SKIN TREATMENT DEVICE WITH DETACHABLE WRISTBAND

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ABSTRACT

Persons often encounter the need to apply some form of skin treatment when on the go. Such treatments include disinfectant, sunscreens, medications, and moisturizing lotions. The present invention comprises convenient portable skin treatment dispensers in the form wrist-worn devices with detachable wristbands. The devices are convenient to use, unobtrusive and can even be disposable. Ease of manufacture is facilitated by the use of self-sealing diaphragm valves.
SKIN TREATMENT DEVICE WITH DETACHABLE WRISTBAND

REFERENCE TO RELATED APPLICATION


BACKGROUND

Prior Art

[0002] The increase in bacterial immunity to modern antibiotics is problematic and one of the chief vectors of infection is the human hand. Hence, when not in the proximity of a washroom to disinfect one’s hands, it would be useful to have a means to accomplish such sanitation. Also, in the midst of daily activities, it can be inconvenient to uncap bottles of disinfecting gels or hand lotions to otherwise treat the hands.

[0003] Fortunately, it has been established that ethyl alcohol is a most effective antiseptic for gram-negative pathogens; it is of low viscosity, easily dispensed from a portable container, and does not require the use of a material wipe or cloth because of the speed of evaporation. Further, an adequate dose for sanitizing the hands comprises but a few drops of this antiseptic. To prevent choking, glycerin can be added to the alcohol without levels of viscosity increase that would be deleterious to the dispensing process.

[0004] Various methods of portable disinfectant or lotion dispensers have been disclosed in the prior art. These include body-mounted dispensers, wrist bracelet dispensers, and others. U.S. Pat. No. 6,371,946 discloses a dispensing tube that drips liquid onto the hand. U.S. Pat. No. 6,053,898 discloses a tube-fed finger dispenser. A body-worn dispenser of form factor similar to a pager is disclosed in U.S. Pat. No. 5,927,548.

[0005] What has not been demonstrated is a dispenser that is wrist- or arm-worn that provides ease of actuation and, more specifically, single hand actuation. Neither has there been a device that can be surreptitiously actuated. This is an important consideration with respect to public relations. Individuals such as business and sales personnel may come in contact with and greet many people during the day. It would be desirable to have the option of sanitizing the hands after a handshake with a person without conveying a disdainful message to that person in so doing.

[0006] A wrist-mounted dispenser that achieves dispensing directly to the hand with a simple hand action is a major advantage of the present invention. This is especially useful to nurses and doctors in busy hospital settings, as well as for allied health care workers who cannot take time to repeatedly wash their hands with soap and water.

SUMMARY OF THE INVENTION

[0007] The present invention discloses wrist- or forearm-mounted device versions for dispensing a small amount of alcohol-based disinfectant hand rub, moisturizer, or other skin medicament. Even powder-based skin treatments can be dispensed using the present invention. A wristband or other attachment means removably affix the device to arm or wrist. Various locations are feasible including the top, side, or underside of the wrist or forearm. In a preferred embodiment, the device is in the form of a low profile, wrist-mounted dispenser with a slit-based diaphragm valve that produces a small amount of dispensed skin treatment when actuated.

[0008] Surreptitious actuation and dispensing of hand treatments is made possible with embodiments of the invention that are mounted on the underside of the wrist and can be easily actuated in a casual, not easily detected manner.

[0009] Because only a few drops of alcohol-based disinfectant comprise a dose adequate to achieve sanitization of the hands, the device can dispense hundreds of doses of disinfectant before requiring refill or disposal. It can be used at any orientation of the arm and will avoid leakage when not actuated. Options exist for the fabrication of the device whether disposable or refillable. For example, hard or soft pliable plastics can be employed. For disposable versions of the device, biodegradable plastics are cited as advantageous device construction materials.

Objects and Advantages

[0010] Several objects and advantages of the present invention are:

[0011] (a) Provide a convenient, portable means for dispensing skin treatments;
[0012] (b) Provide a cost-effective means for dispensing skin treatments;
[0013] (c) Provide an unobtrusive means of dispensing skin treatments;
[0014] (d) Provide an easily actuated means of dispensing skin treatments;
[0015] (e) Provide an arm- or wrist-mounted means of dispensing skin treatments;
[0016] (f) Provide a wrist-mounted disposable means of dispensing skin treatments;
[0017] (g) Provide a disposable wrist-worn skin treatment dispenser.
[0018] (h) Provide an easy-to-manufacture skin treatment dispenser using a diaphragm valve.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] FIG. 1a is a pictorial and side view diagram of a single slit diaphragm valve.
[0020] FIG. 1b is a pictorial diagram of a diaphragm valve having cross slits.
[0021] FIG. 1c is a pictorial diagram of a tricuspid-type diaphragm valve.
[0022] FIG. 2 is an exploded diagram of a slit-based diaphragm valve embodiment of the invention in which the valve is captivated by a retainer.
[0023] FIG. 3 is a cross-sectional diagram of the device of FIG. 2.
FIG. 4 is an exploded diagram of a second version of a slit-based diaphragm valve embodiment of the invention in which the valve snap-fits into the reservoir.

