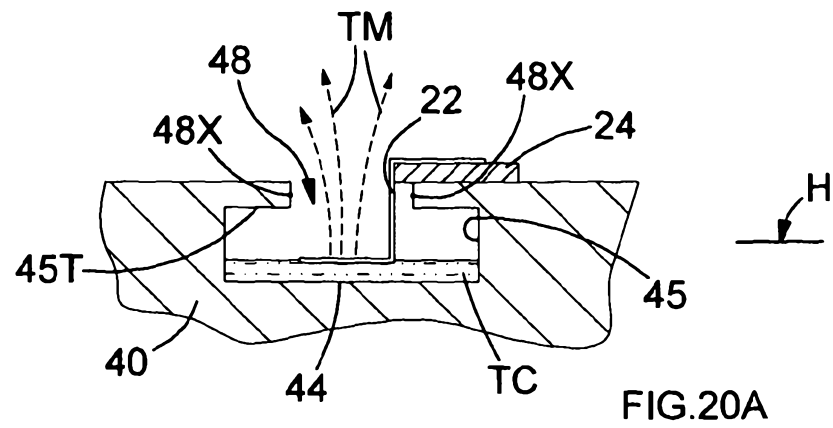


FIG. 19D

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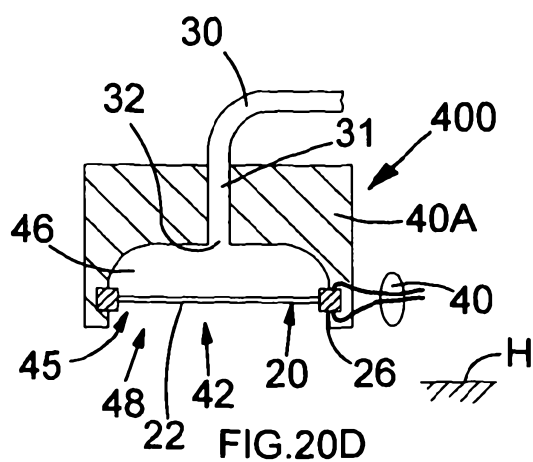


FIG. 20D

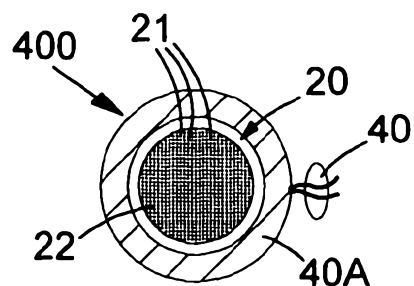


FIG.20E

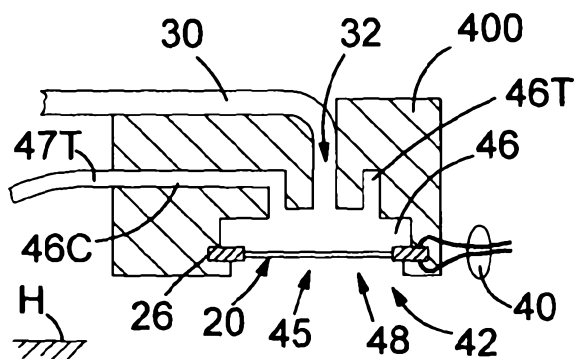


FIG.20F

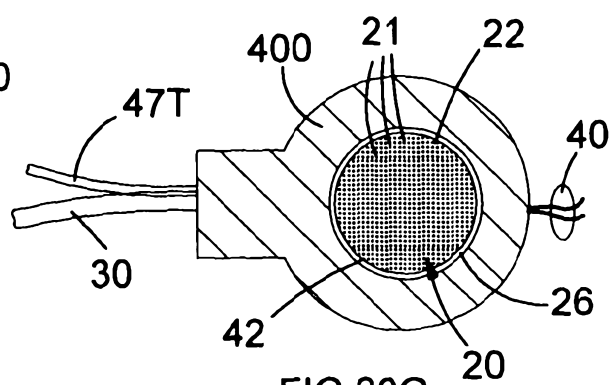


FIG.20G

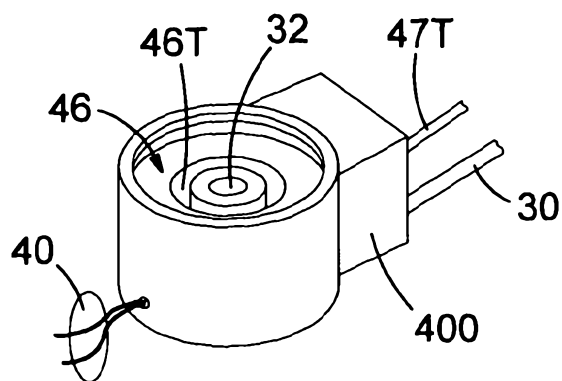


FIG.20H

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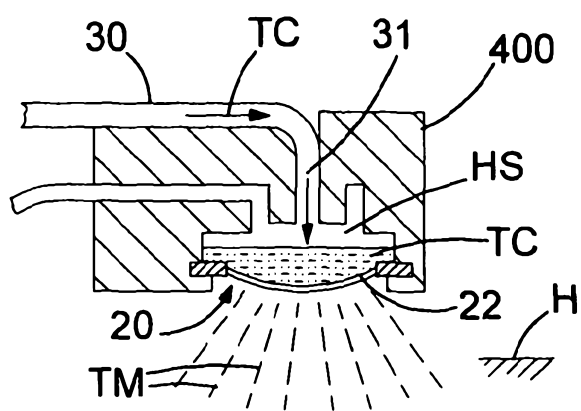


