

[54] APPARATUS FOR PHOTOCATHODE PROCESSING

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[51] Int. Cl. C23c 13/12
[58] Field of Search 118/48-49.5

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[57] ABSTRACT

An evacuated coating chamber includes a substrate support and a centrally disposed heater means. A plurality of crucible means are located in separate chambers which are each radially disposed with respect to the coating chamber and having each a valve means operatively associated therewith. Means are adapted to sequentially translate the crucibles between said separate chambers and an operative position is proximity to said heater.

4 Claims, 2 Drawing Figures

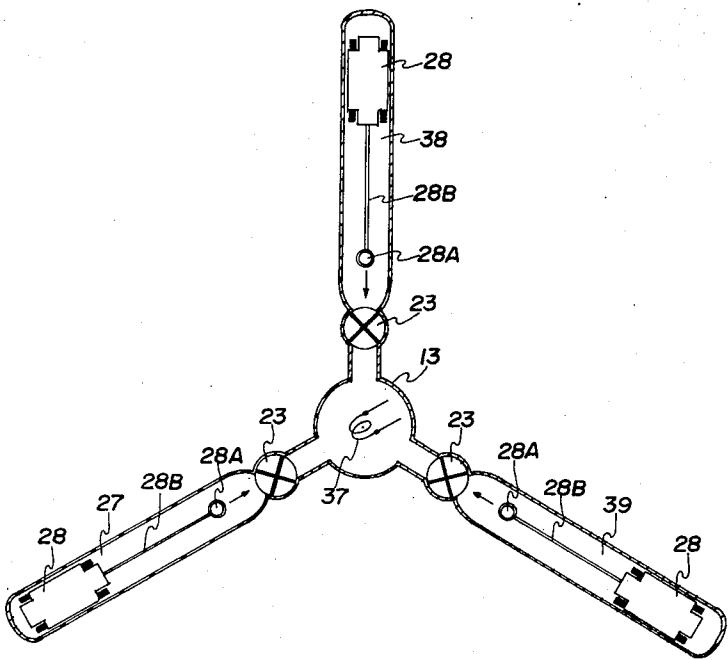


Fig. 1

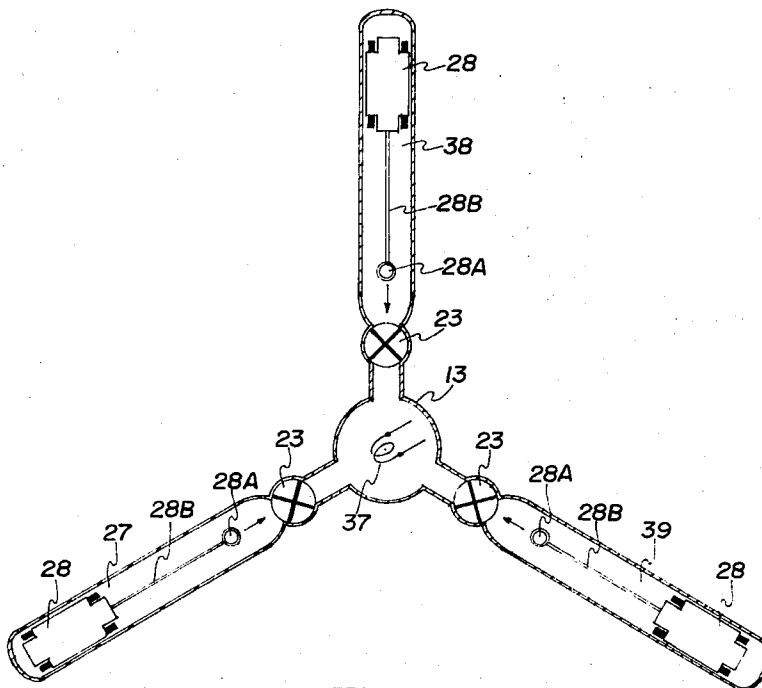
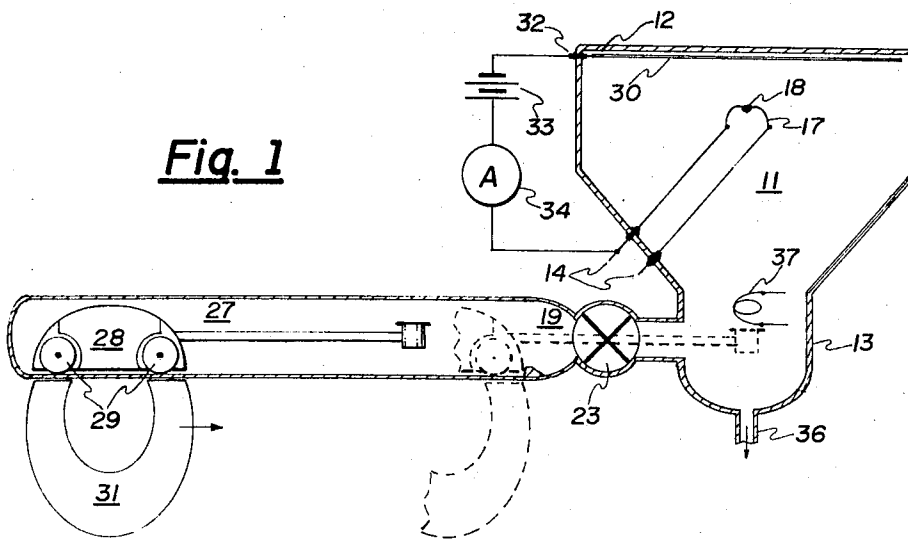


Fig. 2

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APPARATUS FOR PHOTOCATHODE PROCESSING

BRIEF DESCRIPTION OF THE INVENTION

The present invention relates to apparatus for photocathode processing and more particularly to apparatus for photocathode processing utilizing pure alkali metals with a single heating means.

