

SYSTEM AND APPARATUS FOR A DISINFECTING DEVICE

Field of the Invention

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The Invention relates automated and semi-automated disinfection devices. In particular, the invention related to disinfectant bottles for use with said devices.

Background

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When providing disinfectant solution to disinfect a large space, there are issues with pouring the disinfectant into the disinfecting device. Issues of contamination, spillage and a general lack of control of how the solution is managed can deter users from using such devices, despite the clear advantage over hand sanitizing an occupiable space.

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The invention seeks to provide a better system for using and re-supplying such device through better solution management.

Summary of Invention

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In a first aspect, the invention provides a disinfecting device comprising: a seal engagement station, said station having a seal piercing pillar; a solution tank arranged to contain a disinfectant solution, said solution tank couplable to the seal engagement station; wherein the solution tank includes a seal for sealing the solution in the solution tank, such that on coupling the solution tank to the seal engagement station, the pillar is arranged to pierce the seal and release the solution.

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Accordingly, by providing a purpose-built bottle having a seal that interacts with a seal opening pillar, the disinfectant solution never leaves the bottle until delivered directly to

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the device. Thus, interoperability solves the issues of the prior art system where the solution is poured.

5 **Brief Description of Drawings**

It will be convenient to further describe the present invention with respect to the accompanying drawings that illustrate possible arrangements of the invention. Other arrangements of the invention are possible and consequently, the particularity of the
10 accompanying drawings is not to be understood as superseding the generality of the preceding description of the invention.

Figures 1A and 1B are isometric views of a disinfectant bottle according to one embodiment of the present invention;

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Figure 2 is an elevation view of a bottle and seal engagement station according to one embodiment of the present invention;

Figure 3A is an elevation cross-sectional view of the interoperability of the bottle and
20 device according to one embodiment of the present invention;

Figure 3B is an isometric view of a seal engagement station according to one embodiment of the present invention;

25 Figures 4A to 4C are various views of seals according to various embodiments of the present invention;

Figures 5A and 5B are elevation views of pillars according to various embodiments of the present invention, and;

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Figure 6 is an isometric view of a disinfecting device according to one embodiment of the present invention.

Detailed Description

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Figures 1A, 1B and 2 show one embodiment of the present invention, whereby a purpose-built bottle 5 acts as a solution tank arranged to be coupled to a disinfecting device. The bottle contains a disinfectant solution for use with the disinfecting device, as shown in Figure 6, in which is generated a mist by transducers which are placed
10 inside the solution tank and the RADS (Rapid Aerial Disinfection System).

In this embodiment, the bottle 5 includes a lid 15 mounted to said bottle 10. The lid may be in screw-threaded engagement, welded, chemically adhered or other such means of attaching the chamber 10 and lid 15.

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The lid 15 has a central orifice 20 into which is fixed a seal 25 for retaining the solution in the bottle. As shown in Figure 2, the bottle is arranged to be inverted so as to place the lid proximate to a seal engagement station 37 of a disinfecting device 35. It is then lowered 30 onto a pillar 40 within the seal engagement station 35, such that the lid 15
20 fits within the station 37, with the weight of the bottle 5 and solution causing the pillar 40 to pierce the seal. This allows for the disinfectant solution to be released and flow from the bottle 5 into an area 45, or other such outlet, for use of the solution by the disinfectant device.

25 Figure 3B shows an alternative arrangement of the seal engagement station 37, whereby the pillar 40 resides inside a threaded cap, so that the bottle and cap can couple allowing better stability of the bottle during use.

Figure 3A shows an elevation view of this interoperability between the bottle 5 and the
30 seal engagement station 37. The seal 52, which is fixed to the lid 15 is pierced by the pillar 40. The pillar 40 includes an inlet for receiving the solution 60, and a conduit 50

for directing 65 the solution from the bottle 5, to then exit 70 the pillar 40 through an outlet 55. Various means are available for then flowing the solution into the device for distribution. In this embodiment, the solution is directed 75 to the solution tank 45 which is in fluid communication with the transducers to vaporise the solution.

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The seal may take several forms, depending upon the intended use, as shown in Figures 4A to 4C.

Figure 4A shows a seal 52A having a peripheral edge for fixing to the lid. A centrally
10 located frangible portion 85 comprises a thin membrane, perhaps made from silicone, polyethylene, polypropylene, that is pierced by the pillar to release the solution, as previously described. In this embodiment, once the frangible portion 85 is broken through piercing by the pillar, it is intended to remain permanently unsealed. This may be useful where the bottle is only intended for use until empty. The bottle can then have
15 the lid removed, new solution inserted, ready for re-use of the bottle.

Figure 4B shows an alternative embodiment, where the central portion 95 includes flaps
100 in a cross arrangement proximate to the frangible portion. The flaps in this arrangement are resilient and arranged to deform on piercing by the pillar. The flaps
20 may be well suited to be formed from silicone or other appropriate material, such that once the pillar is removed, the flaps resiliently re-form to close and re-seal the pierced frangible portion 90. The resilient stiffness of the flaps 100 may be sufficient to seal against varying degrees of remaining solution including 50% 25%, 10% or less than 5%.

25 Thus, if the disinfecting event is completed with the bottle still partially full, use of the re-sealable flaps 100 may allow the partially filled bottle to be removed and stored until the next event.

Figure 4C shows a still further embodiment, whereby the seal 52C includes a similar
30 flap arrangement to 52B. In this case, however, the frangible portion 115 is larger, with the flaps 110 still being resiliently closable, but only sufficient to re-seal against a small

residual portion of disinfectant. It may be that on emptying the bottle, the residual disinfectant may reside in the bottle, and so on removal, the flaps 110 re-seal against the residual solution to mitigate against solution spilling during removal. This the seal 52C forms a compromise between the seals 52A and 52B

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Figures 5A and 5B show alternative arrangements of the pillar 120, 160. In the first embodiment, the pillar 120 includes a sharp piecing tip 125, and a longitudinal slot 130. On insertion into the bottle, the point 125 and a portion of the pillar 120 remains inside the bottle, with the lower portion remaining outside. Divided by the seal, the upper
10 portion of the slot forms on inlet 140 for the inflow of solution 145. As the solution travels down 150, the seal maintains the conduit until the lower portion 135 allows the solution to outflow 155.

Figure 5B shows an alternative arrangement, whereby the pillar 160 is essentially a
15 cylinder, similar to a wide syringe needle. This allows for greater design control on the sharpness of the piercing tip 165, as well as providing two inflow paths, being axially 190A proximate to the tip 165 and peripherally 190B through vents 170 in the upper portion of the pillar 160.

20 Similar to the previous embodiment, the solution passes 195 through a conduit 175 formed in the pillar, and exits 200 through a dedicated outlet 180 proximate to a base of the pillar.

Figure 6 shows one example of the type of disinfecting device 205 that may use the
25 bottle, seal and pillar according to the present invention. Here the device receives the bottle into the seal engagement station 225. It is then processed by the device so as to distribute the disinfectant solution in vaporised form the nozzle 220. Operation of the device may also be monitored, and possibly controlled, through screen 215.