FIG. 20I1

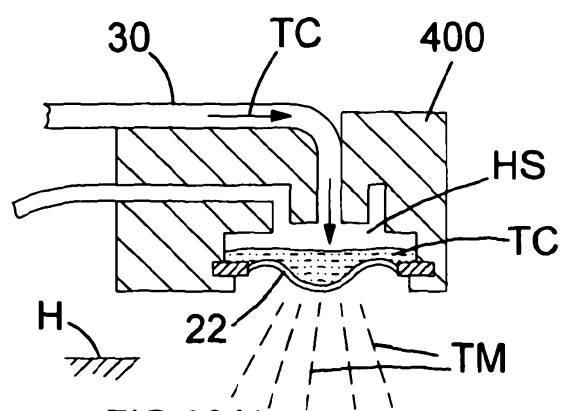


FIG. 20J1

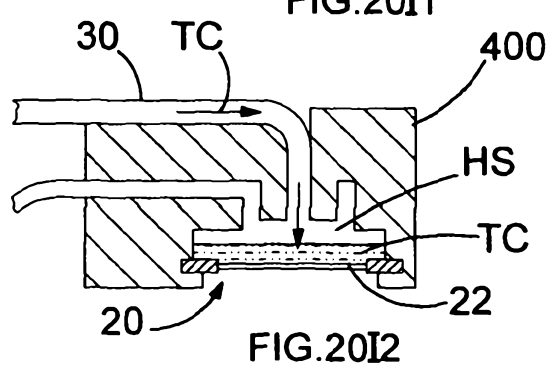


FIG. 20I2

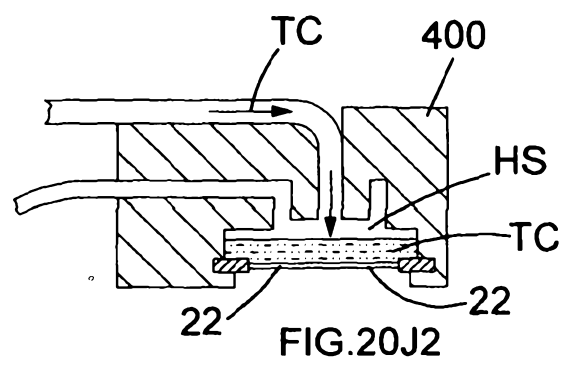


FIG. 20J2

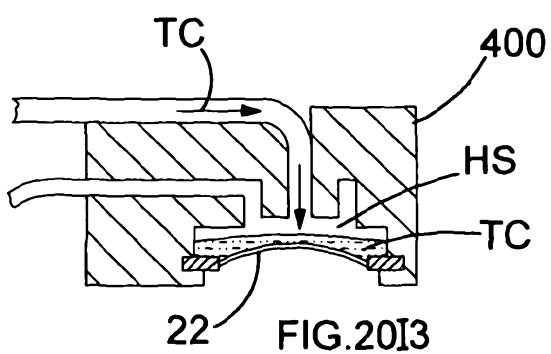


FIG. 20I3

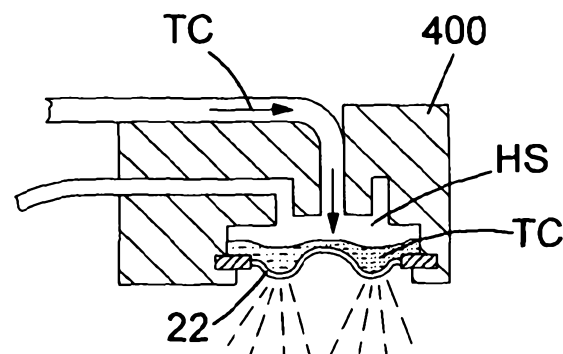
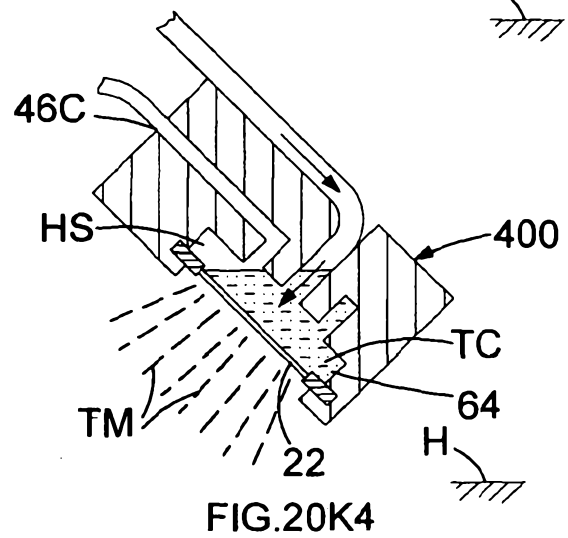
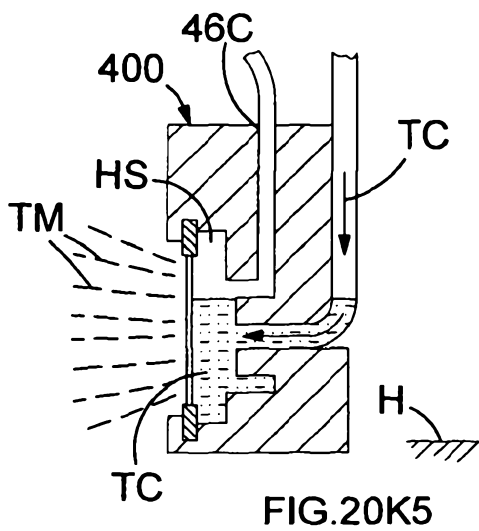
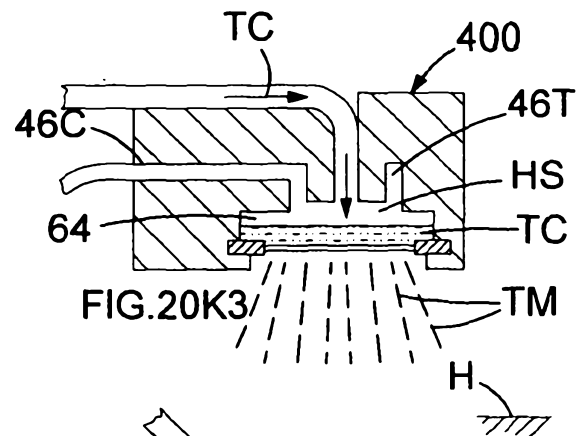
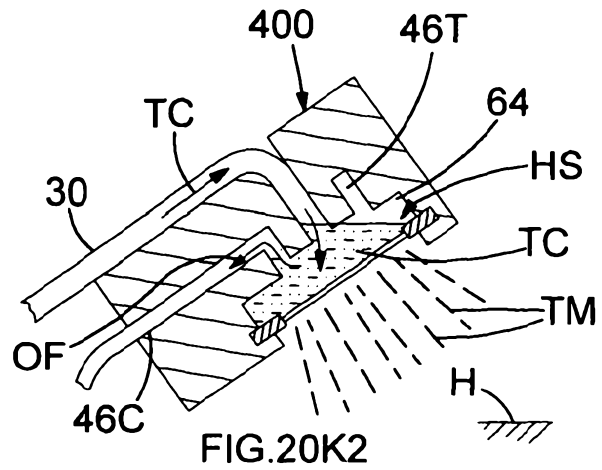
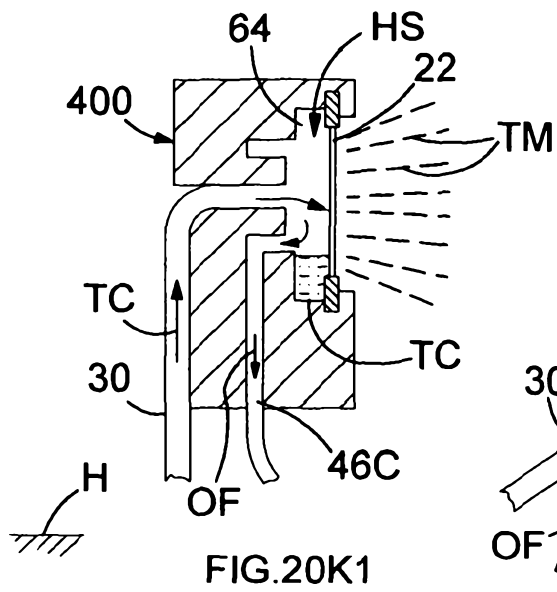


