Dec. 18, 1951 S. J. PASK 2,579,242

GERMICIDAL CABINET

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Fig. 1

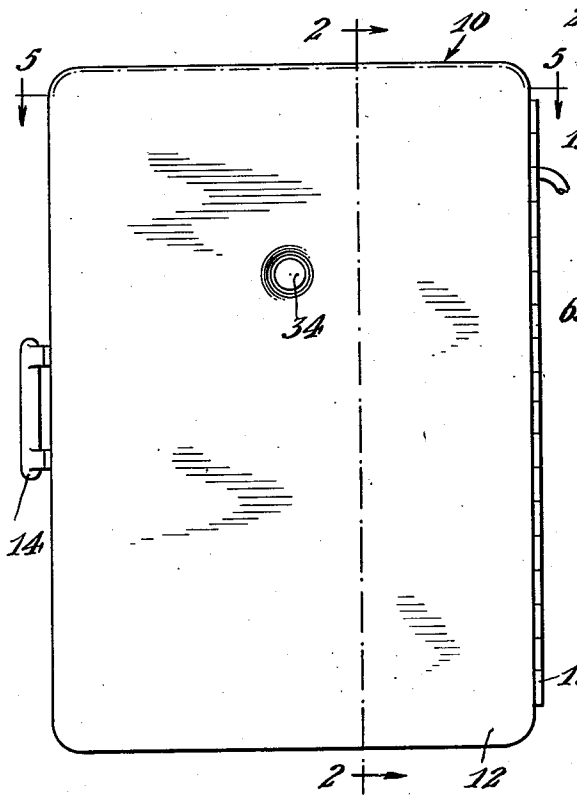


Fig. 2

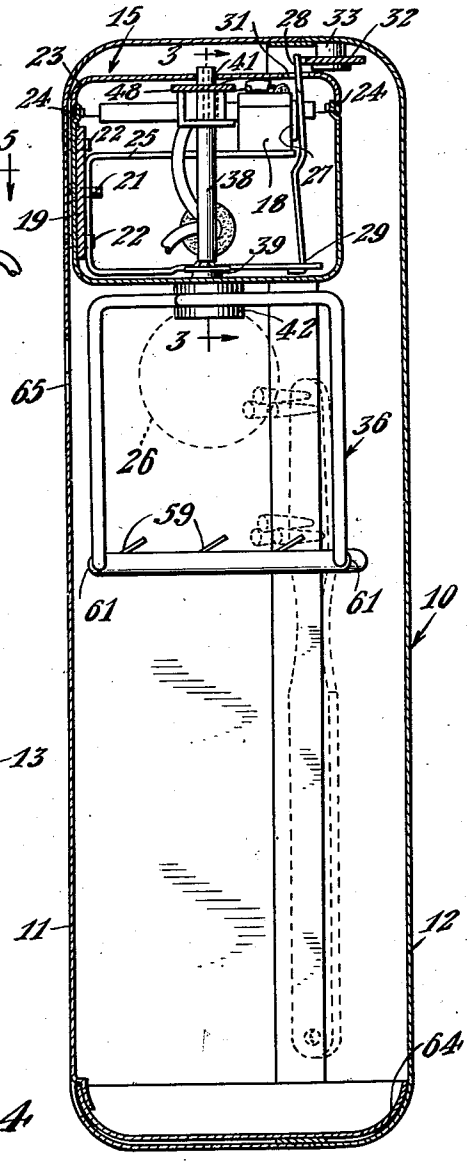


Fig. 3

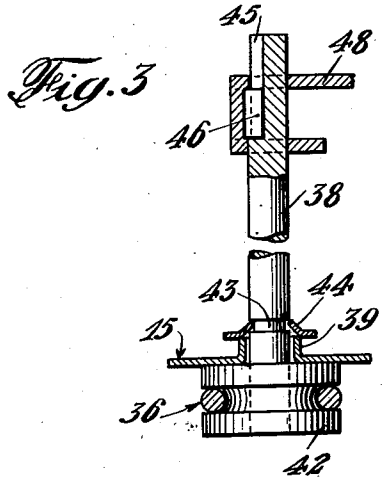
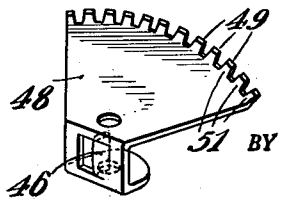


