Aug. 20, 1940. A. G. THOMAS 2,212,330

STERILIZING DEVICE

Original Filed May 3, 1938 2 Sheets-Sheet 1

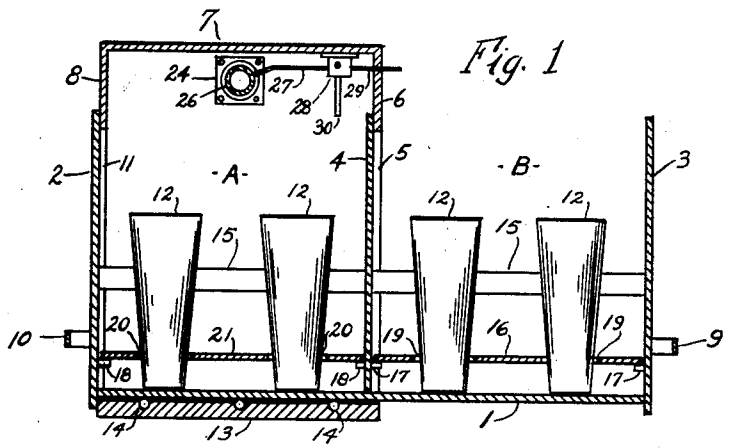

Fig. 1

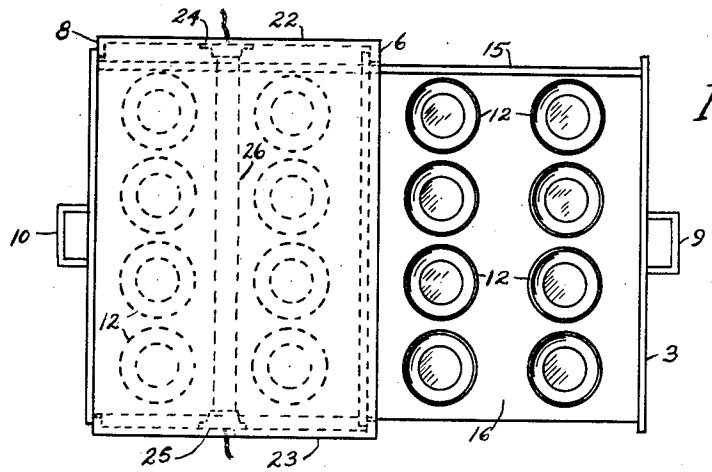

Fig. 2

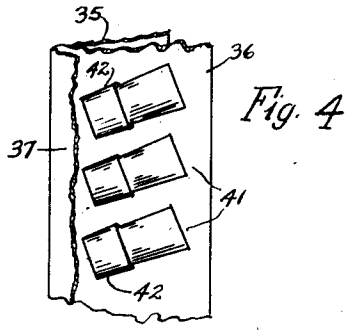

Fig. 4

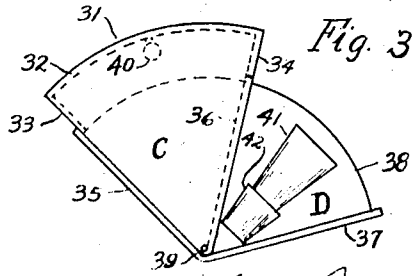

Fig. 3

Albert G. Thomas. Inventor

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Fig. 5

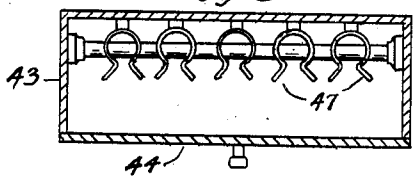


Fig. 6

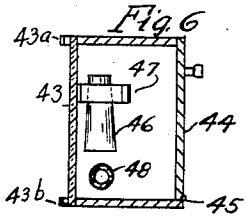
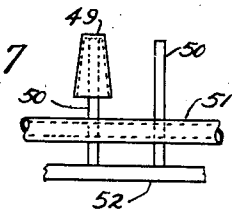