FIG. 20J3

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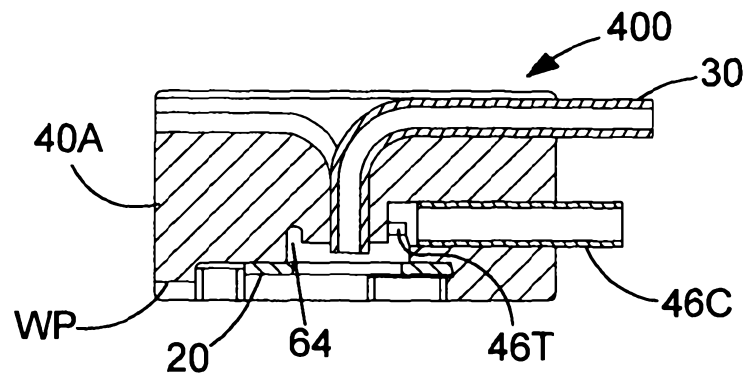


FIG.20L1

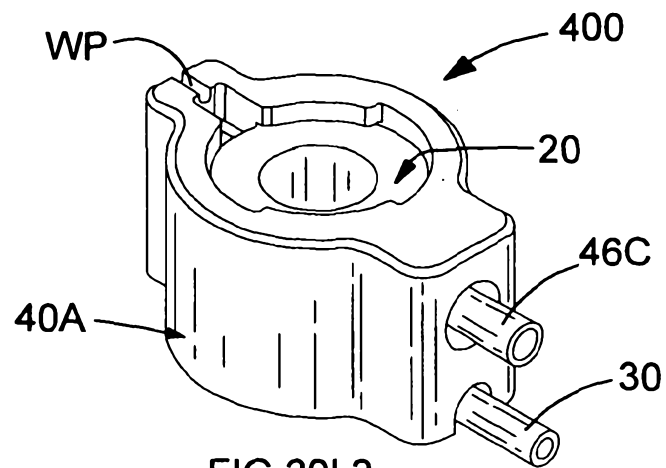


FIG.20L2

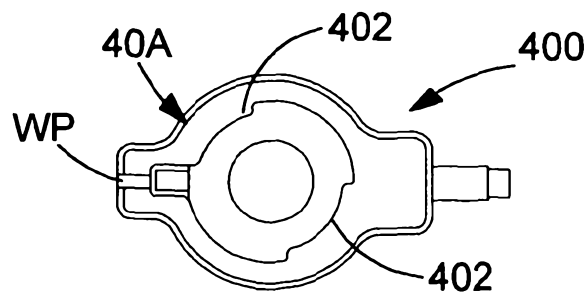


FIG.20L3

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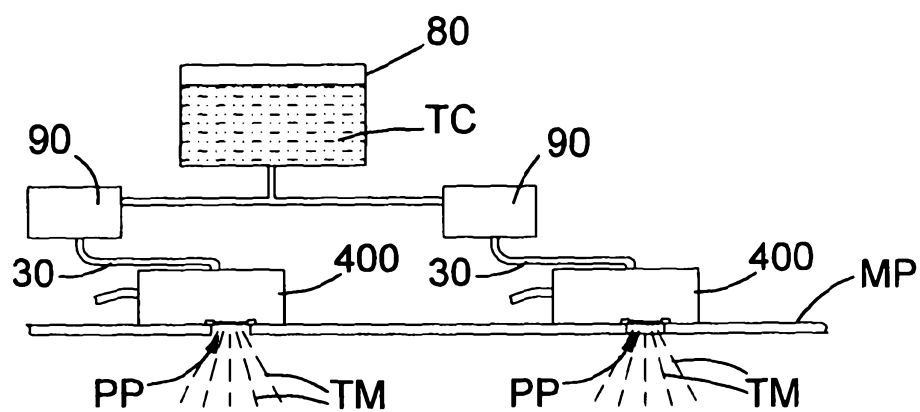
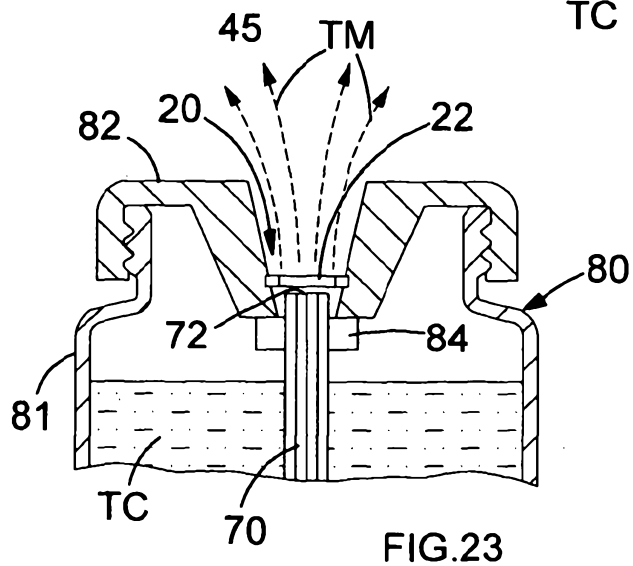
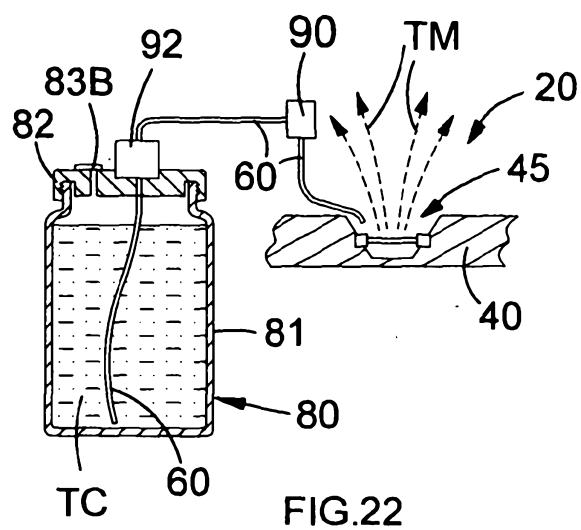
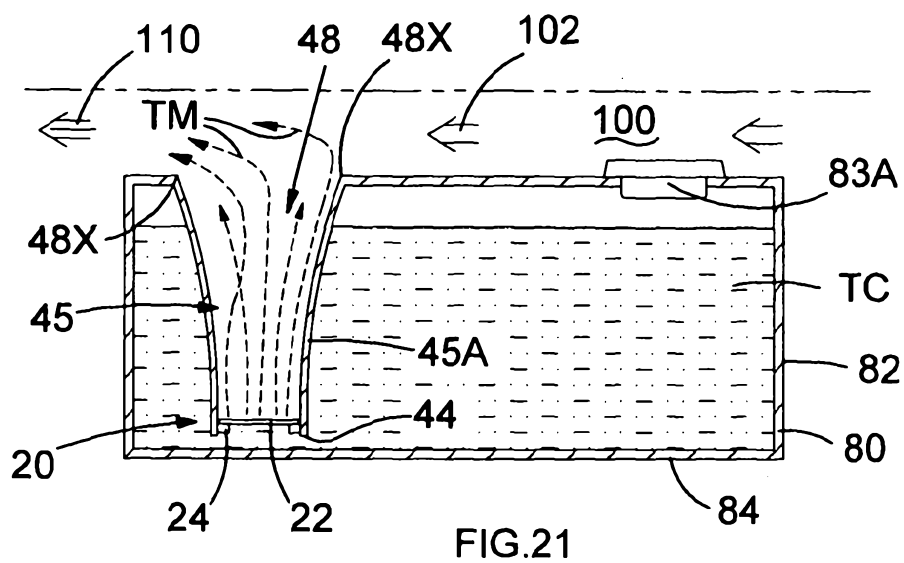
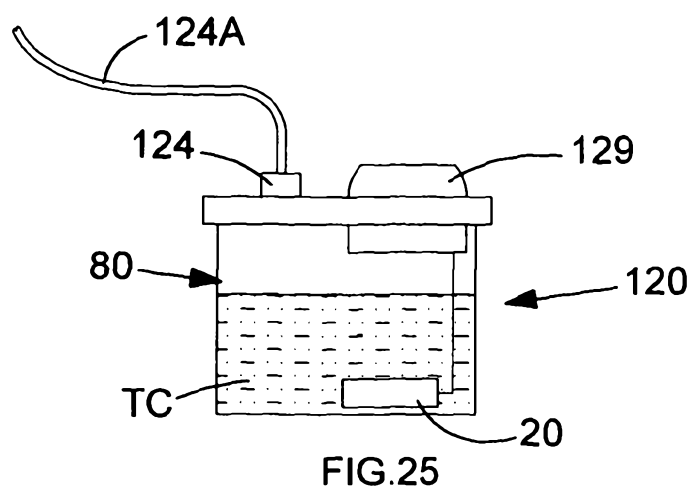
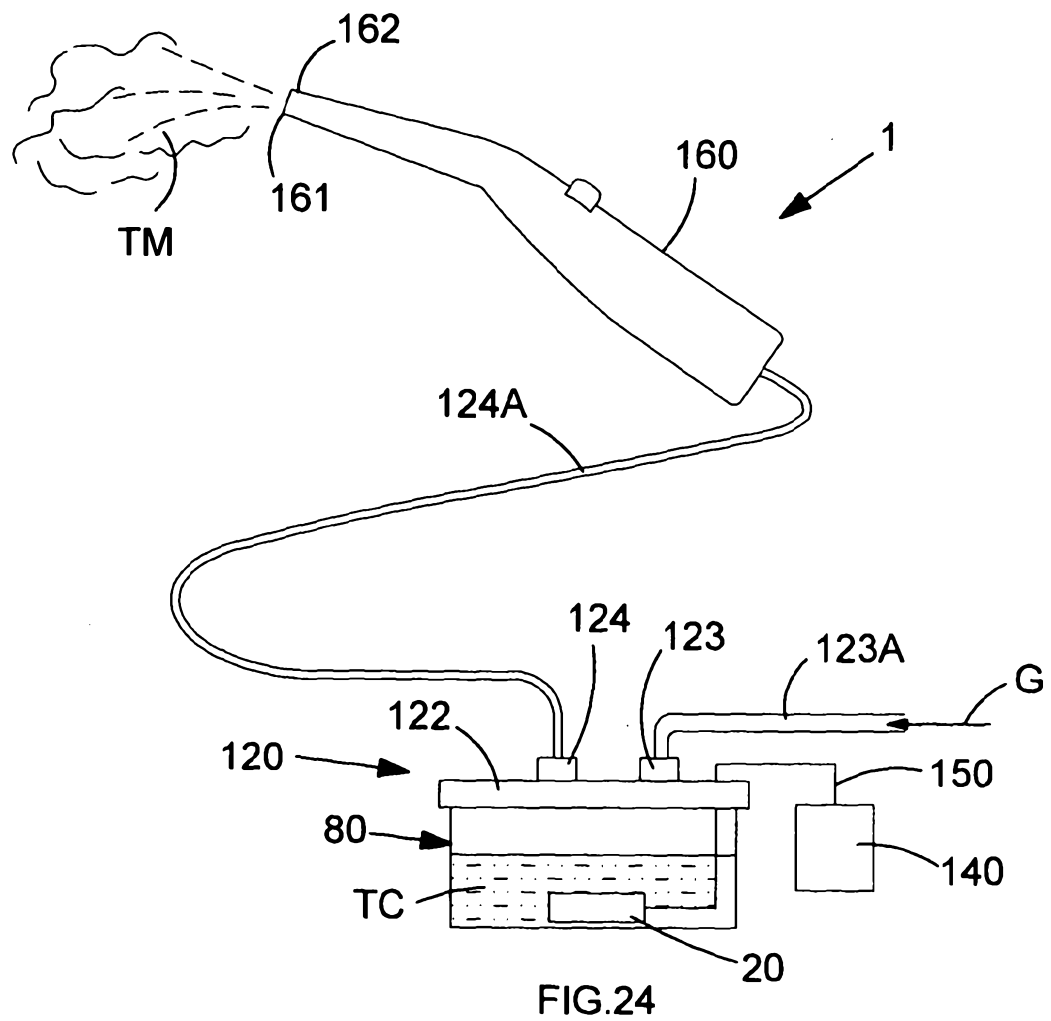


