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PHOTOCELL

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Fig. 1

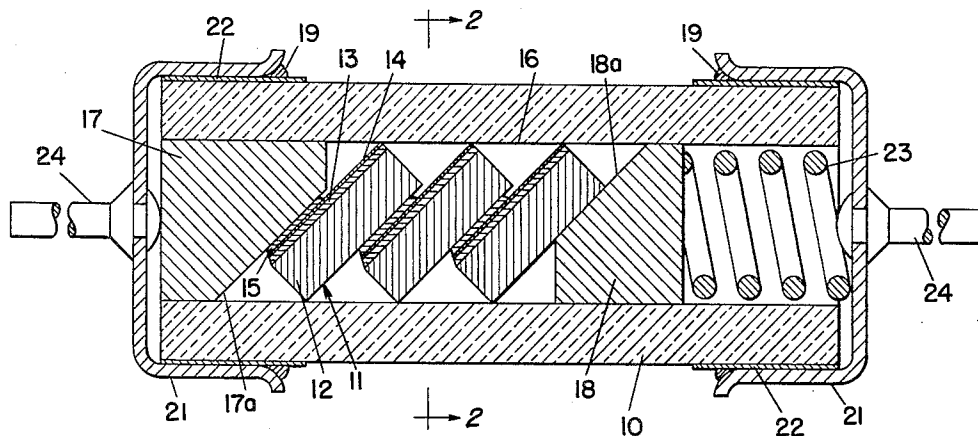


Fig. 2

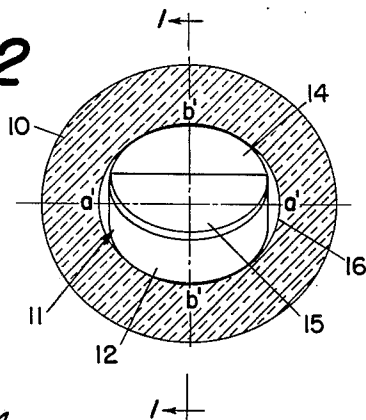


Fig. 3

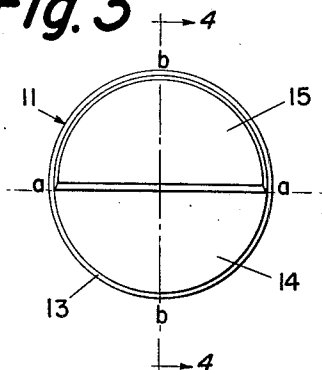
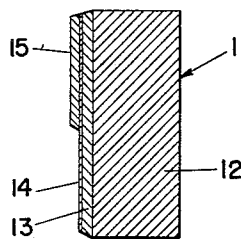


Fig. 4



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PHOTOCELL

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6 Claims. (Cl. 136—89)

This invention relates to a light sensitive device of the photocell type and more particularly to an assembly of a plurality of the photocells in series.

Heretofore, photocells used to supply high impedance devices had low voltage outputs with resulting disadvantages. It has been proposed to use small cells in series to increase voltage output, but this has not been successful because of the difficulty of assembling the small cells into satisfactory units.

It is therefore an object of this invention to provide conveniently an assembly of small photocells which will furnish higher voltages than furnished by individual cell units. Another object is to provide a series assembly of photocells which can be easily assembled with a minimum expenditure of labor and materials.

These objects are obtained by assembling a plurality of photocells in a transparent tube and by shaping the cells with respect to the bore of the tube so that the cells must be tilted at an acute angle with respect to the longitudinal axis of the tube when inserted therein. They are also in partial overlapping relation thereby exposing a portion of the light sensitive surface of each of the cells to light.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown one of the various possible embodiments of this invention:

Figure 1 is a sectional view of the assembly taken along the line 1—1 of Figure 2;

Figure 2 is a transverse sectional view of the assembly taken along the line 2—2 of Figure 1;

Figure 3 is a front view of one of the photocells of the assembly; and

Figure 4 is a sectional view of the photocell taken along the line 4—4 of Figure 3.

Similar reference characters refer to similar parts throughout the several views of the drawing.

Referring to Figure 1 the light sensitive device comprises a tube 10 of a dielectric material capable of allowing light to pass therethrough such as glass or some other translucent material. Within the tube 10 is a plurality of photocells 11, the number thereof determining the voltage output desired. Each cell is identical and as seen in Figures 3 and 4, comprises a base 12 of conductive material such as aluminum, a semi-conducting coating 13, e. g. light sensitive material such as selenium, on one surface thereof, a thin transparent layer 14 of a conducting metal, and a layer 15 of a conducting material such as Woods metal partially covering the transparent layer 14. The base 12 and the outer layer 15 act as electrodes in the usual manner.

The cells 11 are inserted in the tube 10 tilted at an angle to the longitudinal axis thereof as shown in Figure 1 with each cell 11 contacting the surface of the bore of tube 10 at at least one point on each surface of the

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cell which points are on the diagonal of the transverse cross-section of the cell. This allows the outer electrode layer 15 of each cell to contact the base of the adjacent cell thereby connecting the cells in series and leaving the uncovered portions of the light sensitive coating 13 exposed to the light. For ease of assembly and maintenance of desired relationship in the tube each cell has a transverse dimension $a-a'$ (Figure 3) similar to the transverse dimension $a'-a'$ (Figure 2) of the bore. The cell dimension $b-b$ (Figure 3) normal to the dimension $a-a$ is larger than the corresponding dimension $b'-b'$ of the bore as seen in Figure 2. In Figure 2, the tube has an elliptical bore 16 and the cells are circular to provide these relative dimensions although other shapes may be used. Obviously, the shapes may be reversed, the bore of the tube circular and the cells elliptical, or the bore and the cells may be square or rectangular.