Fig. 4



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Fig. 5

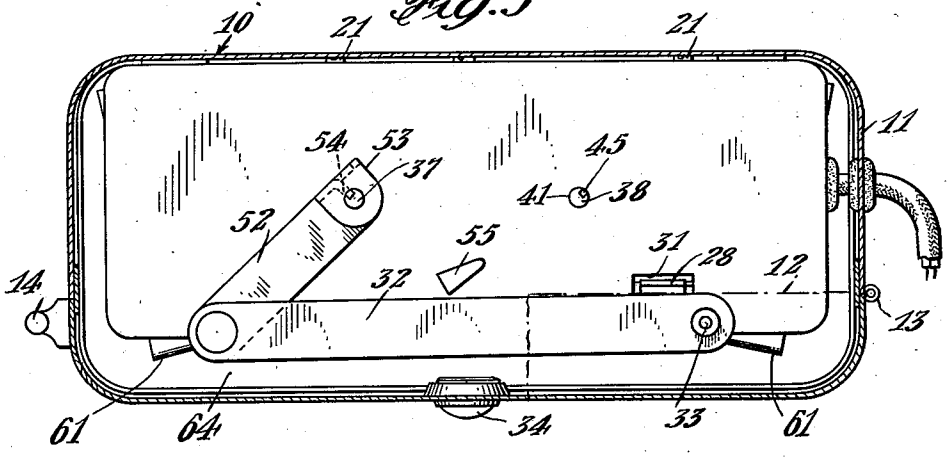


Fig. 6

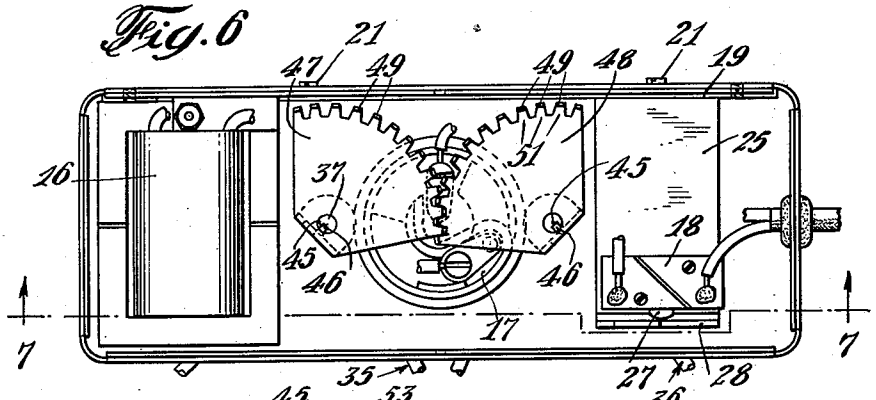


Fig. 7

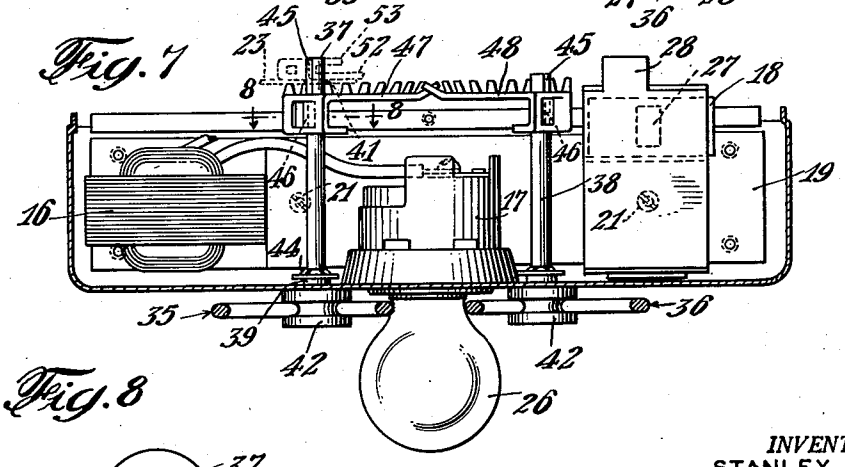
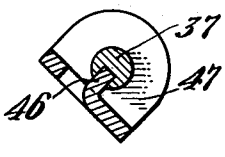