This application represents an improvement in the apparatus disclosed in my co-pending application for a Photocathode Processing Method, Ser. No. 760,468, filed Sept. 18, 1968, and now abandoned. As such, the instant application is directed to a new and improved apparatus for achieving substantially the same results as discussed in the above-referenced application. While the apparatus disclosed and claimed in the above-referenced application has achieved excellent results in photocathode processing, it has been found that a more efficient method can be employed and the present application is directed to this end.

According to the invention, a plurality of co-planar and radially spaced channels are in communication with the photocathode chamber, each of said channels being coupled through a valve to the chamber. In each of the channels, a magnetic slug is slidably disposed having attached thereto an elongated rod carrying a cup toward the photocathode chamber. The cup will contain the specific alkali metal in pure form with which it is desired to coat the cathode. Antimony is supplied in any conventional manner, such as that disclosed in my co-pending application referenced above. When it is desired to coat the cathode with a particular alkali metal in a particular branch, the valve is opened and the magnetic slug moved toward the photocathode chamber as by a slidably mounted permanent magnet. When the cup containing the alkali metal is directly beneath the cathode, a tungsten heater is turned on which is preferably disposed above the cup for a more efficient evaporation of the surface portions of the alkali metal. This will cause the alkali metal to evaporate and deposit a coating on the cathode. When a sufficient coating has been received from a given alkali metal, the slug is then pulled back magnetically into the branch and the valve closed. At this time, if a second or third alkali metal is desired, the valve in the desired branch may be opened and through an identical apparatus, a cup containing the desired alkali metal is magnetically pushed out under the heater for evaporation and deposition on the cathode. Hence, a method and apparatus for the coating of a plurality of alkali metals on a cathode has been achieved without the necessity of a plurality of heaters and a much more efficient placing of the pure alkali metal during the coating process.

An object of the present invention is the provision of an improved photocathode processing apparatus which is extremely efficient in the utilization of alkali vapors.

Another object of the present invention is the provision of an improved apparatus of producing photoelectric cathodes utilizing alkali metals in their pure form.

A further object is the provision of an improved apparatus for the processing of photocathodes which is extremely simple, inexpensive and reliable.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like

reference numerals designate like parts throughout the figures thereof and wherein:

FIG. 1 is a schematic representation of the preferred embodiment of the present invention showing one branch line; and

FIG. 2 is a schematic representation of a portion of the present invention showing three branch lines.

DETAILED DESCRIPTION OF THE DRAWING

Referring to FIG. 1, an evacuated envelope shown generally at 11 has a flat cathode portion 12 and a neck portion 13. A pair of leads 14 is sealed through envelope 11 and is connected to a filament 17 which is attached to an antimony pellet 18. Side branch 19 is in contact with neck portion 13 through valve 23. Side branch 19 terminates in an evacuated chamber 27 in which a magnetic slug 28 having wheels 29 is slidably received. A permanent magnet 31 is slidably coupled to branch 27 in proximity with slug 28.

Photocathode film 30 is in electrical contact with terminal 32 which is connected to the negative side of battery 33, the positive side of which passes through micrometer 34 to one of the leads 14. Exhaust tubulation 36 is coupled to an exhaust manifold and pumping system (not shown). Tungsten heater 37 is disposed directly beneath photocathode 12 in the center of neck portion 13.

Referring to FIG. 2, neck portion 13 is shown in contact with channels 27, 38 and 39, each of which slidably receives a magnetic slug 28 carrying cups 28a by rods 28b and each coupled to neck portion 13 through a valve 23. Heater 37 is shown disposed in the center of neck portion 13.

OPERATION

Referring back to FIGS. 1 and 2, it can be seen that the same alkali metals can be applied as in the above-referenced co-pending application, e.g., the cups 28a can contain pure potassium sodium and cesium for the desired cathode coating and the heating methods and the meter and monitoring method would be identical to that disclosed in the above-referenced co-pending application. The improvement and the gist of the instant invention lies in the utilization of slugs 28 and cups 28a in cooperation with central heater 37, which can be a tungsten heater, for example. Here, instead of heating the entire branch line, one stainless steel slug 28 is merely pulled by one magnet 31 until its associated cup 28a is directly beneath central heater 37. A current is then applied to heater 37 and the alkali metal evaporated until a sufficient coating 30 is applied to cathode 12, as indicated by the proper peaking of meter 34. This method results in an extremely efficient utilization of the alkali metals since being heated directly in proximity with the cathode, much more of the evaporated metals will reach the cathode resulting in a saving of both material and time.

Because of the more direct proximity of the evaporating alkali metals to the cathode, a much more precise control is also effected.

It should be understood that this invention is not limited to the specific materials covered, but contemplates the utilization of any one or more of the alkali metals utilized in conjunction with antimony which will be dictated by the specifications and parameters of usage.

The invention claimed is:

1. A photocathode processing apparatus comprising:
an evacuated chamber containing a cathode to be processed;
an electric heater centrally disposed in said evacuated chamber;
a plurality of channels extending substantially radially from said evacuated chamber;
a cup containing a pure alkali metal slidably disposed in each of said channels; and
means for sequentially placing said cups in direct proximity to said heater whereby to evaporate said alkali metal and to coat said photocathode.

2. The photocathode processing apparatus of claim 1 wherein:

said means for sequentially placing said cups in proximity to said heater comprises a movable magnet.

3. The photocathode processing apparatus of claim 2 wherein:

each of said cups is coupled to a magnetic slug for cooperation with said magnet.

4. The photocathode processing apparatus of claim 1 wherein:

said plurality of channels are co-planar.

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