FIG. 5 is a cross-sectional diagram of the device of FIG. 4.

FIG. 6 is an exploded diagram of a slit-based diaphragm valve embodiment of the invention exhibiting an insert-molded valve.

FIG. 7 is a cross-sectional diagram of the device of FIG. 6.

The following definitions serve to clarify the disclosed and claimed invention:

Bladder refers to an elastic, resilient container that can be deformed under compression.

Skin treatment material comprises any of a host of liquid, powder, gel, or aerosol medications, or sanitizing agents that are typically applied to the hands or other skin surfaces. Examples include alcohol, glycerin, moisturizing lotions, sunscreen, and desiccating powders. The combination of treatments such as disinfecting lotion and sunscreen are included in this definition.

Working fluid refers to the fluid which transfers manual pressure to the material to be dispensed. Such transfer of pressure can occur in one or multiple stages and typical working fluids include air contained in a squeeze bottle as well as liquid versions of the hand treatment material itself.

Diaphragm valve refers to a diaphragm having one or more slits that form flaps in the diaphragm. These flaps are normally closed but can be caused to open upon fluid or gas pressure applied to one side of the diaphragm. In this way, the diaphragm valve mimics the operation of human heart valves such as the tricuspid valve.

**DETAILED DESCRIPTION OF THE INVENTION**

The present invention is useful for dispensing either hand treatments such as moisturizers or disinfectants; even powders can be dispensed in powder-aerosol form. Typically, the active ingredient in hand antiseptics such as Purel is ethyl alcohol. This is fortuitous because it is a relatively non-toxic liquid that exhibits low viscosity over the temperature range of interest for this application. This makes delivery of a directed stream of fluid relatively easy. In contrast to liquid, alcohol gels are useful in that they do not run and although they will require more force to dispense than liquid, such higher viscosity disinfectant or moisturizing formulations can be accommodated in differing embodiments of the present invention. Various means of dispensing the aforementioned hand treatments are feasible and can be tailored to the type of material to be dispensed. The target locations for deposition of the hand treatment include the regions on the top of the hand, and the underside of the hand, either fingers or palm. The preferred embodiment for a means of dispensing hand cleaning dosages in a device that attaches to either the top or underside of the wrist. It can be worn unobtrusively underneath a long-sleeved shirt.

FIGS. 1a through 1c depict the basic geometry of self-sealing diaphragm valves. In FIG. 1a is a simple disc diaphragm 971 of flexible polymeric material is shown with a central slit 973. The thickness and construction of this diaphragm valve along with the nature of the polymer employed provide sufficient stiffness that inadvertent fluid leakage will not occur. As shown in the side view of the diaphragm, when sufficient fluid force is applied to one side of the diaphragm, the flaps of the slit open to release fluid, but otherwise close to provide a seal. Low density polyethylene (LDPE) is one of a number of good candidate materials for this type of valve. Other slit geometries are feasible such as the cross 977 of FIG. 1b and the tri-slit 979 of FIG. 1c which resembles the tricuspid valve of the human heart. Variations in the cross-sectional thickness of the diaphragm valve offer potential advantages such as rigidity of the valve perimeter for mounting into the reservoir. FIGS. 2 through 7 depict various slit-based diaphragm valve embodiments of the invention that have detachable wristbands. These embodiments are characterized by use of the aforementioned self-sealing diaphragm valves. As shown in FIGS. 2 through 7, the diaphragm valve is located in a region of the dispenser surface exhibiting a smooth substantially outwardly curved profile that immediately surrounds the valve.