Fig. 8



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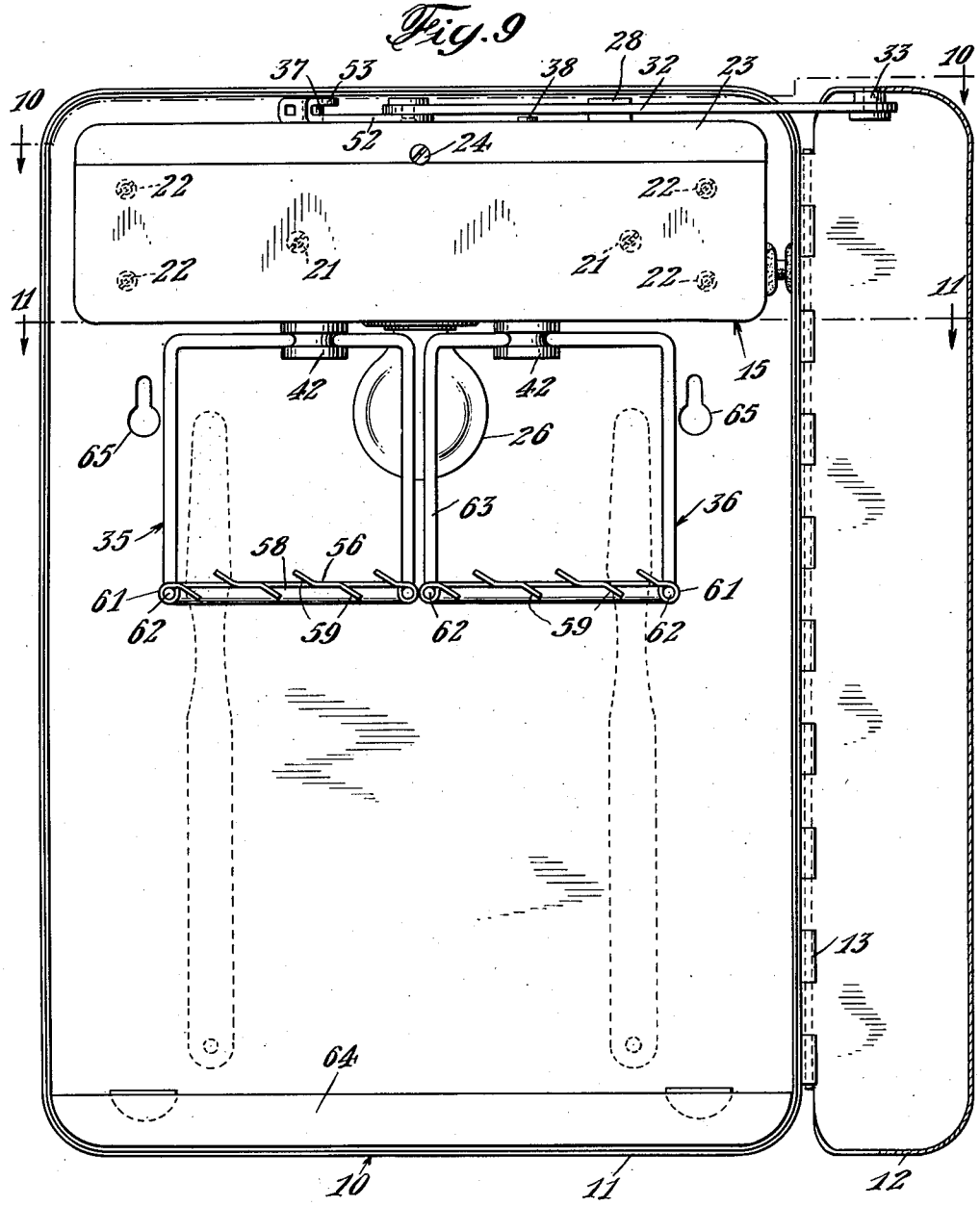
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Fig. 9



