May 1, 1934. M. PRESSLER 1,956,590

PHOTO-ELECTRIC TUBE

Filed April 18, 1931

Fig. 1

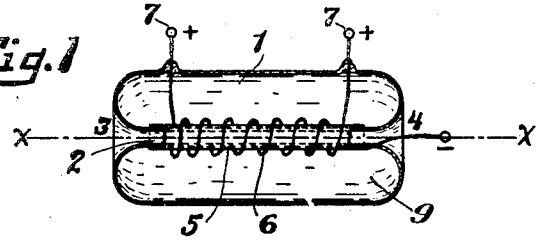


Fig. 2 a

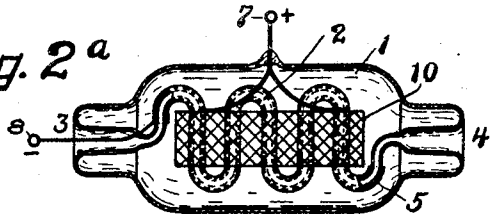


Fig. 2 b

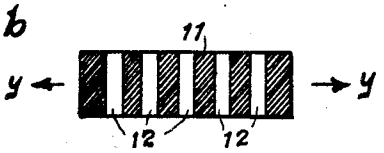


Fig. 3

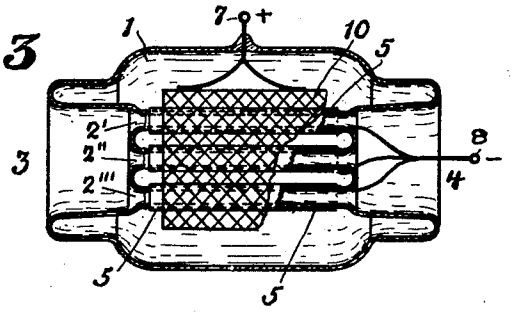
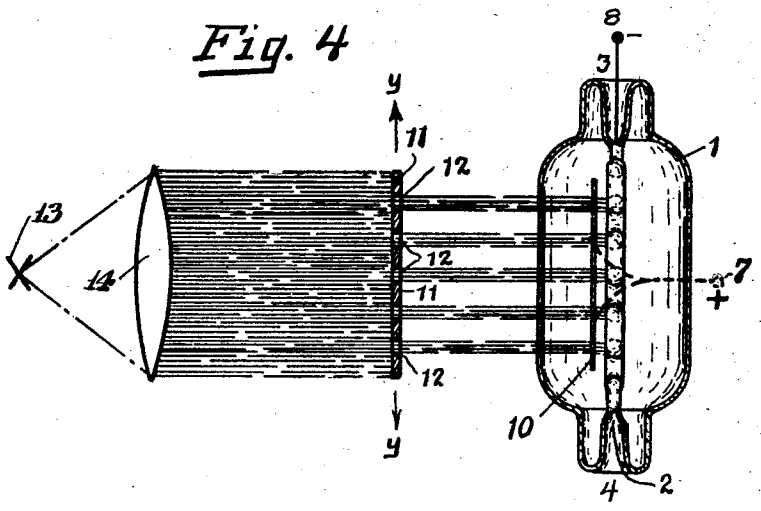


Fig. 4



INVENTOR
Max Pressler

BY Samuel Ostrolenk

ATTORNEY

Patented May 1, 1934 1,956,590

UNITED STATES PATENT OFFICE

1,956,590

PHOTO-ELECTRIC TUBE

Max Pressler, Leipzig, Germany, assignor of fifty percent to Radio Patents Corporation, New York, N. Y., a corporation of New York

Application April 18, 1931, Serial No. 531,099
In Germany April 26, 1930

3 Claims. (Cl. 250—27.5)

This invention relates to a new photoelectric tube and method for manufacturing the same, and more particularly to tubes of the vacuum or gaseous type.