FIG.20M

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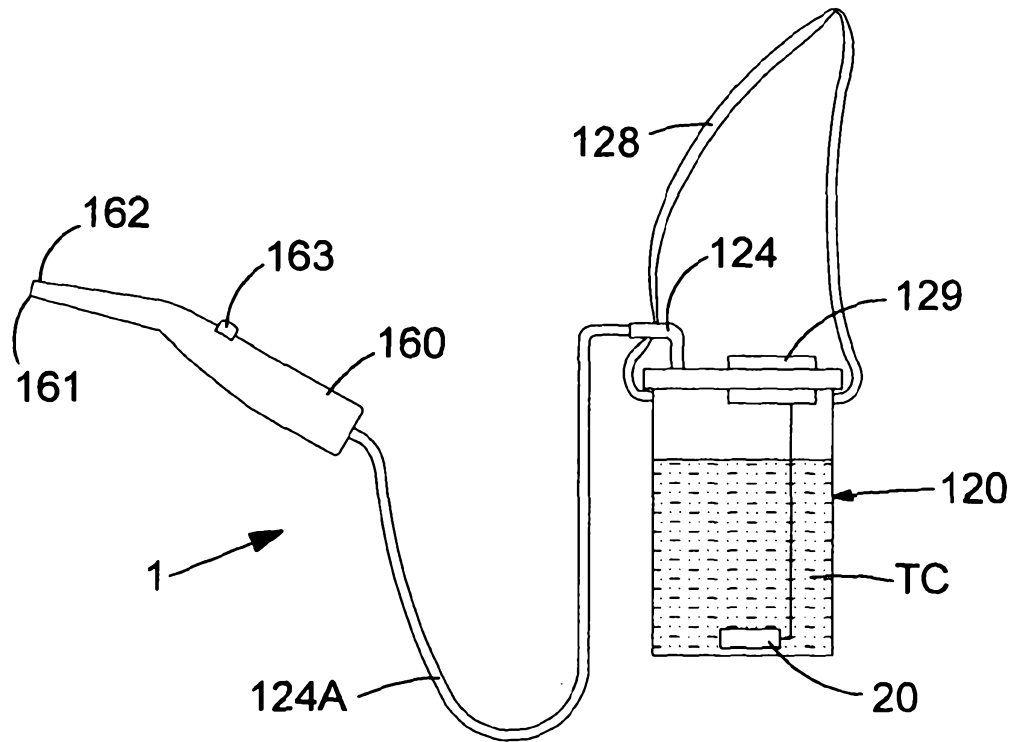