A first version of the slit-based diaphragm valve type dispenser is shown in FIG. 2. A self-sealing diaphragm valve of the type just described is part of the diaphragm valve assembly 985 is constructed of a soft, polymeric material that is “tuned” to deform under pressure from the treatment fluid. Once deformed, small slits in the diaphragm surface enable treatment fluid to dispense into palm or fingers of the actuating hand. Again, the diaphragm has enough material rigidity to allow air to travel back in to replace the displaced cleanser, but not allow the treatment fluid in the reservoir to escape unless a positive pressure is applied to the flexible reservoir 981. The valve assembly retainer 983 is a rigid polymeric component that retains the flexible diaphragm valve 985 in its service position. It also enables attachment of one end of the retention of the wrist strap 987. The wrist strap 987 is a flexible material (such as non-woven polyethylene) with re-usable adhesive on at least one side such that the strap could be placed over hand and around several sizes of wrists and be secured for its service cycle, and then disposed. FIG. 3 is a cross-sectional diagram of this version of the invention showing captivation of the diaphragm valve assembly 985 by the valve assembly retainer 983.

FIG. 4 is an exploded diagram of a second version of the slit-based diaphragm valve type dispenser that uses a valve 1113 that snap-fits into the reservoir 1111. This is better understood with reference to the cross-sectional diagram of FIG. 5. The flange 1119 on the valve 1113 snap fits around a corresponding shaped flange 1117 in the aperture of reservoir 1111. Also shown is the wrist strap 1115.
FIG. 6 is an exploded diagram of a third version of the slit-based diaphragm valve type dispenser which makes use of a diaphragm valve 1143 that is integrally or insert-molded to the reservoir 1141. Wrist strap 1145 is depicted also. In the cross-sectional diagram of FIG. 7, the valve 1143 is shown molded to the valve seating surface 1147 of the reservoir 1141.

Depending upon the compounding of the specific treatment fluid to be dispensed by the present invention, various biodegradable plastics can be employed in disposable embodiments of the invention. The table below provides examples of various categories of candidate biodegradable plastics.

While there have been shown and described the preferred embodiments of the present invention, it is to be understood that the invention can be embodied otherwise than is herein specifically illustrated and described and that, within such embodiments certain changes in the detail and configuration of this invention, and in the form and arrangement of the components of this invention, can be made without departing from the underlying idea or principles of this invention within the scope of the appended claims.

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<thead>
<tr>
<th>Category</th>
<th>Generic Name</th>
<th>Trade Name</th>
<th>Producer</th>
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<tr>
<td>Biopolymer</td>
<td>Poly 3-hydroxybutyrate</td>
<td>Biogreen</td>
<td>Mitsubishi Gas Chemicals</td>
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<tr>
<td>Synthetic</td>
<td>Polybutylene succinate</td>
<td>Bionelle 1000</td>
<td>Showa Highpolymer</td>
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<td></td>
<td>EnPol 4000</td>
<td>Ie Chemical</td>
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<tr>
<td></td>
<td>Polybutylene succinate/carbonate</td>
<td>Iupol</td>
<td>Mitsubishi Gas Chemicals</td>
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<td>Boimax</td>
<td>Dupont</td>
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<td>BASF</td>
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<td>EastarBio</td>
<td>Eastman Chemicals</td>
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<td>NatureWorks</td>
<td>CelGreen PH</td>
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<td></td>
<td>Cellulose/Starch</td>
<td>Dolon CC</td>
<td>Aicello Kagaku</td>
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1. A skin treatment dispensing device comprising:
   a) a dispensing reservoir containing treatment material exhibiting an interior volume enclosed by a reservoir wall,
   b) a slit-based diaphragm valve resident in a region of said reservoir wall that exhibits an external surface shape taken from the group comprising substantially convex and substantially flat, and
   c) body attachment means comprising a wristband removeably attachable to said reservoir.

2. A device as recited in claim 1 wherein said dispenser housing includes means to permit refill of said reservoir with said skin treatment material.

3. A wrist-worn skin treatment dispenser comprising in combination:
   a) a dispenser housing;
   b) a diaphragm valve; and
   c) wrist attachment means detachable from said housing, said dispenser housing having a reservoir for containment skin treatment material, an aperture wherein is placed said diaphragm valve, and connection to said wrist attachment means, a flexible portion of said dispenser housing is manually deformed to provide pressure on the skin treatment material contents of said reservoir and on said diaphragm valve so as to cause dispensing of said skin treatment material.

4. A device as recited in claim 3 wherein said diaphragm valve is constructed of low density deformable polymer.

5. A device as recited in claim 3 wherein said diaphragm valve is captivated by a hard plastic retainer.

6. A device as recited in claim 3 wherein said diaphragm valve snap-fits into said housing.

7. A device as recited in claim 3 wherein said diaphragm valve is integral to the construction of said housing.

8. A device as recited in claim 3 wherein said device is constructed of biodegradable polymer.