Fig. 7



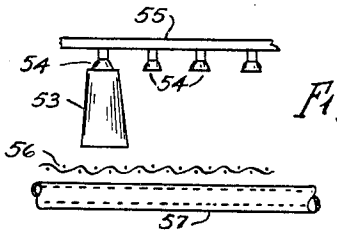


Fig. 8

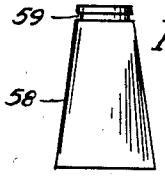


Fig. 9

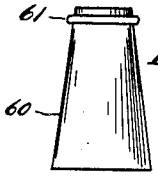


Fig. 10

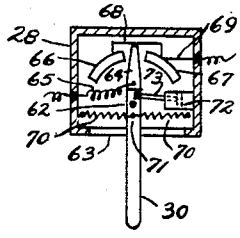


Fig. 11

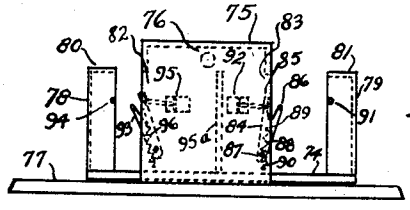


Fig. 12

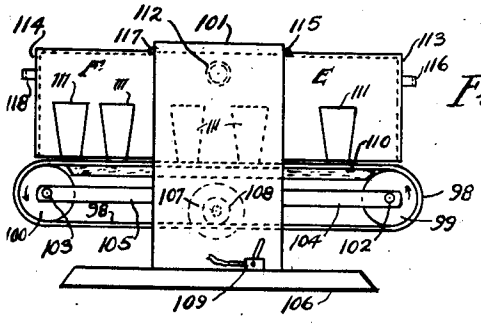


Fig. 13

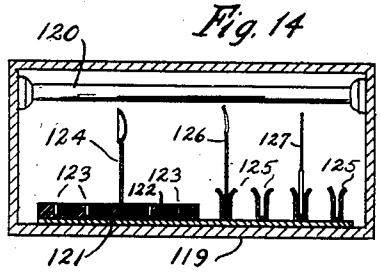


Fig. 14

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UNITED STATES PATENT OFFICE

2,212,330

STERILIZING DEVICE

Albert G. Thomas, Lynchburg, Va.

Application May 3, 1938, Serial No. 205,683
Renewed January 5, 1940

5 Claims. (Cl. 250—52)

This invention relates to sterilizing devices.

An object is to provide a device for use at soda fountains, in restaurants, in hotels, in dairies, etc., for quickly sterilizing glasses, dishes, bottles and the like.

A further object is to provide a sterilizer which can be economically manufactured and which will be effective and easily operated.

Other objects will appear in the following description.

In the drawings:

Figure 1 is a side elevation, in part section, of a sliding tray type sterilizer.

Figure 2 is a plan view of the sterilizer shown in Figure 1.

Figure 3 is a plan view of a rotary type sterilizer.

Figure 4 is a fragmentary side elevation, with a boundary wall partly broken away, of the sterilizer shown in Figure 3.

Figure 5 is a plan view, in part section, of a sterilizer with clamps for holding glasses.

Figure 6 is an end elevation, in part section, of the sterilizer shown in Figure 5.

Figure 7 is a fragmentary front elevation of a novel glass support and sterilizer tube.

Figure 8 is a fragmentary front elevation of a vacuum cup glass holder and screen protected sterilizer tube.

Figure 9 is an elevation of a novel drinking glass.

Figure 10 is an elevation of another novel drinking glass.

Figure 11 is an elevation, in part section, of a time delay switch.

Figure 12 is a side elevation of a double acting tray sterilizer with time delay mechanism.

Figure 13 is a side elevation of a moving belt type sterilizer.

Figure 14 is a front elevation, in part section, of a sterilizing device for instruments such as knives, forks, spoons, etc.

In Figure 1, drawer bottom 1 has vertical end cover plates 2 and 3 either integral with or attached to bottom 1. Vertical plate 4 is attached to bottom 1 approximately midway between end plates 2 and 3. Plate 4 is so positioned that it will strike against wall 6 of housing 7 at the same instant that plate 2 strikes against wall 8 of housing 7, when the drawer 1 is moved to the right by one of the handles 9 or 10 attached to plates 3 and 2 respectively.