FIG. 26

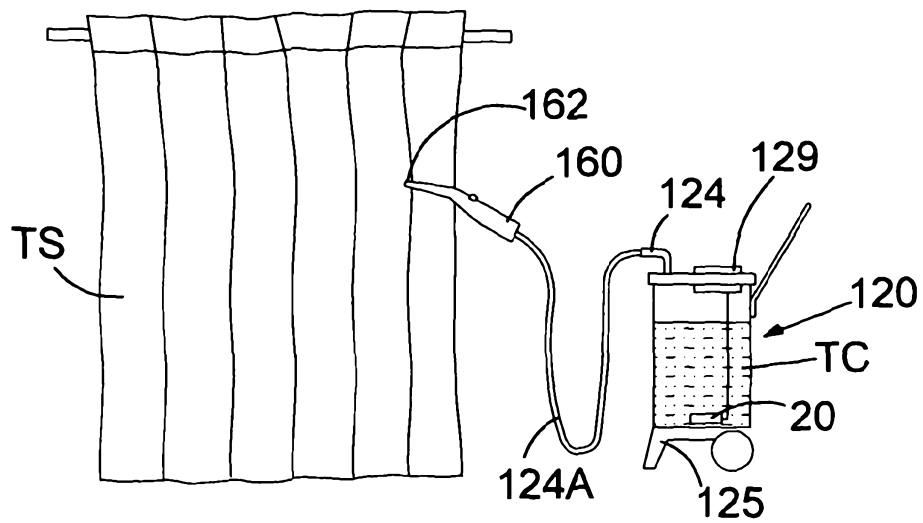
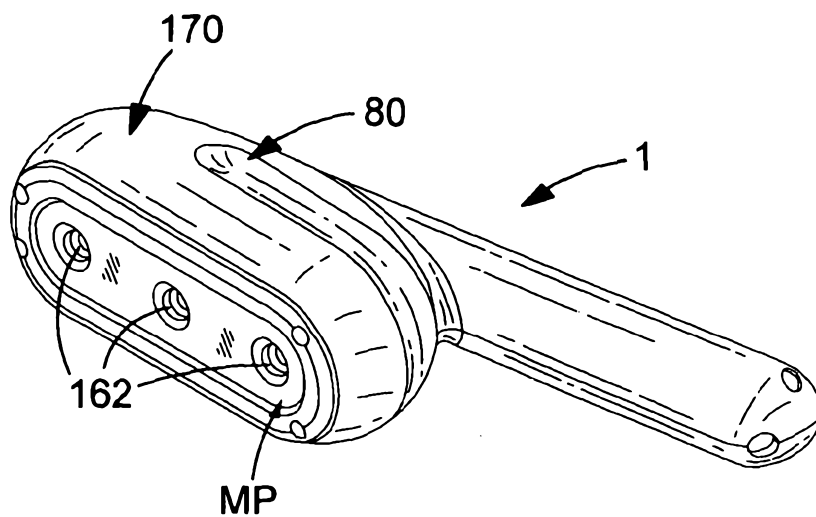
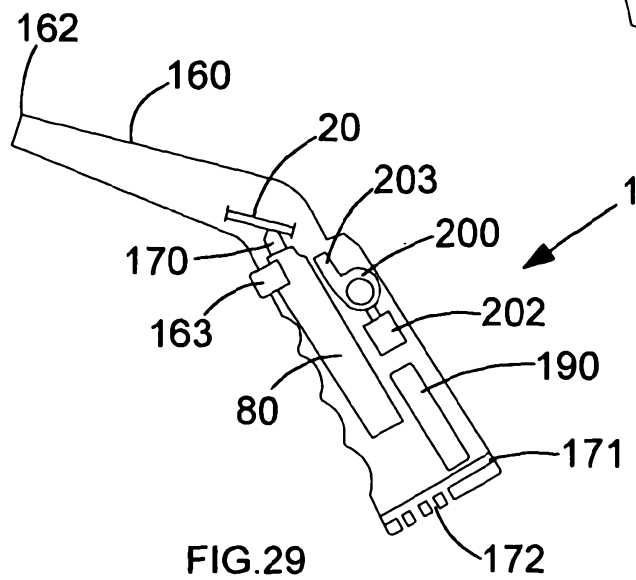
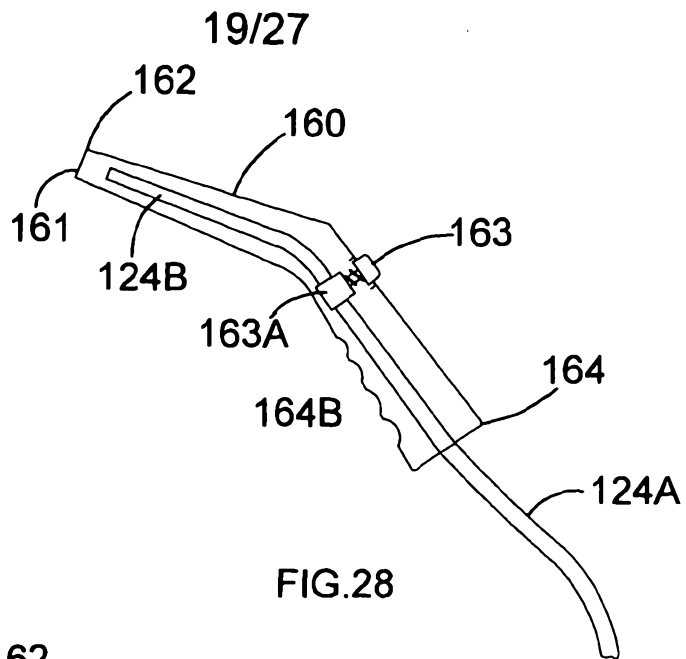


FIG. 27



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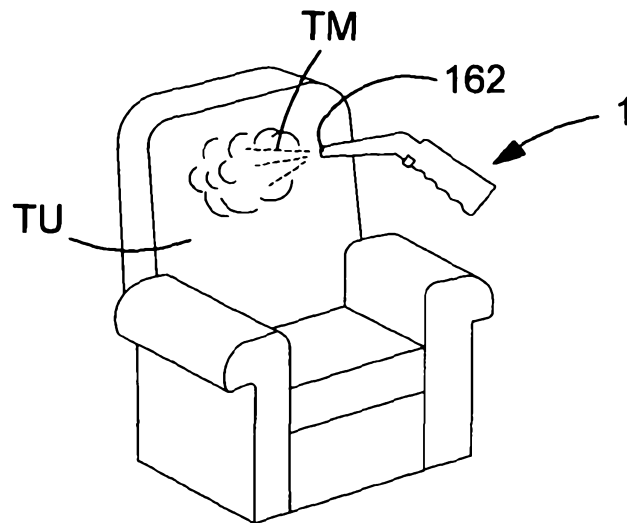