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Fig. 10

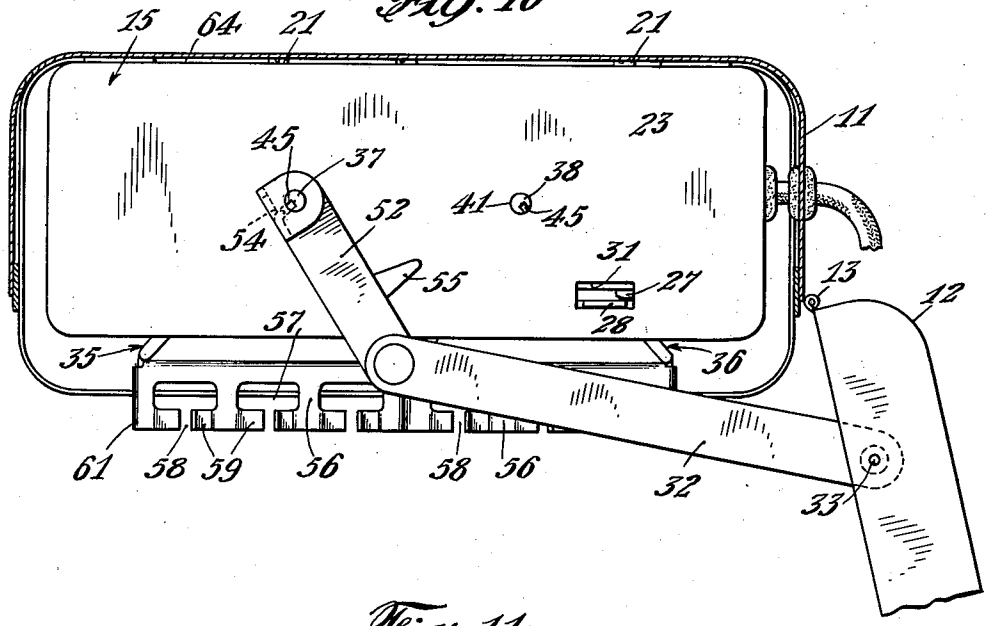
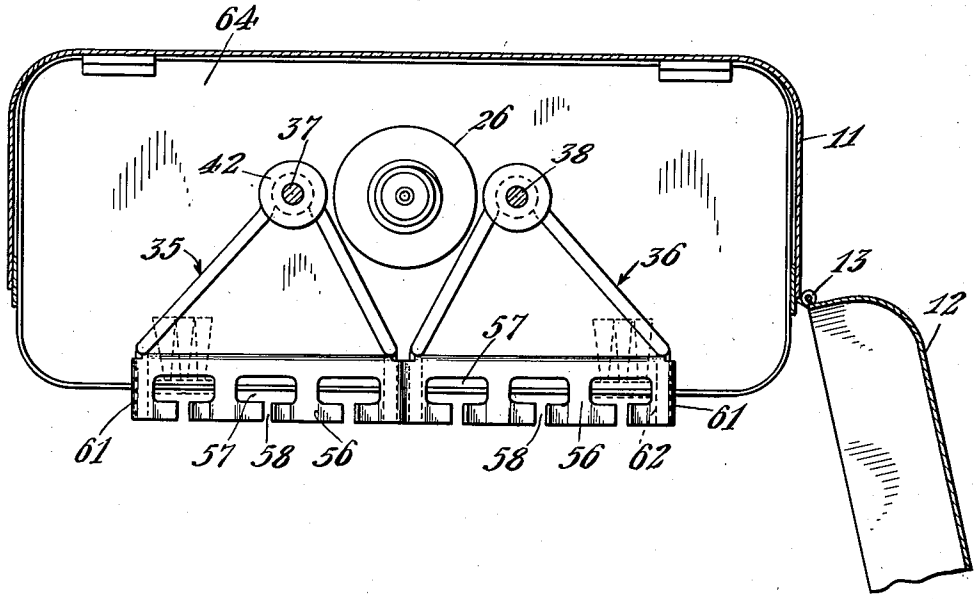


