United States Patent [19]

Atanasoff et al.

[11] **3,913,849**

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[54] **FLUORESCENT TUBE DIGESTER**

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[21] Appl. No.: **434,130**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 265,199, June 22, 1972, abandoned.

[52] **U.S. Cl.** **241/55;** 241/99; 241/100; 241/282.1

[51] **Int. Cl.²** **B02C 19/14**

[58] **Field of Search** 241/55, 99, 100, 277, 282.1

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Primary Examiner—Granville Y. Custer, Jr.
Assistant Examiner—Howard N. Goldberg

[57] **ABSTRACT**

A digester for fluorescent tubes is formed of a container in the shape of a funnel having an open bottom adapted to be inserted in a bunghole in a storage drum. A tube for receiving fluorescent tubes opens into the container at one side. Within the container is a rotating blade which passes beneath the opening of the tube for breaking up fluorescent tubes, and similar materials. The axis of the tube is arranged in a plane tangential with respect to the axis of rotation of the blade and the tube slopes downwardly in the direction of rotation of the blade. The blade has a rearwardly and downwardly sloping surface for creating a downward draft of air within the funnel to prevent phosphorus and mercury vapors from escaping outward. A slightly downwardly sloping shelf is arranged beneath the tube and below the plane of rotation of the blade, by a distance at least substantially equal to the length of the terminal prongs of a fluorescent tube. The leading edge of the blade forms an acute angle with the radius drawn from the axis of rotation to the top of the leading edge.