Rectangular opening 5 in wall 6 and a similar opening 11 in wall 8 are provided so that the drawer 1 may be moved to the left or right as the case may be, to place glasses 12 in, or withdraw them from the interior of cabinet 7. Glasses 12 are placed in openings 19 in plate 16 which is supported in section B of drawer 1 by means of lugs 17 attached to plates 3 and 4. Similarly the glasses are placed in openings 20 of plate 21 in section A, plate 21 being supported by lugs 18 attached to plates 2 and 4. Bar 15 is fastened to vertical plates 2, 4, and 3 in order to give rigidity to the drawer structure. Any suitable type of bracing could be used however, or none at all, depending upon the strength of the materials used.

Walls 6 and 8 and end walls 22 and 23 of housing 7 are fastened to base 13. Rollers 14 are preferably provided so that drawer 1 can be moved laterally with little effort.

Ultraviolet tube lamp 26 is fastened into sockets 24 and 25 attached to walls 22 and 23 respectively. This lamp is connected in well known manner to a source of supply of current, a transformer being usually included in the circuit. Such circuits are well known and need not be described here.

One end of tube 26 is supplied with current through wire 29, through double acting time delay switch 28 and through wire 27. Pivoted switch arm 30 will be struck by the upper part of plate 4 and will therefore be rotated a certain distance to make current connection to lamp 26 for a definite period each time drawer 1 is moved to right or left for the full travel of the drawer. Details of this switch are shown in Figure 11.

In operation, glasses 12 are placed in openings 19 or 20 depending upon whether section B or section A is outside housing 7. As an illustration we will say that A is initially outside and therefore drawer 1 will be moved to the right to carry glasses 12 into housing 7. This movement will be continued until plates 2 and 4 strike walls 8 and 6 and cover up openings 11 and 5 respectively so that radiation from lamp 26 will be confined to the interior of housing 7. When plate 4 rotates and releases lever 30 lamp 26 will be illuminated for a definite time interval, say 30 seconds or more. Then switch 28 will automatically cut off lamp 26 so that the irradiated glasses will be ready to use.

Before pushing drawer 1 to the left, washed glasses are placed in openings 19 in section B and drawer 1 is moved to the left until plate 4 strikes the inner surface of wall 8 and so covers up opening 11. At the same instant end plate 3 strikes the outer surface of wall 6 and covers opening 5. By this operation the sterilized

glasses in section A are carried outside housing 7 so they can be used and the newly placed glasses in section B are carried inside housing 7 so they will be sterilized. When plate 4 moves to the left it again strikes lever 30 and causes lamp 26 to be energized for approximately the same time interval as before.

It has been demonstrated that such an ultraviolet lamp, of proper wave length, will destroy most bacteria usually encountered in about 15 seconds. An exposure of articles to such rays for 30 seconds or more is therefore ample to sterilize such articles, be they glasses, dishes or other utensils.

The parts of the glasses not receiving direct rays from tube 26 will receive reflected rays so that they will be effectively sterilized. In addition the ozone generated will produce a sterilizing effect. If desired however, a plurality of ultraviolet tubes may be used and may be arranged so that all desired parts of the glasses, especially the interiors and upper outside portions will receive direct rays.

While only one double acting switch 28 is shown it is obvious that two single acting switches could be used and these could be placed so that the lamp 26 is not energized until the openings 5 and 11 are covered, in order to prevent even momentary rays of ultraviolet radiation from escaping. Excessive exposure to such rays may of course be harmful to the operator.

Part or all of housing 7 may be made of light transparent material such as glass which is opaque to ultraviolet rays. Advertising matter can then be placed on housing 7 and will be illuminated when tube 26 is energized. It may be desirable also for the public to be able to see the articles being sterilized.

Plates 16 and 21 may readily be lifted out so that the drawer 1 and other parts can be cleaned. While the drawings show drawer 1 as being slidable across the length of lamp 26 it is obvious that the drawer may be slidable at right angles to this direction by changing the positions of openings 5 and 11. Rollers or other supports may be fastened to the bottom of plates 2 and 3 if desired.

This sterilizer is a particularly convenient device since as one batch of sterilized glasses is being used, the other batch is being sterilized, and furthermore, the operation of the double section drawer prevents the usual lost motion in handling such devices.

