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METHOD AND APPARATUS FOR RECLAIMING ULTRAVIOLET LAMPS

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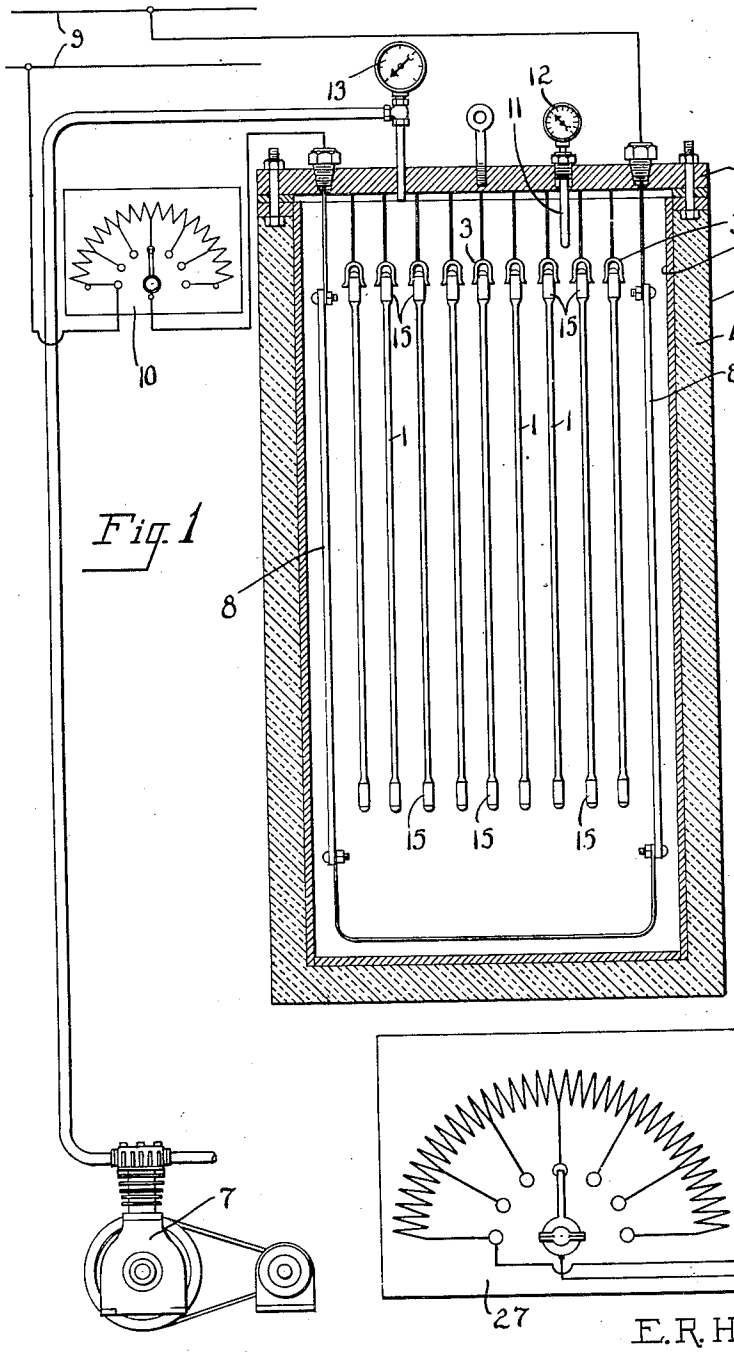


Fig. 1

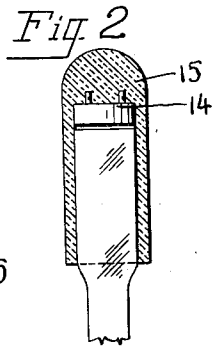


Fig. 2

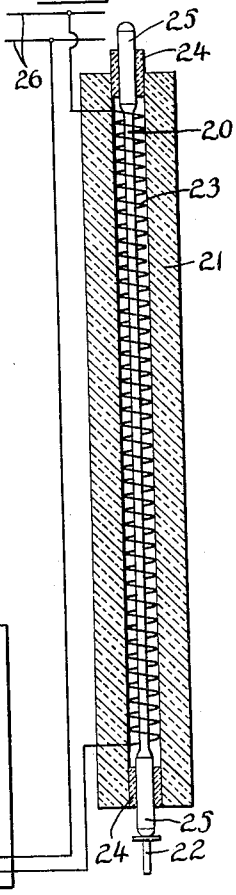


Fig. 3

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METHOD AND APPARATUS FOR RECLAIMING ULTRAVIOLET LAMPS

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12 Claims. (Cl. 176—3)

This invention relates to ultra-violet generators or lamps and more particularly to a method and apparatus for reclaiming the light or lamp tubes of such generators when their efficiency becomes impaired by the accumulation of smut or smudge on the inner side of the tube.