This type of photoelectric tube, as is well known, generally consists of a vessel, preferably of glass either completely evacuated or filled with a gas of proper nature and pressure, and including a cathode electrode with a light sensitive surface and an anode electrode to cooperate therewith.

According to the usual method of manufacturing tubes of this type, the photoelectric substance, such as potassium, caesium, etc., is brought into the tube and evaporated by the application of heat from the outside. Afterwards the tube is allowed to cool down whereupon the photoelectric material produces a deposit on the wall of the vessel.

One of the main difficulties of this process consists in the limitation of the deposit or precipitation of the photoelectric material to definite portions within the tube, as it is necessary to leave the remaining parts free to allow ready passage to the operating control light rays.

It has already been proposed in the co-pending patent application Serial No. 324,107, filed December 6, 1928, to provide a hollow body within the tube or vessel which may be filled from the outside during the manufacturing process with a cold liquid, so that during the heating period of the tube, the deposit will be limited to that part of the tube being cooled during the process.

The present invention is a further improvement of this process and has for its object to provide means for depositing a photoelectric surface of any desired configuration to be used for any specific purpose.

A more specific object of the invention is a photoelectric tube structure in which the photoelectric material is deposited on the outside wall of a hollow body, preferably of tubular form which forms part of an inside wall of the tube and which may have any desired shape and is readily accessible at both of its ends for passing a cooling medium during the depositing operation.

A more specific object of the invention is to provide means whereby the photoelectric deposit may have the shape of a grating with light-sensitive strips arranged at definite distances from each other.

These and further objects of the invention will become more apparent from the following description taken with reference to the accompanying drawing, which illustrates, by way of example, practical embodiments of the invention. The description, however, should be regarded as being illustrative only of the broader principle and scope of the invention, as might be obvious, and as set forth in the appended claims.

Figure 1 illustrates a photoelectric tube of simple construction embodying the principle of the invention.

Figure 2*a* is a structure similar to Figure 1, in which the photoelectric surface has the form of parallel strips at definite distance from each other.

Figure 2*b* illustrates schematically a shutter to be used in connection with the tube structure of Figure 2*a*.

Figure 3 shows another way of accomplishing the object according to Figure 2*a*.

Figure 4 is a schematic showing of the photo tube and shutter in a light system.

Similar reference characters denote similar parts throughout the different views of the drawing.

The invention contemplates broadly a structure in which one or more hollow bodies, preferably in the form of thin tubes, are arranged within the tube itself, whereby their outside wall forms a part of the inside wall of the tubes in such a manner that there are at least two openings leading to the outside so as to allow the passage of a cooling medium such as a liquid or gas, during the depositing operation. In this way the precipitation of the light-sensitive material is confined to the outside surface of the hollow body within the tube. This latter may be given any shape or configuration for obtaining any specific object, as will be described in more detail.

Furthermore, this new expedient according to the invention makes it possible to use comparatively thin members which may be bent in any desired way to assume a desired figure or shape and covered with the light-sensitive material. In this respect, the invention presents a meritorious and important advance of the art, in that it makes it possible to adapt the photoelectric tube or rather the shape or configuration of the light-sensitive deposit to various optical problems of specific nature.

Referring to Figure 1, this illustrates a simple photoelectric tube in cross-section, embodying the invention. The tube body is shown at 1 and constitutes a torus or body of revolution, which is obtained by rotating the boundary surface des-

ignated by 9 around a central axis x—x, in such a manner that a central tubular body 2 is obtained with outside openings 3 and 4 through which, during the depositing process, a cooling medium, such as liquid or gas, may be passed.

In this manner, the precipitation of the photoelectric substance is confined to the outer surface of the body 2 as illustrated at 5. Cooperating with the photoelectric cathode 5, there is a spirally wound anode wire 6 connected to outside terminal posts 7. The spiral shape of the anode 6 allows a ready passage of the incident light rays impinging upon the photoelectric surface 5. The photoelectric surface may be connected to an outside terminal post in any well known manner.