While the sterilizer is shown as holding 8 glasses to a section, it may be made to hold any desired number. In addition the glasses may be arranged in tiers, with a separate sterilizing tube for each tier, if desired.

It is obvious that rotary movement instead of sliding movement may be employed. In Figures 3 and 4 wedge shaped housing 31 has curved vertical end wall 32 and vertical side walls 33 and 34 attached to a suitable base. Vertical, plane cover plates 35, 36 and 37 are attached to bottom plate 38 and the combination is pivoted by vertical pivot rod 39 so that as cover plate 35 is rotated in clockwise direction to place section C in housing 31, end cover plate 37 is rotated to bring the sterilized glasses in section D outside for use. At the instant that plate 35 strikes wall 33 to cover up the opening in wall 33, plate 36 covers up the opening in wall 34. This plate is shown as fitting flush but it can be made to overlap if desired. Similarly when plate 37 is rotated in counterclockwise direction to cover the opening in wall 34, plate 36 will cover the opening in wall 33.

Ultraviolet lamp 40 is fastened in cabinet 31 in vertical position and a suitable automatic switch similar to switch 28 may be provided, or either of these switches may be manually operated.

Glasses 41 are placed in cups 42 which are welded or otherwise fastened to walls 37 and 36 and to walls 35 and 36. These cups are fastened at a slight angle to prevent the glasses from falling out. The cups and glasses in compartment C are not shown.

This sterilizer is operated in virtually the same manner as the machine previously described except that the glasses are placed vertically and the movement of the drawer is circular instead of lateral. The vertical arrangement of the glasses will tend to save space. The sterilizer could be placed horizontally, however, on suitable supports.

In Figures 5 and 6 the cabinet 43 has door 44 hinged at 45 and glasses 46 are supported by flexible clamps 47 attached to cabinet 43. These clamps may have their gripping surfaces covered with rubber, rubber suction cups, or any suitable material to prevent slippage of glasses 46 which may be placed in reversed position as shown, to facilitate draining. Uitraviolet tube 48 is placed beneath and is suitably energized to irradiate the glasses. This tube can be disconnected from the current before door 44 is opened. Guides 43*a* and 43*b* are provided to hold advertising matter such as a display card. This card may be translucent, if desired, and can be readily changed at will.

In fragmentary Figure 7 glass 49 is shown as being supported on peg 50 which is fixed to bottom 52 of the cabinet. Ultraviolet tube 51, placed below, will irradiate glass 49.

In fragmentary Figure 8 glass 53 is held by its bottom by one of rubber suction cups 54 which are attached to the top 55 of a cabinet similar to cabinet 43. Screen 56 may be placed above ultraviolet tube 57 so that if a glass should fall it would be caught by this screen and would not break tube 57.

In Figure 9 glass 58 has circumferential groove 59 near the bottom so that this glass may be easily suspended in upside down position, by means of a suitable clamp or rack. The groove 59 may consist of one or more indentations rather than a circumferential groove, if desired.

In Figure 10 glass 60 has raised circumferential bead 61 near the bottom of the glass. This bead will prevent the glass from slipping off a suitable support. This bead may be in sections instead of continuous as shown.

Figure 11 shows the details of double acting time delay switch 28 of Figure 1. Switch housing 28 has lever 30 pivoted at 62. Arm 30 is movable in slot 63 in housing 28. Fastened to arm 30, which is preferably of insulating material is metal switch arm 64 to which is attached flexible conductor 65 which is brought out of casing 28 through a suitable insulator. Metal or graphite contacts 66 and 67 are fastened to suitable insulating supports and are electrically connected by means of wire 68. Wire 69 is connected to contact 67 and is brought out of housing 28 by means of a suitable insulator.

The midpoint of tension spring 70 is connected to lever 30 at 71, the ends of this spring being connected to the interior of housing 28. Spring 70 is adjusted so that switch arm 64 normally

rests midway between contacts 66 and 67, touching neither. Dashpot 72 is pivoted to arm 30 by means of rod 73 so that when lever 30, and consequently switch arm 64, is rotated in either direction dashpot 72 will create a yielding resistance to create a time interval before spring 70 returns switch arm 64 to central neutral position, after arm 64 is first displaced. In the event that wire 68 is not used to connect contacts 66 and 67, the switch may be used to operate two circuits instead of one.