In order to maintain the cells 11 in the desired angular relationship a pair of spacer members 17 and 18 are provided, one at each end of the cells. Thus, the spacer member 17 has a tapered surface 17a which faces the cells and contacts the outer electrode layer 15 of the adjacent cell 11. The spacer member 18 also has a similar surface 18a facing the cells and tapered to contact the base 12 of the adjacent cell 11. The ends of tube 10 are covered by cup-shaped metal caps 21 sealed in position in any convenient manner. For example, the ends of the tube may be silvered as at 22 and the caps soldered thereto as at 19. A helical spring 23 is compressed against spacer member 18 by the adjacent cap 21 to press the cells together for good electrical contact and a lead member 24 is riveted to each cap 21.

To assemble the parts, it is merely necessary to insert the spacer members and photocells in the tube in the correct order. The cells will automatically assume the desired angular relationship since, as previously described, the shape of the cells and tube necessarily tilts the cells against the tapered surfaces on the spacer members. The spring is then inserted and the caps are fitted over the ends of the tube and soldered in place, thereby compressing the spring and compressing the cells tightly.

It will thus be seen that there has been provided a convenient structure for holding a plurality of photocells in assembled relationship so that they will not only be connected in series conveniently but exposed to the light for maximum efficiency in operation. Not only is the resulting structure simple, durable and practical, but it results in a method of assembly responsible for marked economy in manufacture. Accordingly, I have provided structure for assembling a plurality of photocells in series economically to achieve maximum output results.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment set forth, or shown in the accompanying drawings, it is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A series photocell construction comprising the combination of a tube of a material capable of allowing light to pass therethrough, a plurality of photocells in the tube, each cell having a light sensitive surface and being of such size and shape with respect to the bore of the tube that the cell is tilted at an angle with respect to the longitudinal axis of the tube and contacts the surface of the bore of the tube at least one point on the periphery of each surface of the cell which points are on the diagonal of the transverse cross-section of the cell, each cell also overlapping and contacting the adjacent cells leaving a portion of the light sensitive surface exposed directly to the light passing through the wall of the tube and providing a series connection between the cells, and means in said tube for holding the cells in said tilted relation.

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2. A series photocell construction comprising the combination of a translucent tube, a plurality of photocells in the tube, each cell being tilted at an angle with respect to the longitudinal axis of the tube so as to contact the surface of the bore of the tube at at least one point on the periphery of each surface of the cell which points are on the diagonal of the transverse cross-section of the cell and in partial overlapping relation with and contacting the adjacent cells so that a portion of the surface of each cell is exposed directly to the light passing through the wall of the tube and the cells are connected in series, means in said tube for holding the cells in said tilted relation, and means forming connections with the cells at the opposite end of the tube.

3. The combination as set forth in claim 2 in which each photocell comprises a base plate of an electrically conductive material, a layer of a semi-conducting light sensitive material covering one surface of the base plates, a thin transparent layer of a conducting metal covering the layer of the light sensitive material, and a layer of an electrically conducting electrode material partially covering the layer of the transparent metal, the uncovered portion of the transparent metal layer being the exposed portion of the cell and the layer of the electrode material being the portion of the cell overlapping and contacting the base plate of the adjacent cell.

4. A series photocell construction comprising the combination of a translucent tube, a plurality of photocells in the tube, each cell having one transverse dimension similar to a transverse dimension of the bore of the tube but having a dimension substantially normal thereto larger than the corresponding dimension of the bore so that each cell is tilted at an angle with respect to the longitudinal axis of the tube, contacts the surface of the bore of the tube at at least one point on the periphery of each surface of the cell which points are on the diagonal of the transverse cross-section of the cell and partially overlap the adjacent cell leaving a portion of each cell exposed directly to the light passing through the wall of the tube and means in the tube holding the cells in said tilted relation.

5. A series photocell construction comprising the combination of a translucent tube, a plurality of photocells in the tube, each cell being tilted at an angle with respect to the longitudinal axis of the tube so as to contact the surface of the bore of the tube at at least one point on the periphery of each surface of the cell which points

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are on the diagonal of the transverse cross-section of the cell, each cell also being in partial overlapping relation with the adjacent cell so that a portion of the surface of each cell is exposed directly to the light passing through the wall of the tube, a metal spacer member in the tube at each end of the series of cells the surfaces of the spacer members facing the cells slanting to partially overlap the adjacent cell, resilient means holding the spacer members and the cells in contact with each other so that the cells are connected in series, and connectors at the ends of the tube connected to each spacer.

6. A series photocell construction comprising the combination of a translucent tube, a plurality of photocells in the tube, each cell being tilted at an angle with respect to the longitudinal axis of the tube and contacting the surface of the bore of the tube at at least one point on the periphery of each surface of the cell which points are on the diagonal of the transverse cross-section of the cell, each cell also in partial overlapping relation with the adjacent cells so that a portion of the surface of each cell is exposed directly to the light passing through the wall of the tube, a metal spacer member in the tube at each end of the series of cells, the surfaces of the spacer members facing the cells slanting to partially overlap the adjacent cell, a cap attached to and extending across each end of the tube, a spring compressed between one cap and the adjacent spacer member to hold the spacer members and the cells in contact with each other so that the cells are connected in series, and means forming connections with each of said spacer members.

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