5 Claims, 6 Drawing Figures

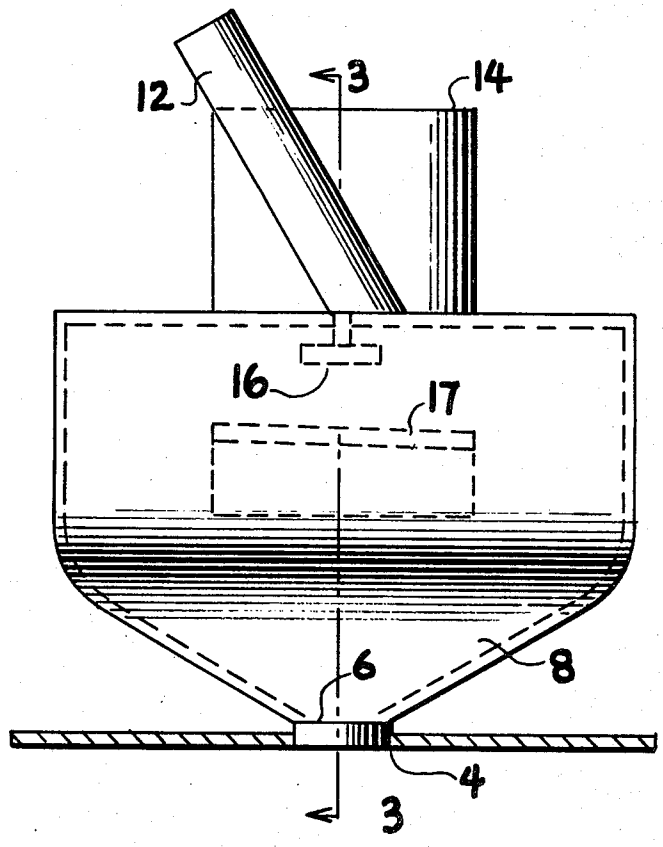


FIG. 1

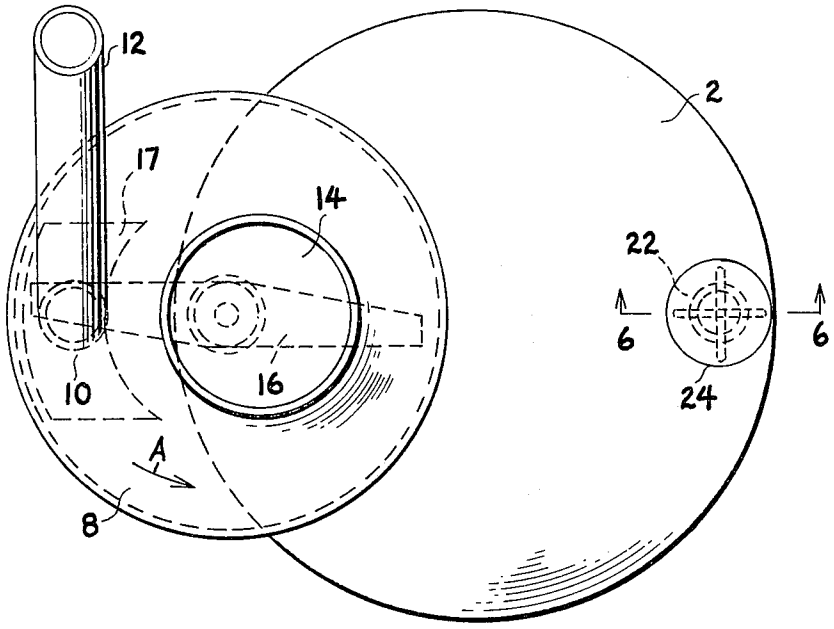


FIG. 5

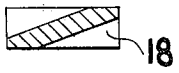


FIG. 6

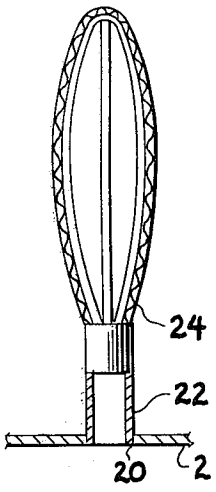


FIG. 3

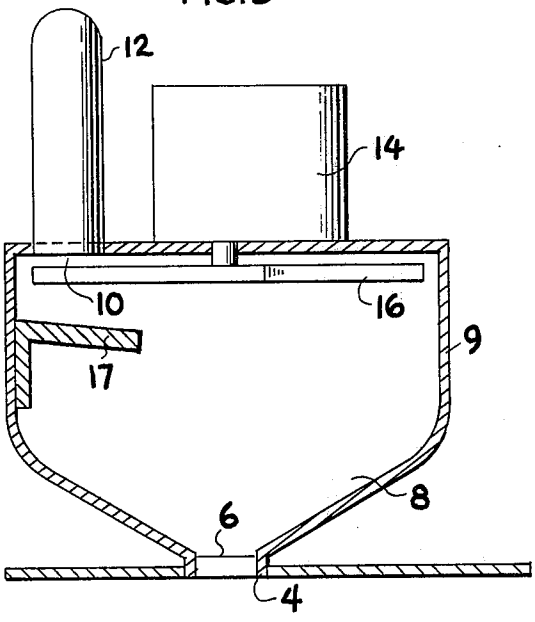


FIG. 2

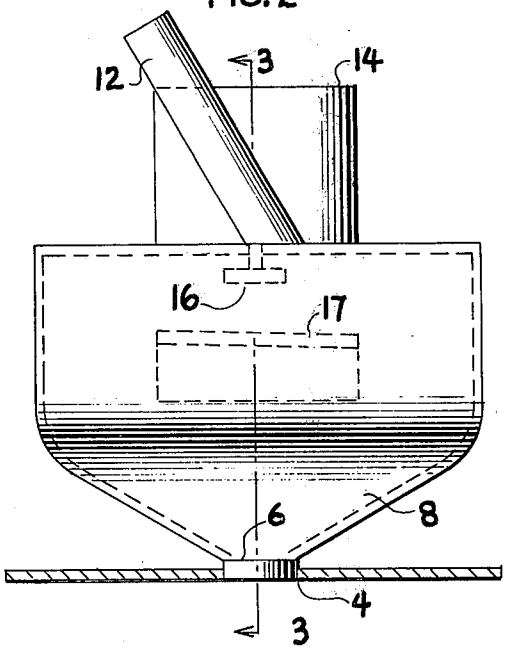
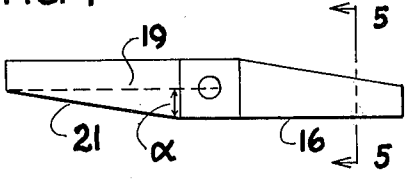