Fig. 11



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UNITED STATES PATENT OFFICE

2,579,242

GERMICIDAL CABINET

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Application March 10, 1949, Serial No. 80,638

5 Claims. (Cl. 250—51)

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This invention relates to a germicidal cabinet and more particularly to such a cabinet for the sterilization of articles of any nature such as medical or dental supplies and tools, nursery equipment or personal household articles, such as toothbrushes, drinking glasses, medicine dispensers, and the like. The invention will be illustrated with reference to the sterile storage of toothbrushes, it being understood, however, that this is only by way of example.

The invention is concerned with a suitable cabinet which employs the sterilizing effect of ultraviolet radiation from a suitable source, such as a mercury vapor arc lamp, and means for supporting the objects to be sterilized in proper relation to the lethal radiations from such source.

As is well understood, airborne micro-organisms of the pathogenic or disease producing type, of which *B. coli* is a typical representative, are prevalent in the atmosphere and constitute a menace to health at all times. It is also well recognized that such germs are rapidly inactivated or destroyed by exposure to ultraviolet radiation between 2000 A. and 2900 A.

It is one of the objects of the present invention to provide a suitable cabinet containing a source of radiant energy in the above-mentioned region which is particularly suitable for use in homes, laboratories, nurseries, beauty parlors, barber shops, and the like, and which will have a high germicidal effectiveness for both air and liquid or waterborne bacteria.

Another object is to provide such a cabinet which will be economical to produce, convenient to use, pleasing in appearance and readily installed.

Still another object is to provide a supporting structure for articles to be sterilized in a germicidal cabinet which will be readily accessible for the applying of articles thereto or removal therefrom, and which will permit such articles to be subjected to the direct lethal radiations.

Germicidal lamps, having a high output of radiation of wave length 2537 A., are particularly suitable for the purpose of the present invention. Such rays are, however, extremely harmful to the eyes as well as detrimental to the skin. It is, therefore, another object of the invention to provide a cabinet of the above nature in which the user will be protected from exposure to the germicidal energy.

Other objects and advantages will hereinafter appear.

In accordance with the present invention I provide a suitable container for the objects to

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be sterilized, composed of any desired material opaque to radiations in the region from 2000 A. to 2900 A., such as plastic, metal or wood, although I prefer to employ aluminum having a polished or oxidized interior surface, since this material provides high reflective characteristics for ultraviolet radiation in the abiotic or sterilizing region. Aluminum, moreover, is light in weight, is relatively inexpensive, and may be readily drawn or otherwise formed into the desired shape. An ultraviolet lamp having the required germicidal output, depending upon the physical dimensions of the cabinet, is preferably mounted in the upper portion thereof together with its current limiting and starting transformer, so as to irradiate the space there beneath. Within this irradiated space I provide one or more racks for the support of objects to be sterilized, the racks being actuated by the closing movement of the cabinet door in such manner as to move inwardly against the side walls of the cabinet, thereby to leave the central area of the cabinet unobstructed. The racks are oppositely actuated by the opening movement of the door so as to be advanced toward or through the door opening, for more convenient access thereto by the user.