The most common type of ultra-violet generator consists of a gas filled composition glass tube with electric contacts mounted on each end. When the proper voltage of electricity is applied to the contact point the gas in the tube completes the circuit. The electricity passing through this gas in the presence of mercury produces ultra-violet rays. The life of such lamps at maximum efficiency is comparatively short especially when employed at refrigeration temperatures for control of mold and bacteria action since their burning gradually produces a smut or smudge on the inside of the tube which eventually screens out the ultra-violet rays materially cutting down the efficiency of the lamp and requiring its replacement with a new lamp tube.

An object of the present invention is the provision of a method and apparatus for removing the accumulated smut or smudge from the interior of the tube in a practical, economic manner whereby the tube may be reclaimed for further use without requiring its dismantling or reconstruction.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawing, showing a method and apparatus for reclaiming ultra-violet lamps of a preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawing:

Figure 1 of the drawing shows in vertical section one form of the apparatus employed for reclaiming the impaired ultra-violet lamp tubes.

Figure 2 is a detailed section of one end of tubes showing a protective cap mounted thereover.

Figure 3 is a longitudinal section through a modified form of apparatus for treating impaired tubes to restore or reclaim them.

Referring more particularly to the drawing, the ultra-violet lamp tubes indicated at 1, the efficiency of which has been impaired by the formation of a smudge or smut upon the interior of the tubes, are in the form shown in Figures 1 and 2 of the drawing detachably suspended vertically in a container 2 by means of suitable supporting members 3. The container 2 is formed of both heat and electrical current insulating material and in Figure 1 is shown as comprising a main body 4 formed of insulating material and having a lining or inner wall 5. The container 2 is sealed by a cover 6 which is detachably attached to the container to form an air tight seal to permit a vacuum to be drawn within the container by any suitable type of vacuum creating means such as a conventional vacuum pump illustrated at 7.

The suspending members 3 for the tubes 1 are preferably carried by the cover 6 as are also the electrical heating elements 8. The electrical heating elements or units 8 are shown in the drawings as strip elements, and they are connected to a line supply source of electrical energy indicated at 9 through a rheostat 10 of conventional form whereby the heat within the container or oven 2 may be regulated as required. A thermotube 11 of any conventional type which may be purchased upon the open market is also carried by the cover 6 and projects into the container or oven 2. The gauge 12 of the thermotube 11 is positioned exteriorly of the container or oven 2 so that the degree of temperature within the container may be readily determined. A gauge 13 is connected in the line between the vacuum creating apparatus 7 and the interior of the container or oven 2 so that the degree of vacuum within the container may also be readily determined and regulated.

Owing to the fact that the electrical contacts 14 are soldered under the ends of the tubes 1 it is necessary to protect these caps from the heat within the container or oven 2 and for this purpose caps 15 of asbestos or other suitable insulating material are placed over the contact-forming ends of the tubes.

In carrying out the method of reclaiming impaired ultra-violet generating lamp tubes the tubes are suspended in the container or oven 2 by the supporting members 3, and the container 2 is sealed, after which a vacuum is created within the container approximately equal to the vacuum within the tubes so as to prevent collapsing or distortion of the tubes when the glass of which they are formed is heated. Heat is created within the container 2 and applied exteriorly to the tubes 1 by the heat generating means 8 to a degree just slightly below the degree required for melting the glass of which the tubes are formed. This heat is applied for a

predetermined time period, which can be and has been arrived at by experimentation, that is, the heat is applied for a sufficient length of time to cause a dissolving or dissolution with the disappearance of the smut or smudge on the interior of the tubes.

After the smudge or smut has disappeared or been dissipated by the heat, the heat is cut off and the tubes are removed from the oven.

When the lamps are removed from the oven or container 2 they will not function properly in the standard type of fixtures receiving electric current of the voltage for which they are designed to be used so that after they have cooled, electric current of a voltage higher than that which they normally receive is passed through the lamp for a few minutes after which the voltage of the current is reduced and the lamps will then operate efficiently at electric currents of the voltages normally applied to them.

Figure 3 of the drawing shows a modified form of the apparatus employed for reclaiming the defective ultra-violet lamp tubes, and in this modified form the tube 20 to be treated is supported vertically within a container or sleeve 21 of insulating material by a suitable supporting member 22. Within the insulating container or sleeve 21 is a niachrome electrical heating element 23 in the form of a coil through which the tube 20 is inserted. Heat insulating sleeves 24 of asbestos or other suitable insulating material are placed about the electrical contact-carrying ends 25 of the tube 20 and fit tightly within the bore of the sleeve or container 21 serving the dual function of rigidly supporting the tube 1 in vertical position within the container or sleeve 21 and forming an insulating element to prevent transmission of excessive heat to the contact-forming ends 25 of the tube.