FIG.30

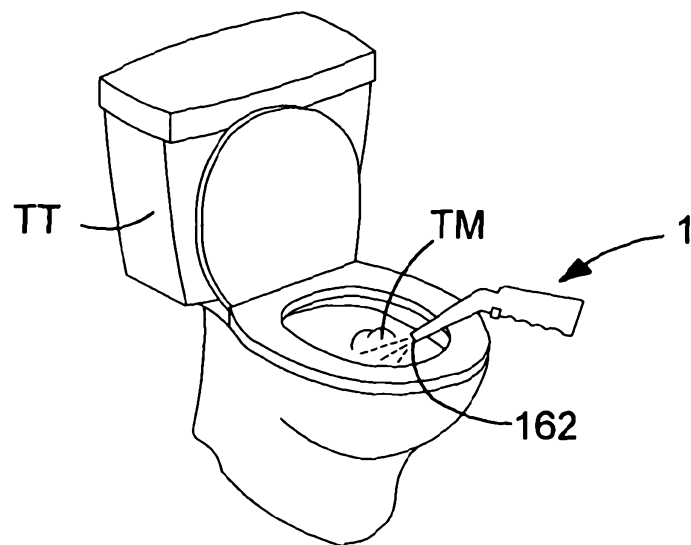


FIG.31

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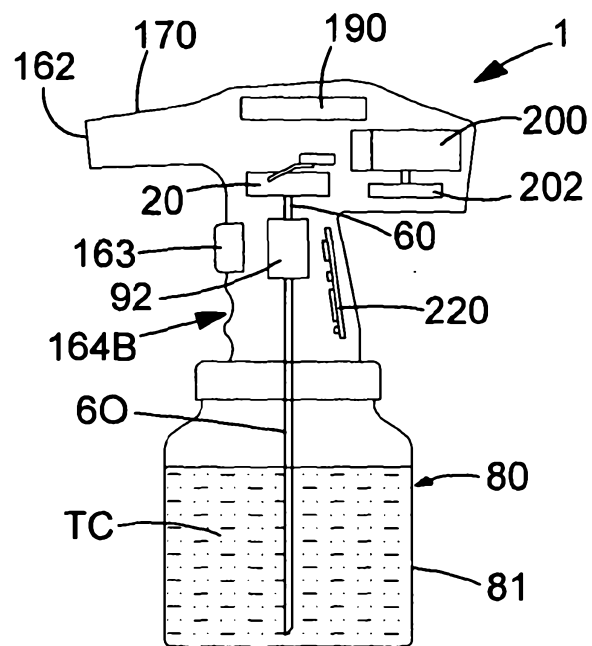


FIG.32

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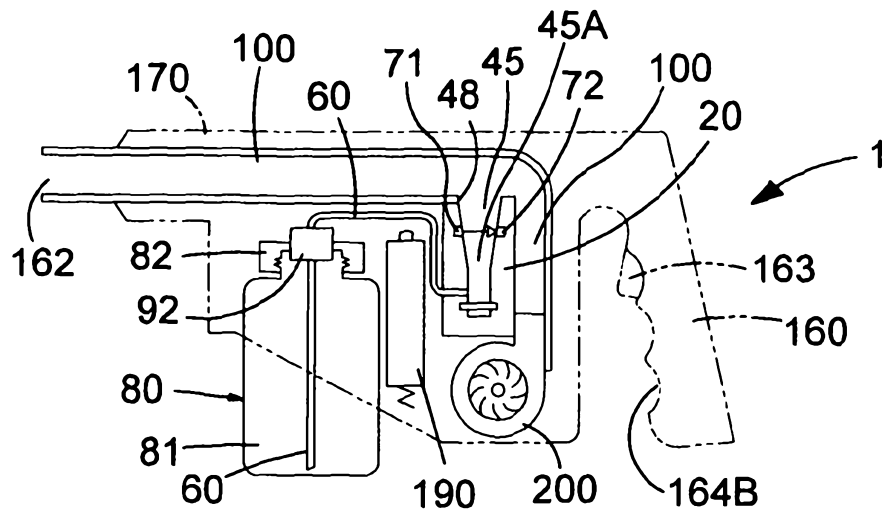


FIG. 33

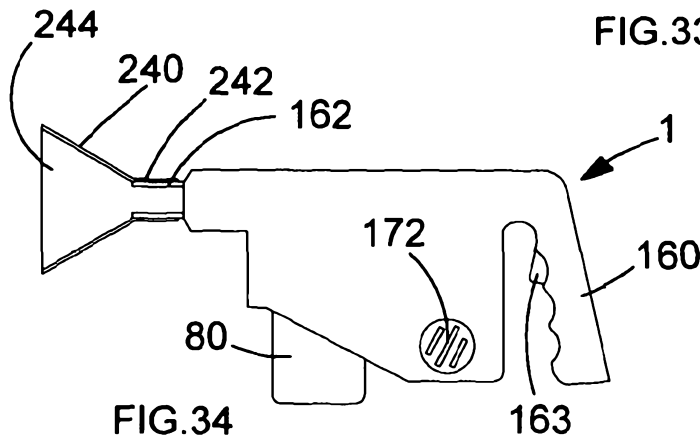


FIG. 34

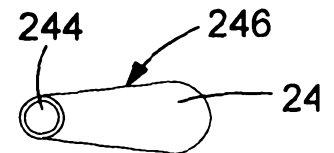


FIG. 35A

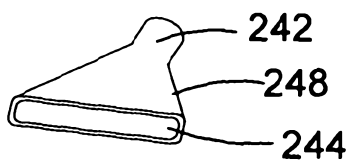


FIG. 35B

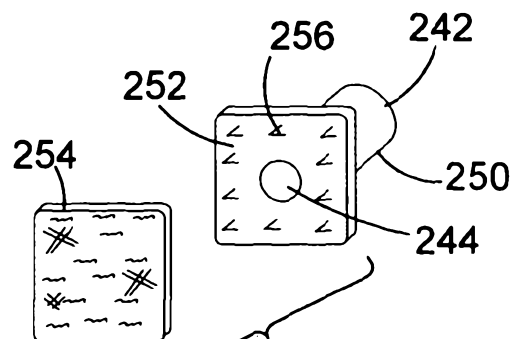


FIG. 35C

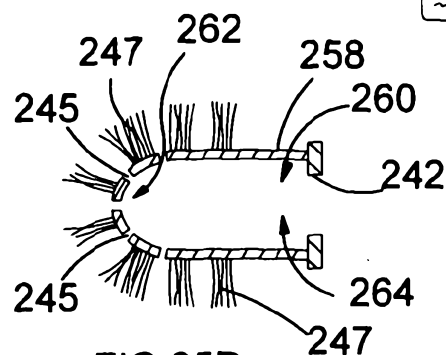


FIG. 35D

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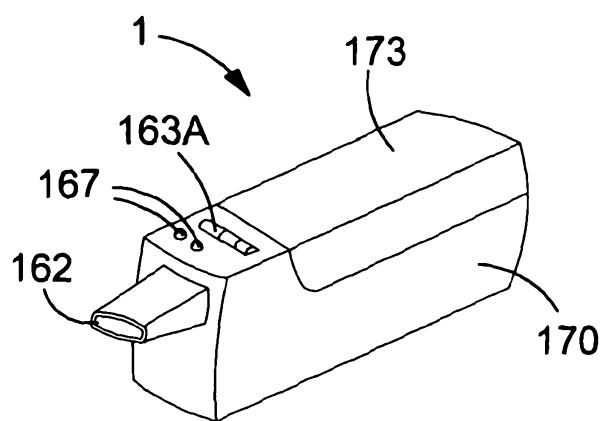


