

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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 (72) Inventor DOUGLAS HAIGH GLASSON



(54) IMPROVED TRAY FOR LIQUID STERILISER

(71) We, AQUATRON CORPORATION (AUST.) PTY. LIMITED, a Company registered under the laws of the State of New South Wales, Commonwealth of Australia, of 254 Illawarra Road, Marrickville, New South Wales, Commonwealth of Australia, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention has been devised to provide a tray for liquid to be sterilised by ultra violet rays.

In our Australian Patent No. 259,734, a water steriliser has been disclosed which incorporates a removable tray in which the water is sterilised from above by ultra violet ray radiation. The removability of the tray is an important feature as this facilitates cleaning of the tray.

For the maintenance of a sterile product, contamination must be avoided during the transfer of the product from the steriliser to a container therefor. This transfer is very often more difficult to effect than the actual sterilisation of the product in the steriliser.

The discharge from sterilising trays has, in the past, been through a pipe. The difficulties in maintaining such a pipe sterile are at once obvious. The deletion of the pipe and the formation of a liquid discharge hole, without a pipe, in the bottom of the liquid trough of the tray was originally seen as a solution to this problem. However, in experiments it was found that beads of liquid can form around the edge of the hole in a position out of line with the sterilising medium, that is, the U.V. radiation. These beads are a possible source of unsterile liquid as they are recontaminated by contact with the tray underface, and they could contaminate the otherwise sterile contents of the receptacle collecting liquid from the sterilising tray if they were to enter the receptacle.

It would be possible to provide supplementary sterilising means below the tray in a sterilising unit and so largely overcome the

above problem. Practical difficulties, however, rule out such an arrangement. For example, additional sterilising means, e.g. U.V. tubes would be required, the overall size of the sterilising unit would have to be increased and obtaining efficient radiation on the underface of the tray, which is partly obscured by a container for the liquid, would be a further problem.

A tray according to the present invention comprises a trough, a liquid discharge hole through the bottom of the trough and reflector means mounted on the tray to intercept U.V. rays originating above the trough and passing through said hole, said reflector means being shaped and dimensioned to reflect the U.V. rays incident thereon against the underside of the tray at least around said hole and being located in a position to avoid liquid discharged from said tray contacting said reflector means.

By reflecting the ultra violet rays in the manner described, any beads of liquid which might hang by surface tension on the edge of the hole or on the underface of the trough bottom adjacent the hole are sterilised by the reflected ultra violet rays.

In a preferred form, the trough also includes weir means to maintain the trough partly filled to a depth determined by said weir means and the discharge hole is downstream from the weir means.

The invention is described with reference to the accompanying drawings in which

Fig. 1 is a perspective view of the tray from above;

Fig. 2 is a perspective view from below;

Fig. 3 is a fragmentary enlarged view of the tray reflector; and

Fig. 4a to H are schematic views of various forms of tray according to the invention.

As illustrated in Figs. 1 to 3, the tray has a top surface 1, a turned down rim 2 and a trough 3 formed in the top surface 1. The trough 3 decreases in depth from its ends 4 to two weirs 5 between which is a depressed area or well 6 from which liquid can discharge through a sharp edged circular hole 7.

It will be understood that the trough need not have a sloping bottom.

To the underside of the well 6 is fixed by one end a tubular reflector 8 which is substantially concentric with but larger than the hole 7. The reflector 8 has an internal polished surface 9 and is of short length with an inwardly downwardly inclined portion at its other lower end to provide an angular reflective shoulder 10.

From the dotted lines in Fig. 3 representing U.V. rays, it will be seen that rays incident upon the shoulder 10 will be reflected back onto the underface of the well 6 at least around the hole 7 and in fact some rays may be reflected back through the hole 7. With the multiplicity of rays resulting from blanket radiation of the liquid in the tray, some pass through the liquid in the well and hole 7 and these are sufficient when reflected to render the irradiated area of the underface of the well sterile.

In a presently preferred arrangement the hole 7 has a diameter of $5/8$ " the reflector 8 has an internal diameter of $1\ 5/8$ " and the shoulder 10 lies at an angle of 35° to the central axis of the cylinder 8. The shoulder 10 terminates in an opening 11 of $1\ 1/16$ " diameter.