A switch is also arranged to be actuated by the movement of the door so as to complete an energizing circuit for the ultraviolet lamp upon closure of the door and to extinguish the lamp upon opening of the door, thereby to protect the eyes of the user when inserting an object into or removing it from the cabinet. A suitable signal indicates whether or not the lamp is properly functioning when the door is closed.

The invention will best be understood by reference to the accompanying drawings, in which:

Fig. 1 is a front view of a germicidal cabinet embodying the present invention, with the cover closed;

Fig. 2 is a vertical section of the cabinet on the line 2—2 of Fig. 1;

Fig. 3 is a detail view of one of the article support operating shafts, partly in section, on the line 3—3 of Fig. 2;

Fig. 4 is a perspective view of a gear segment provided on the shaft of Fig. 3;

Fig. 5 is a horizontal sectional view on the line 5—5 of Fig. 2, with the cover closed;

Fig. 6 is a plan view of the drive mechanism shown in the upper part of Fig. 2, with the cover removed;

Fig. 7 is a vertical sectional view on the line 7—7 of Fig. 6;

Fig. 8 is a cross-sectional view on the line 8—8 of Fig. 7;

Fig. 9 is a front view of the cabinet, with the cover open;

Fig. 10 is a horizontal sectional view on the line 10—10 of Fig. 9; and

Fig. 11 is a horizontal sectional view taken on the line 11—11 of Fig. 9.

Referring first to Figs. 1, 2 and 9, the germicidal cabinet is shown, by way of example, as comprising a rectangular box, generally indicated at 10, having an open front body portion 11 and a closure member or door 12. The door 12 is hinged at one side 13 and is provided at the opposite side with a suitable opening handle 14. While any desirable material may be employed, I prefer to fabricate the cabinet of aluminum which may be polished or oxidized on its inner surface to increase the ultraviolet reflection. Such material provides a reflection of rays of wave length 2600 A. of about 60%. However, if desired, other metals such as steel may be employed, but in such case I prefer to chromium plate the inner surface, since chromium has a reflective index for the germicidal rays approaching that of aluminum.

A rectangular compartment 15 extends longitudinally across the upper portion of the cabinet and serves to house a current limiting and voltage step-up transformer 16, a lamp socket 17 and an electrical switch 18. The transformer 16 is supported at one end of a reinforcing plate 19 which extends transversely across the rear wall of the compartment and is secured thereto by screws 21. Other screws 22 (Fig. 2), passing through the rear wall of the cabinet 10, the rear wall of the compartment 15, and the reinforcing plate 19, serve to support the compartment within the cabinet. A top cover 23 is secured to the compartment 15 by suitable screws 24.

The switch 18 is carried by a U-shaped bracket 25, in turn secured to the opposite end of the plate 19. The lamp socket 17 is supported in an opening disposed centrally in the lower wall of the compartment 15 so that the lamp 26 depends into the upper portion of the cabinet, as best shown in Fig. 9.

The switch 18 is normally biased to the open position and is provided with an operating button 27 engageable by a lever 28, pivoted at 29 in an opening in the bottom leg of the U-shaped bracket 25. The lever 28 extends upwardly across the button 27 and through an opening 31 in the top cover 23, with the upper end thereof projecting above the compartment 15 in such position as to be engaged by a lever 32, pivoted at 33 to the upper inturned flange of the cabinet door 12. The lever 32 is actuated by the door 12 upon closure thereof to rock the switch operating lever 28 into engagement with the switch button 27, thus to close the switch. Similarly, upon opening of the door 12 the switch 18 is released to its open position by the outward movement of lever 32.

It will be understood that the contacts of the switch 18 are connected in series with the secondary winding of the transformer 16 and that the terminals of the lamp socket 17 are in circuit with the secondary winding of the transformer. Consequently the lamp 26 will be energized whenever the door is closed to operate the switch 18 and will be deenergized when the cover is open. This feature of the construction provides protection for the eyes of the user when opening the cabinet to remove an article therefrom or insert an article therein.