Referring to Figure 2*a*, this shows a structure similar to Figure 1, with the difference that the body 2 has been extended and arranged in a winding shape with parallel portions at definite distances from each other, so that in connection with a rectangular shaped net-like anode 10, the practical equivalent of a light-sensitive surface consisting of light-sensitive parallel strips, is obtained. This structure is useful in connection with many problems; for instance, as shown in Figure 2*b*, which diagrammatically illustrates a control shutter for intercepting the beam of light acting upon the tube. This type of shutter 11, as shown in Figures 2*b* and 4, is provided with parallel openings or slits 12 of definite length and distance corresponding to the photoelectric surface strips of the tube according to Figure 2*a*. During the open position of the shutter, as is readily understood, the slits 12 are in a position to register with the parallel portions of the tube 2 or the photoelectric surface strips in such a manner that with comparatively slight movement of the shutter in either direction indicated by the arrows, the entire resultant light-sensitive surface is darkened by the solid parts of the shutter.

In other words, by using this type of photoelectric tube and cooperating shutter, it is possible to release a maximum of photoelectric current with a minimum of mechanical movement. Figure 4 illustrates a top view of a photoelectric tube and shutter combination of this type corresponding otherwise to Figures 2*a* and 2*b*. A source of light 13 and lens 14 are shown in the usual manner.

A further application of a tube of the type according to Figure 2*a* which, in other words, is a kind of a light-sensitive grating, consists in its use in connection with a spectrometer arrangement either of the prism spectrometer or grating spectrometer type. As is well known, the spectrums produced by such devices contain certain pronounced bright lines parallel to each other at a definite distance and being characteristic of the nature of the chemical substance under investigation.

By placing the parallel portions of the body 2 according to Figure 2*a* at distances corresponding to the distance of the characteristic lines of a certain spectrum, this type of photoelectric tube may be readily used for indicating or controlling purposes. It may serve, for instance, as an indicating or control device in metallurgical processes to ascertain that a certain stage in the process is reached, this stage being characterized by the development of a special substance or gas, and accordingly a specific position of the bright lines in the spectrum of such gas. By providing in the latter example a photoelectric tube in connection with the usual optical equipment such as lenses, etc., with the parallel sensitive strips or parallel portions of body 2, according to Figure 2*b*, at corresponding distances to the bright lines in the spectrum of the specific gas to be indicated, it is readily seen that with the appearance of the said substance, the light-sensitive surface of the tube becomes illuminated, producing a discharge current in the tube in the known manner which can be used for producing a required control or indication.

Figure 3 shows a further tube structure for accomplishing a similar object to Figure 2*a* in a somewhat different manner. In this tube, a plurality of thin hollow bodies 2', 2'', 2''', as shown in the example, are arranged instead of a single body 2, as per Figure 1, so as to present a number of passages for the cooling medium. The tubes may again be arranged parallel to each other, so that the effect obtained will be equivalent to Figure 2*a*, as is readily understood.

What I claim is:

1. A photoelectric tube comprising a vessel of insulating material; a tube of insulating material therein having wound parallel portions at definite distances from each other, said tube being integral with said vessel and having its outside surface constitute a part of the inside surface of said vessel; an anode, and a light sensitive deposit on the outside of said glass tube.

2. A photoelectric tube comprising a glass vessel; a glass tube therein having wound parallel portions at definite distances from each other, said glass tube being integral with said vessel and having its ends open to the outside of said vessel for passing a cooling medium therethrough and having its outside surface constitute a part of the inside surface of said vessel; a netlike anode in front and parallel to said wound glass tube and a light sensitive deposit on the outside of said glass tube.

3. A photoelectric tube comprising a vessel of insulating material; a tube of insulating material having wound portions of a predetermined configuration, said tube being mounted within said vessel and having its outer surface constitute a part of the inner surface of said vessel; an anode within said vessel; and a light sensitive deposit on the outer surface of said tube.

MAX PRESSLER.