The niachrome heating elements 23 is connected by suitable electrical wiring to a line source of electrical current indicated at 26 through any approved type of rheostat 27 by means of which the degree of heat applied exteriorly to the tube 20 may be regulated.

In the employment of this modified construction of apparatus, the method of treating the tubes which have become ineffective due to the formation of the smut or smudge on the inner surface of the tubes is substantially the same as that described hereinabove relative to the use of the apparatus shown in Figures 1 and 2. The tube to be treated is inserted in the container or sleeve 21 through the coiled niachrome heating element 23 and is held securely and in vertical position within the sleeve or container 2 by means of the insulating collars 24. Heat is then applied to the exterior of the tube 20 to a degree slightly less than the heat degree required to melt the glass of which the tube is formed. This heat is maintained for a few minutes or predetermined interval of time sufficient to dissolve or dissipate the smut or smudge after which the heat is turned off and when the tube is sufficiently cooled it is withdrawn from the sleeve or container 21 and an electrical current of voltage higher than that normally used with the tube is passed therethrough for a few minutes after which the tube receives current of voltage for which it was designed and will operate in the same manner as before its efficiency was impaired by the formation of the smut or smudge on its inner surface.

While it has been hereinabove stated that heat of slightly less degree than that required to melt the glass of the tubes is applied to the tubes, it is to be understood that the degree of heat applied is not limited to such a degree, but that heat of any degree found suitable to dissolve or dissipate the smut or smudge on the interior of the tubes may be employed without departing from the spirit of the present invention.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. The method of reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use which consists in applying heat to the exterior of the lamp tube to dissolve the smudge which accumulates on the interior of the tube by its use.

2. The method of reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use which consists in applying heat at a temperature slightly below that required for melting glass to the exterior of the lamp tube to dissolve the smudge.

3. The method of reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use which consists in suspending the tube to be reclaimed vertically to prevent distortion of the tube, applying heat below a temperature required for melting glass to the exterior of the lamp tube to dissolve the smudge.

4. The method of reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use which consists in placing the tubes in a container, creating a vacuum in the container about the tubes approximately equal to the vacuum in the tubes, and dissolve the smudge by applying heat to the exterior of the tubes of sufficient thermal degree to dissolve the smudge.

5. The method of reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use which consists in applying heat to the exterior of the lamp tube to dissolve the smudge, allowing the tubes to cool, passing an electrical current of a higher voltage than the voltage required for normal use of the tubes through the tubes for a predetermined time, and then reducing the voltage to the voltage required for normal operation of the tubes.

6. The method of reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use which consists in suspending the tube to be reclaimed vertically within a container, creating a vacuum in the container about the tubes approximately equal to the vacuum in the tubes, dissolving the smudge by applying heat to the tubes at a degree below the temperature required for melting glass, allowing the tubes to cool and removing them from the container and passing an electrical current of a voltage higher than the voltage required for normal use of the tubes through the tubes for a predetermined time and then reducing the voltage to the voltage required for normal operation of the tubes.

7. In an apparatus for reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use, a container of insulating material, means for supporting a tube to be treated vertically in

said container, means within the container for applying heat to the tube being treated, and heat insulating members for protecting the contact-forming ends of the tubes from the heat applied to the tubes.

8. In an apparatus for reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use, a container of insulating material, means for supporting a tube to be treated vertically in said container, means within the container for applying heat to the tube being treated and means for creating a vacuum in said container approximately equal to the vacuum within the tube.

9. In an apparatus for reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use, a container of insulating material, means for supporting a tube to be treated vertically in said container, means within the container for applying heat to the tube being treated, means for creating a vacuum in said container approximately equal to the vacuum within the tube, and means for regulating the degree of heat applied to the tube.

10. In an apparatus for reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use, a container of insulating material, means for supporting a tube to be treated vertically in said container, means within the container for applying heat to the tube being treated, means for creating a vacuum in said container approximately equal to the vacuum within the tube, means for regulating the degree of heat applied to the tube, and heat insulating members for protecting the contact-forming ends of the tubes from the heat applied to the tubes.

11. The method of reclaiming ultraviolet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use which consists in placing the tubes in a container, creating a vacuum in the container about the tubes approximately equal to the vacuum in the tubes, applying heat to the exterior of the tubes, said heat being of sufficient thermal degree to dissolve the smudge, removing the tubes from the container, passing an electrical current of higher voltage than the voltage required for normal use in the tubes through the tubes for a predetermined time then reducing the voltage to the normal voltage required for operating the tubes.

12. The method of reclaiming ultra-violet generating lamp tubes by removing the smudge formed upon the inner surface of the tubes during use which consists in suspending the tubes to be reclaimed vertically within a container, creating a vacuum in the container about the tube approximately equal to the vacuum in the tubes and dissolving the smudge by applying heat to the exterior of the tubes, said heat being of sufficient thermal degree to dissolve the smudge and at a degree below the temperature required for melting glass.

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