FIG.36

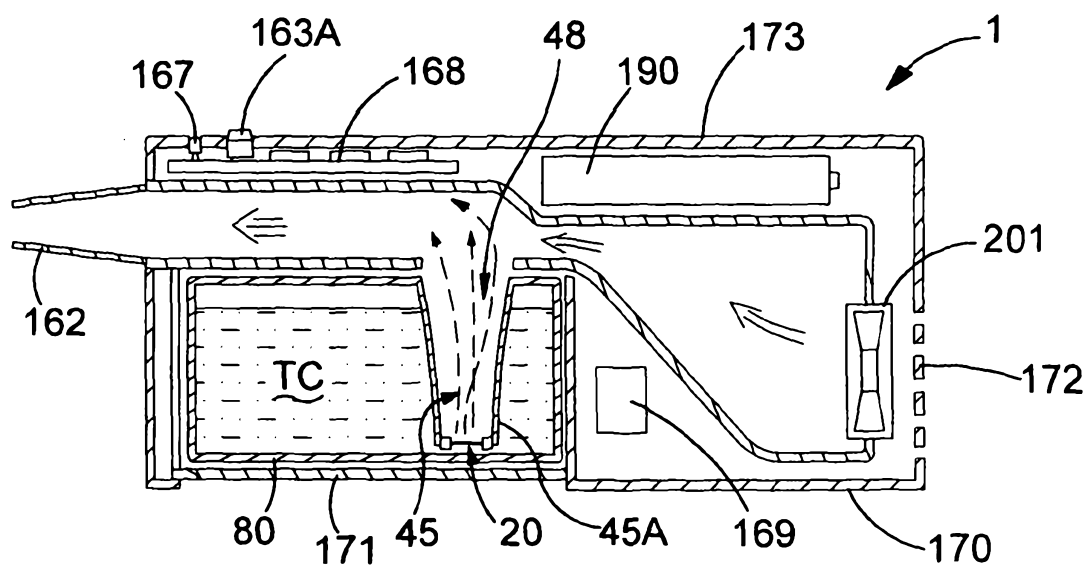
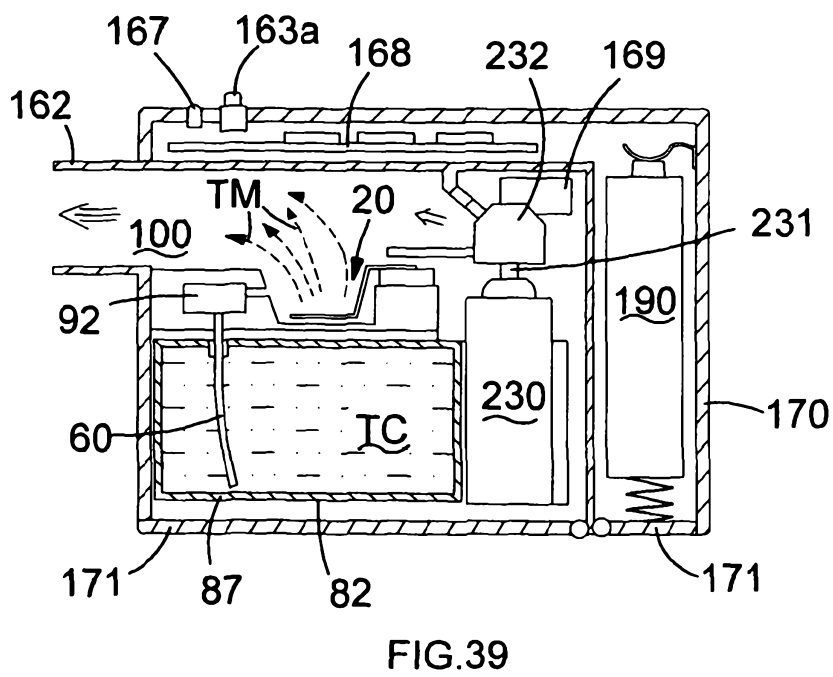
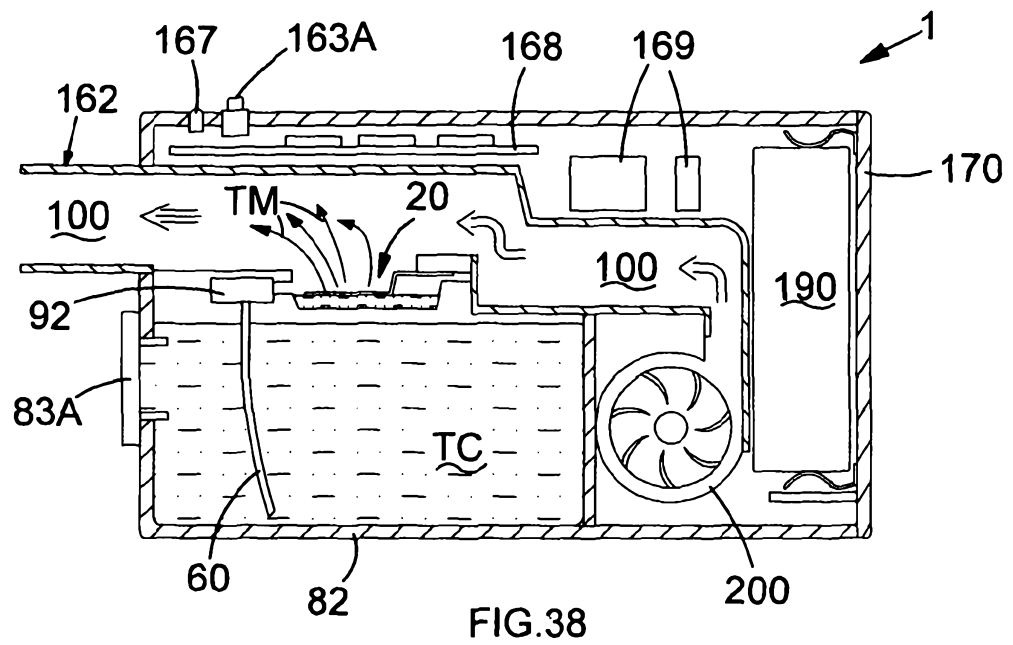