While a dashpot is shown, it is obvious that clockwork, a thermostatic switch, or other mechanism may be used to delay the switch action.

In Figure 12 the construction is similar to that shown in Figure 1 except that drawer 74 is arrange to creep into housing 75 slowly for the last part of the travel, in order to expose all desired portions of the glasses sufficiently to the rays from ultraviolet lamp 76. In this case base 77 is shown as extended and end plates 78 and 79 have bounding extended collars 80 and 81 respectively. These collars are for the purpose of closing openings 82 and 83 in housing 75, before end plates 78 and 79 are flush with the bounding walls of openings 82 and 83.

Flat bar 84 is pivoted to housing 75 at 87 and has prongs 85 and 86 as shown. Tension spring 88 is fastened to bar 84 at 89 and to housing 75 at 90 so that when drawer 74 is moved to the right pin 91 on collar 81 will strike prong 86 and will snap bar 84 over against a suitable stop. Spring 88 will hold bar 84 in this position until drawer 74 is moved to the left to place glasses resting upon drawer 74 in cabinet 75. Pin 91 will then strike prong 85 and will cause spring 88 to pull bar 84 in counter-clockwise direction since spring 88 is arranged to pass over to the left of pivot 87 shortly after collar 81 covers opening 83. This collar is designed to slide through this opening, a close fit being provided. Dashpot 92 is connected to bar 84 so that after pin 91 strikes prong 85 and opening 83 is closed, prong 86 will be slowly rotated to the left by spring 88 so that pin 91 and therefore drawer 74 and the supported glasses, not shown, will be slowly moved to the left relative to ultraviolet lamp 76 in order that all essential parts of the glass surfaces will be sufficiently irradiated. Drawer 74 will finally come to rest with end plate 79 flush with the bounding wall of opening 83.

Similarly pronged bar 93, dashpot 95, spring 96 and pin 94 on collar 80 will cause a creeping movement of tray 74 to the right when the tray is moved in that direction. Central cover plate 95a serves the same purpose as plate 4 of Figure 1. Lamp 76 may be suitably connected with a manually operated or automatic switch.

It is obvious that the plates 16 and 21 of Figure 1 may be shortened and may be given a creeping movement inside housing 7. In this way the dishlike end plates of Figure 12 would not be necessary. The drawer would be completely closed before the movement of the plates would start.

In Figure 13 moving belt 98 passes through housing 101 being carried by pulleys 99 and 100 which are rotatable on shafts 102 and 103 respectively. These shafts are fixed to supports 104 and 105 which are fastened to housing 101. This housing is fastened to base 106. Motor 107 is suitably fastened to housing 101 and has pulley 108 geared down so as to rotate slowly. Pulley 108 makes contact with belt 98 so that this belt is moved around pulleys 99 and 100 when motor 107 is energized by closing switch 109 shown diagrammatically. Plate 110 is fastened to housing 101 and serves to support belt 98 and glasses 111 placed thereon, as the belt is moved through the sterilizer. Sterilizing ultraviolet tube 112 is shown diagrammatically as placed in the housing.

Switch 109 may be connected to energize tube 112 and motor 107 simultaneously. This switch may be arranged to make contact for a definite time and then to cut off, sufficient time being allowed for belt 98 to carry the glasses from compartment E, through the housing and into compartment F. A suitable shelf may be arranged in the latter compartment so that the glasses will be forced upon the shelf and off belt 98. Even though such an arrangement is not used, the belt will slide underneath the glasses should they be stopped before the motor is cut off.

Hood 113 is hinged to housing 101 at 115 and is provided with handle 116 so that it can be lifted to place glasses 111 upon belt 98 in chamber E. The hood is then lowered in order to protect the operator from the rays. Hood 113 may be of glass so that the glasses can be seen. Similarly hood 114 is hinged to housing 101 at 117 and is provided with handle 118 so the hood can be lifted to remove the sterilized glasses in compartment F.