A peephole 34 closed by a suitable glass or crystal is provided in the cabinet door so that the operative or inoperative condition of the lamp 26 may be observed when the door 12 is closed.

A pair of article supporting racks or frames 35 and 36 (Figs. 9 and 11) are suspended within the cabinet from the lower ends of a pair of spaced vertical shafts 37 and 38. These shafts extend upwardly through the compartment 15, bearing at their lower ends in a sleeve 39 formed by an inward deformation of the bottom wall of the compartment, as shown in Fig. 3. At their upper ends the shafts 37, 38 bear in openings 41 in the compartment cover 23. Each shaft 37, 38 has a grooved collar 42 at its lower end, externally of the compartment 15, for supporting the racks 35 and 36, respectively, as will more fully appear hereinafter. Each of the shafts is further provided with an annular groove 43, just above the bearing sleeve 39, which serves to receive the radial fingers of a spring retaining spider 44, also engaging with the lip of the bearing flange 39, so as to retain the shaft in position. Each shaft 37, 38 has a slot or keyway 45 at its upper end adapted to receive the inturned key 46 of gear segments 47 and 48, respectively, stamped from sheet metal, as will be apparent from an observation of Fig. 4. The teeth 49 of each gear segment are formed in an inclined flange 51, bent up from the body of the segment.

In assembling the shafts 37 and 38 in the compartment 15, they are first inserted upwardly through the bearing sleeve 39 and the spring ring 44 is then slipped down over the top thereof and snapped into place. Thereafter the gear segments 47 and 48 are slid down upon their respective shafts with the keys 46 engaging the shaft keyways 45. The top cover serves to hold the gear segments down in position upon their respective shafts. This arrangement, it will be noted, requires no tools to assemble other than a screwdriver for securing the cover 23 in place. The gear segments 47 and 48 are positioned upon the shafts 37 and 38 in such position as to interengage, so that the shafts may be rotated together in opposite directions. The shaft 37 constitutes the driving shaft and for this purpose it has a lever 52 secured to its upper end, above the compartment 15. The lever 52 has a U-shaped end 53 with a key member 54 struck out from the portion intermediate the spaced arms thereof, this key serving to engage the slot or keyway 45 of the shaft 37. The opposite end of the lever 52 is pivoted to the switch operating lever 32.

The orientation of the lever 52 and gear segments 47 and 48, in the closed position of the cabinet door 12, is shown in Fig. 5. Upon opening the door 12, lever 52 is rotated, counterclockwise, by the connection of lever 32 to the door 12, until it has rotated through an arc of 90° to bring lever 52 into engagement with a stop 55 depending from the top wall of the cabinet. Lever 52 in rotating rocks the shaft 37, counterclockwise, and through the interengagement of gear segments 47 and 48, drives the shaft 38 clockwise. Consequently, at the end of a door opening operation the shafts 37 and 38 and gear segments 47 and 48 occupy the position shown in Fig. 6.

The article supporting racks 35 and 36 each comprise a plate or strip 56 (Figs. 9, 10 and 11) having slotted openings 57 therein, arranged in the embodiment shown, for the support of toothbrushes, although it is to be understood that these

racks may be differently shaped to support other types of articles for germicidal treatment. The slots 58, giving access to the openings 57, are defined by the tabs 59 which are alternately bent upwardly and downwardly to form inclined passageways through which the handles of toothbrushes may be passed when similarly inclined. Thereafter, with the brushes suspended vertically in the openings 57, the tabs 59 retain the brushes in position. As shown, the brushes are inserted into the racks with the bristles pointing towards the interior of the cabinet. The reason for this is so that, upon movement of the racks from the forward position shown in Figs. 9 and 11 into the compartment to the position shown in Fig. 2, the bristles of the brushes will be directed toward the ultraviolet source 26.