The opening 11 of the reflector is desirably dimensioned to form a protecting barrier against the possibility of the neck of a receptacle entering the reflector 8 sufficiently to contact the underface of the well 6. It is also made sufficiently large that liquid discharging from hole 7 will not contact the reflective surface of extension 10.

It is to be understood that the design of the reflector has to be in accord with certain factors inherent in the equipment with which the tray is to be used. For example, a steriliser having a plurality of irradiating tubes will require a reflector which is different from that which is required if a single tube is provided as the angles at which the rays pass through the hole 7 would be different. It is important that the reflector be shaped to redirect rays as uniformly as possible and thus avoid any "shadows" of low radiation intensity. For this purpose, a reflector of rectangular cross-section may in some circumstances be found more effective than the circular reflector illustrated.

Referring now to Figs. 4a to 4g, it will be seen that various tray configurations may be adopted with equal effect. Fig. 4H is a plan

view of the tray 4b or 4f or 4g, where the weir means does not extend fully across the trough.

WHAT WE CLAIM IS:—

1. A tray for U.V. transparent liquid which is to be sterilised by ultra violet rays, said tray comprising a trough, a liquid discharge hole through the bottom of the trough and reflector means mounted on the tray to intercept U.V. rays originating above the trough and passing through said hole, said reflector means being shaped and dimensioned to reflect the U.V. rays incident thereon against the underside of the tray at least around said hole and being located in a position to avoid liquid discharged from said tray contacting said reflector means. 60
2. The tray claimed in claim 1, wherein weir means is located in the trough to maintain the trough full to a predetermined depth and said discharge hole is downstream from said weir means. 65
3. The tray claimed in claim 2 wherein said weir means divides said trough into a plurality of liquid holding areas. 70
4. The tray claimed in claim 2 wherein said weir means is comprised of two weirs and said hole is disposed between said weirs. 75
5. The tray claimed in claim 4 wherein said hole is disposed in the floor of a well located between said weirs. 80
6. The tray claimed in any one of claims 2 to 5 wherein said trough increases in depth as it extends away from said weir means. 85
7. The tray claimed in any one of claims 1 to 6 wherein said reflector means is a tubular member substantially co-axial with said hole and provided with an internal shoulder surface which is angled inwardly and away from said tray, at least said shoulder surface being reflective. 90
8. The tray claimed in claim 7 wherein said shoulder surface is disposed at an angle of 35° to the common axis of said hole and said tubular member. 95
9. A tray for use in the sterilisation of ultra violet ray transparent liquid substantially as hereinbefore described with reference to the drawings. 100

For the Applicants:
D. YOUNG & CO.,
Chartered Patent Agents,
9 & 10 Staple Inn, London, W.C.1.



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It is to be understood that the design of the reflector has to be in accord with certain factors inherent in the equipment with which the tray is to be used. For example, a steriliser having a plurality of irradiating tubes will require a reflector which is different from that which is required if a single tube is provided as the angles at which the rays pass through the hole 7 would be different. It is important that the reflector be shaped to redirect rays as uniformly as possible and thus avoid any "shadows" of low radiation intensity. For this purpose, a reflector of rectangular cross-section may in some circumstances be found more effective than the circular reflector illustrated.

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2. The tray claimed in claim 1, wherein weir means is located in the trough to maintain the trough full to a predetermined depth and said discharge hole is downstream from said weir means.

3. The tray claimed in claim 2 wherein said weir means divides said trough into a plurality of liquid holding areas.

4. The tray claimed in claim 2 wherein said weir means is comprised of two weirs and said hole is disposed between said weirs.

5. The tray claimed in claim 4 wherein said hole is disposed in the floor of a well located between said weirs.

6. The tray claimed in any one of claims 2 to 5 wherein said trough increases in depth as it extends away from said weir means.

7. The tray claimed in any one of claims 1 to 6 wherein said reflector means is a tubular member substantially co-axial with said hole and provided with an internal shoulder surface which is angled inwardly and away from said tray, at least said shoulder surface being reflective.

8. The tray claimed in claim 7 wherein said shoulder surface is disposed at an angle of 35° to the common axis of said hole and said tubular member.

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