FIG. 4



FLUORESCENT TUBE DIGESTER

RELATED APPLICATIONS

This application is a continuation-in-part of application Ser. No. **265,199**, filed June **22, 1972**, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to a digester for fluorescent tubes.

2. The Prior Art

Various arrangements have been proposed for breaking up fluorescent tubes, bottles or the like into small pieces. Most of these however, particularly the arrangements therein for preventing escape of phosphorus and mercury which are present in fluorescent tubes, are complicated, requiring vacuum or pressure pumps and the like for their operation.

SUMMARY OF THE INVENTION

The present invention provides a tube digester which serves to prevent the escape of phosphorus and mercury vapors without requiring the provision of pumps for either pressure or suction.

According to the invention, a funnel-like member is provided which has an open bottom and is adapted to fit into a bunghole in a safety container. Adjacent one side of the funnel, a downwardly sloping pipe or tube enters the funnel, the internal size of this tube being substantially that of a fluorescent tube. A motor mounted on top of the funnel drives a blade, the path of which comes beneath the opening of the sloping pipe. This blade has forwardly and downwardly sloping edges which serve to create a flow of air downwardly within the funnel which serves to prevent the escape of phosphorus and mercury vapors. The forward edge of the blade forms an acute angle with the radius from the axis of rotation to the tip end of the leading edge. The diameter of the funnel is relatively small, for example not over about ten times the diameter of the inlet tube. This, in combination with the rake of the leading edge of the blade, causes the glass parts broken away by the blade to impinge against the wall of the funnel and to be shattered into smaller pieces which pack down better in the drum so that it can hold a greater amount of broken glass. Also, the unit is thus relatively small, lighter and easier to move around and to store.

The drum is also provided with an opening closed by a filter, which serves to prevent the escape of any constituents of the tube into the open air.

Spaced below the plane of rotation of the blade by a distance substantially equal to the length of the terminal prongs of a fluorescent tube is a shelf which slopes slightly inwardly to the center of the funnel. This serves to prevent the tube from slipping through too rapidly, while at the same time it permits the terminals of the tube to pass by the blade when the tube is inserted.

The whole device can be mounted on a wheeled carrier and carried from place to place, receiving the tubes as they are removed from the fixtures, so that they need not be carried to a central point and there disposed of or stored.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** is a top plan view of a tube digester according to the invention mounted on a receiving drum;

FIG. **2** is a side view of the digesting device;

FIG. **3** is a cross-section through a part of the device, substantially on the line **3—3** of FIG. **2**;

FIG. **4** is a plan view of the blade;

FIG. **5** is a cross-section on the line **5—5** of FIG. **4**;

FIG. **6** is a cross-section through the filter arrangement.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, **2** represents a drum, for example, a fifty gallon storage drum. Mounted in a bunghole opening **4** in the drum is the smaller open end portion **6** of a funnel-like member **8.** The upper end portion **9** of the funnel-like member is cylindrical. Adjacent one side of the funnel-like member is an opening **10** into which opens a downwardly sloping tube **12** of an inside diameter substantially equal to the outer diameter of the fluorescent tube to be digested. The axis of the tube **12** is located in a plane tangential to the axis of rotation of the blade and slopes downwardly in the direction of rotation of the blade.