The plates 56 are supported from a wire frame by curling the opposite end portions 61 thereof about the horizontally extending ends 62 of the frame. The intermediate section of each frame extends vertically, at 63, and thence converges inwardly, to partially encircle the annular recess of the collars 42 provided on the shafts 37 and 38, in resilient engagement therewith, so as to be rotated by the shafts upon opening or closing of the door 12. In the open position of the door, the racks are faced outwardly, as shown in Figs. 9 and 11, so as to be readily accessible for the removal therefrom or the insertion of a toothbrush therein. Upon closing of the door 12 the racks are pivoted into the cabinet against the side walls thereof as shafts 37 and 38 rotate clockwise and counterclockwise, respectively, thus leaving the central portion of the cabinet free from obstruction which would shadow objects placed therein.

For convenience, a removable tray 64 is provided in the base of the cabinet for the support of additional objects to be sterilized, such as gauze, nursery articles, and the like.

The cabinet may be supported from any suitable wall by means of screws engaging in the openings 65 in the rear wall of the cabinet.

Obviously, the invention is not limited to the structural details shown and described nor to the support of any particular objects since various modifications and arrangements may be made to accommodate objects of any form or shape.

What I claim is:

1. A germicidal cabinet having a door opening, a door normally closing said opening and movable to an open position to afford access to the interior of said cabinet, a germicidal lamp within said cabinet, a compartment within said cabinet, power control means for said lamp mounted within said compartment, a pair of spaced vertical shafts rotatably mounted in said compartment and extending outwardly through one wall of said compartment, intermeshing gear members carried by each of said shafts within said compartment, an operating lever connected to one of said shafts, a link interconnecting said lever and said door, and an article supporting rack carried by the outwardly extending end of each of said shafts for movement therewith.

2. A germicidal cabinet having a door opening, a door normally closing said opening and movable to an open position to afford access to the interior of said cabinet, a germicidal lamp within said cabinet, a compartment within said cabinet, a pair of spaced vertical shafts rotatably mounted in said compartment and extending outwardly through one wall of said compartment, intermeshing gear members carried by each of said shafts within said compartment, an operating lever connected to one of said shafts, a link interconnecting said lever and said door, an article supporting rack carried by the outwardly extending end of each of said shafts for movement therewith, a switch having circuit connection with said lamp, said switch being mounted in said compartment and means engageable by said link, in the closed position of said door, for operating said switch whereby to energize said lamp.

3. A germicidal cabinet having a door opening, a door normally closing said opening and movable to an open position to afford access to the interior of said cabinet, a germicidal lamp within said cabinet, a pair of spaced vertical shafts rotatably mounted in said cabinet, intermeshing gear members carried by each of said shafts, an operating lever connected to one of said shafts, a link interconnecting said lever and said door for operation of said shafts upon movement of said door, and an article supporting rack carried by each of said shafts for movement therewith.

4. A germicidal cabinet having a door opening, a door normally closing said opening and movable to an open position to afford access to the interior of said cabinet, a germicidal lamp within said cabinet, a pair of spaced vertical shafts rotatably mounted in said cabinet, intermeshing gear members carried by each of said shafts, an operating lever connected to one of said shafts, a link interconnecting said lever and said door for operation of said shafts upon movement of said door, an article supporting rack carried by each of said shafts for movement therewith, a switch having circuit connections with said lamp and means engageable by said link, in the closed position of said door, for operating said switch whereby to energize said lamp.

5. A germicidal cabinet having a door opening, a door normally closing said opening and movable to an open position to afford access to the interior of said cabinet, a germicidal lamp within said cabinet, a pair of spaced vertical shafts rotatably mounted in said cabinet, intermeshing gear members carried by each of said shafts, an operating lever connected to one of said shafts, a link interconnecting said lever and said door for operation of said shafts upon movement of said door, an article supporting rack carried by each of said shafts for movement therewith, a switch having circuit connections with said lamp, means engageable by said link, in the closed position of said door, for operating said switch whereby to energize said lamp, and means for indicating the operative condition of said lamp in the closed position of said door.

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