FIG.37



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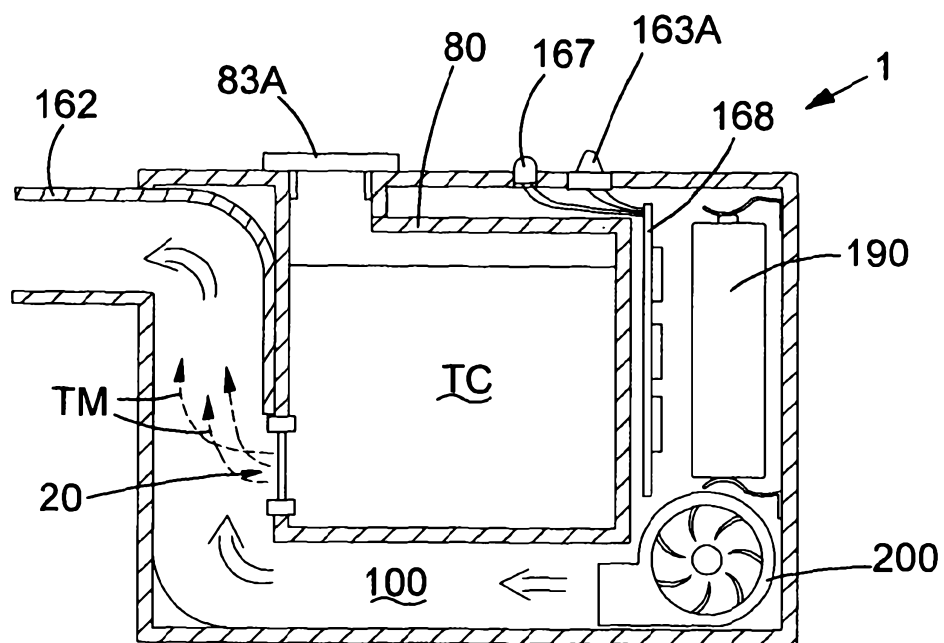
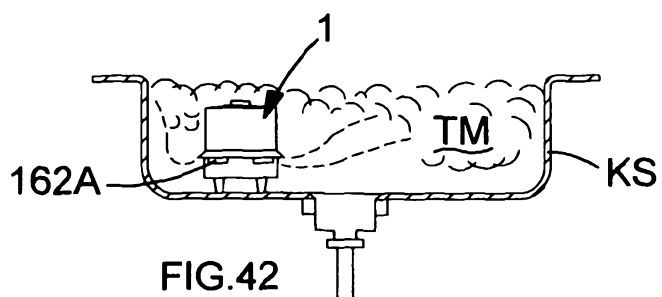
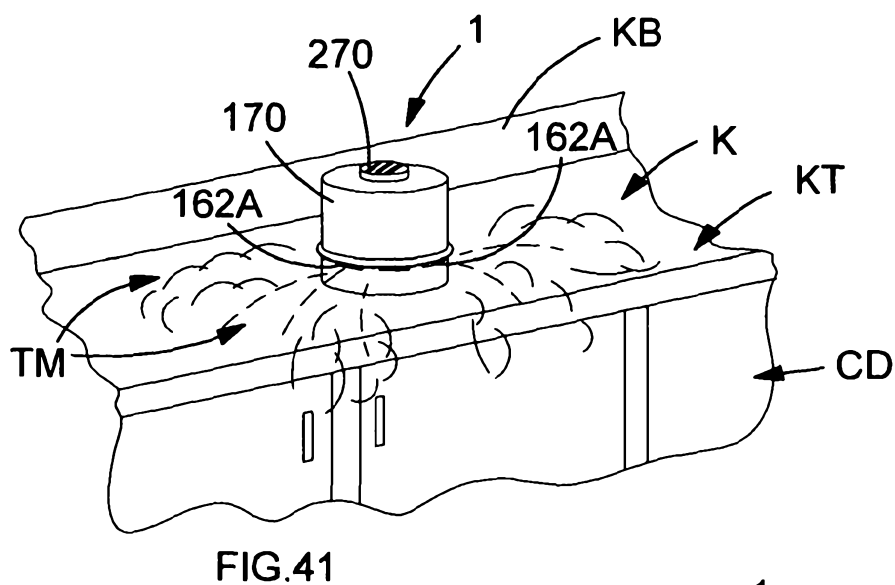
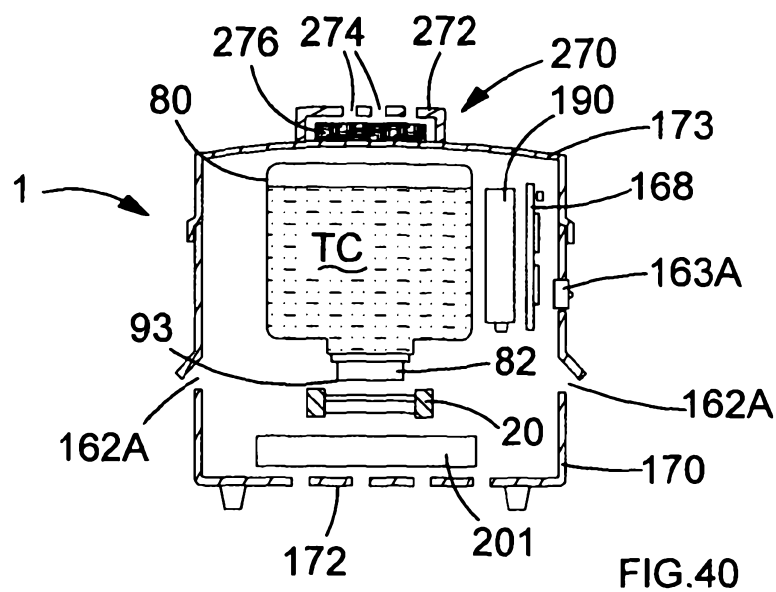


FIG.39A

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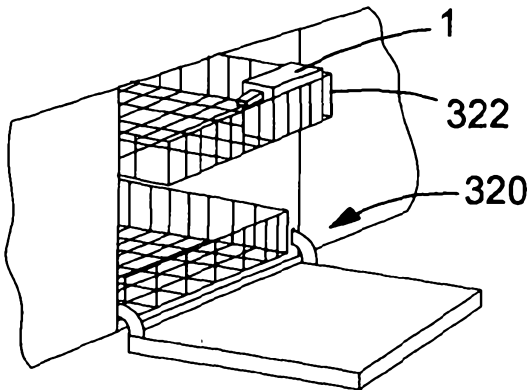


FIG. 43

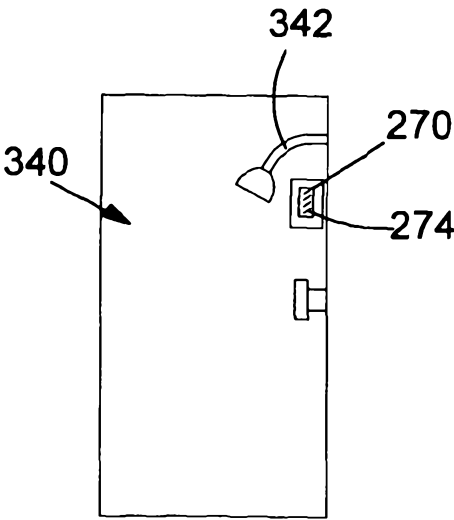


FIG. 44

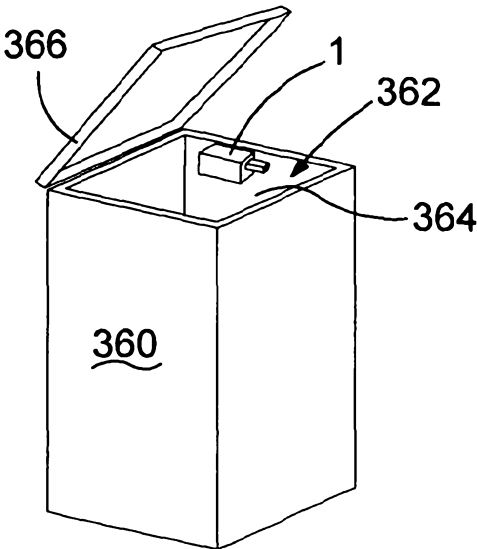


FIG. 45