On top of the funnel **8** is a driving arrangement **14,** which drives a blade **16** which extends at least partly beneath the opening **10** opposite the cylindrical wall **9** and which turns about an axis located substantially centrally of the upper cylindrical end portion **9.** Below this blade is a shelf **17** secured on the inner cylindrical wall of the funnel, which is spaced below the plane of rotation of blade **16** by a distance substantially equal to the length of the terminal of a fluorescent tube, this shelf sloping slightly downwardly towards the center of the container (FIG. **3**). The shelf also is preferably designed to slope slightly downwardly in the direction of rotation of the blade (FIG. **2**), so as to ensure during manufacture that, because of possible tolerances, it does not slope upwardly which might cause material to jam between the blade and the shelf.

As shown in FIGS. **4** and **5,** the blade **16** has a face **18** sloping downwardly and forwardly in the direction of its rotation. The purpose of this is that, during the rotation of the blade, there is produced a downward movement of air into the funnel and through the opening **4** into the drum, which serves to prevent the escape of phosphorus and mercury vapors resulting from the breaking up of the tube.

The downward slope of the tube in the direction of rotation makes it less likely that any pieces of glass or metal will be driven by the impact of the blade back up through the tube.

Also, as indicated in FIG. **4,** the forward edge **21** of the blade forms an acute angle α with the line **19** forming the radius from the axis of rotation to the tip of the blade, that is, the leading edge of the blade slopes backwardly with respect to the direction of rotation from the inner end to the outer end. This rake of the blade, especially the combination with the fact that the diameter of the cylindrical part **9** is relatively small, preferably about five to ten times the diameter of the tube **12,** results in throwing the parts broken off by the blade violently against the wall of the cylindrical part and shattering them into smaller pieces.

It is important that the tube be located adjacent the cylindrical wall, in order for the broken pieces of glass to impinge on the wall as soon as possible after leaving

the blade, and for that reason the axis of the tube is preferably no further from the inside of the wall than the diameter of the tube, and in any event is spaced from the wall of the cylindrical portion by a distance not greater than twice the diameter of the tube.

The drum has another opening **20,** with an upwardly protruding tube **22,** on the top of which is arranged a filter **24,** for example cloth arranged on a metal frame. This serves to prevent the escape from the drum of phosphorus and mercury.

In operation, the tubes will simply be dropped into the pipe **12** and slide downward therein until they are in the range of the rotating blade, whereupon the tube is shattered to bits and the parts drop into the drum. The backward sloping of the pipe **12,** with relation to the direction of rotation indicated by arrow A in FIG. **1,** assists the induction of the tube into the funnel and at the same time prevents the shattered material from escaping.

Furthermore, no operational safety, the tube is so designed that the induction entrance is above the operator's head.

The rotating breaking bar shatters the supported end of the lamp tube while cleaning off the rest platform **17** and gravity automatically feeds the remaining unshattered portion into the breaker bar **12.**

We claim:

1. A digester for fluorescent light bulbs comprising a container having a cover, a cylindrical portion and a tube extending upwardly from the cover and opening therethrough into the cylindrical portion of the container at a point adjacent the wall of the container, a blade mounted to rotate about a vertical axis within the container substantially centrally thereof and slightly below the cover in a circular path at least partly overlapping the tube opening, said blade including means to produce a downward current of air within the container towards the outlet whereby to prevent upward movement of materials disintegrated by the blade, the axis of the tube lying in a plane tangential to the axis of rotation of the blade and sloping downwardly in the direction of the axis of rotation, the axis of the tube being spaced from the wall of the cylindrical portion by a distance not greater than twice the diameter of the tube, the leading edge of the blade sloping backwardly with respect to the direction of rotation from the inner end to the outer end.

2. In a digester as claimed in claim **1,** a shelf within and adjacent the side wall of the container below the tube opening and spaced below the plane of rotation of the blade.

3. In a digester as claimed in claim **2,** said shelf sloping downwardly away from said wall.

4. In a digester as claimed in claim **1,** said current-producing means including downwardly and rearwardly sloping surfaces on the blade.

5. In a digester as claimed in claim **1,** the diameter of the cylindrical portion being from about five to ten times the diameter of the tube.

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