By means of this construction the glasses 111 are slowly moved beneath sterilizing tube 112 so that all necessary parts of the glasses will be adequately irradiated. Motor 107 may, if desired, be used to produce a relative oscillatory movement between lamp 112 and belt 98 either the lamp or the belt being oscillated to expose the glasses sufficiently.

In Figure 14 cabinet 119 has sterilizing tube 120 placed within and provided with a suitable switch and source of energy as usual. Tray 121 has attached thick rubber slab 122 with slots 123 so that instruments such as spoon 124 can be forced into the yielding rubber and will be held by the handle so that radiation from lamp 120 will adequately sterilize the bowl of the spoon and most of the handle. A number of tubes similar to tube 120 may be used to provide radiation from a number of directions.

Similarly metal clamps 125, which may be rubber covered, are fastened to tray 121 and will hold instruments such as knife 127 with the blade up, and fork 126 with the tines up toward sterilizing tube 120. Other instruments such as those used in barber shops, doctors offices, etc., can similarly be sterilized. The instruments can of course be held in any suitable position, either horizontal, vertical, or otherwise. A suitable door or cover would be provided for housing 119.

By means of the device just described instruments can be adequately sterilized on the surfaces actually used, whereas if they were placed in haphazard fashion in a container some of the instruments would shield others from the sterilizing rays.

Many possible changes of detail will be obvious. For instance several sterilizers of the type shown in Figure 1 can be placed one above the other, or a number of drawers can be so placed in an integrated housing. Likewise, the drawers may be moved vertically rather than horizontally, if desired. Many other obvious changes will be readily apparent.

As an illustration, the movable tray in Figure 12 can be made to move in two or more steps rather than continuously. The tray may be held in one

position against spring tension by a catch and then the catch can be released by a suitable timing device so that the tray will then quickly reach its final position.

What I claim is:

1. In a sterilizer, a housing, means for creating sterilizing radiation within said housing, a pair of opposed openings in said housing, a carrier movable back and forth through said openings for carrying objects to be sterilized into and out of said housing, a closure for one of said openings at one end of said carrier, a closure for the other said opening at the other end of said carrier, a closure substantially centrally located on said carrier said latter closure being adapted to close one said opening and then the other said opening as said carrier is displaced alternately in opposite directions through said openings.

2. In a sterilizer, a housing, means for creating sterilizing radiation within said housing, a pair of openings in said housing, a carrier passing through said openings and projecting outside of said housing, said carrier being adapted to carry objects to be sterilized into and out of said housing, a closure on said carrier adapted to close one of said openings at the end of travel of said carrier in one direction, another closure on said carrier adapted to close the other said opening at the end of travel of said carrier in the reverse direction, and a closure on said carrier situated between said other closures and adapted to close first one said opening and then the other said opening after said carrier is alternately displaced in opposite directions for the length of travel of said carrier.

3. In a sterilizer, a housing, electrical means for creating sterilizing radiation within said housing, a pair of openings in said housing, a carrier passing through said openings and projecting beyond said housing, said carrier being adapted to carry objects to be sterilized into and out of said housing, a closure for one of said openings on one end of said carrier, a closure for the other said opening on the other end of said carrier, a closure on said carrier situated intermediate said closures for closing either of said openings, and a time switch controlling said electrical means, said switch being operated by movement of said carrier.

4. In a sterilizer, a housing, electrical means for creating sterilizing radiation within said housing, openings in said housing, carrying means for carrying objects to be sterilized into and out of said housing through said openings, and timing means operated by movement of said carrying means for energizing said electrical means for predetermined intervals of time.

5. In a sterilizer, a housing, means for creating sterilizing radiation within said housing, a pair of openings in said housing, a carrier passing through said openings and projecting beyond said housing, said carrier being adapted to carry objects to be sterilized into and out of said housing, a closure for one of said openings on one end of said carrier, a closure for the other said opening on the other end of said carrier, a closure on said carrier intermediate said other closures and adapted to close either of said openings, and means for causing slow movement of said carrier for a predetermined distance before said carrier reaches the end of its travel.

ALBERT G. THOMAS.