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[54] **SOLAR CELL PACKAGING ASSEMBLY FOR SELF-CONTAINED LIGHT**

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[73] Assignee: **Siemens Solar Industries, L.P.**, Camarillo, Calif.

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[51] **Int. Cl.**[5] **H01L 31/048**

[52] **U.S. Cl.** **136/251**; 136/259; 136/291; 362/183

[58] **Field of Search** 136/251, 259, 291; 362/183

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,057,439	11/1977	Lindmayer	136/251
4,241,493	12/1980	Andrulitis et al.	437/2
4,280,853	7/1981	Palazzetti et al.	136/246
4,321,417	3/1982	Kurth et al.	136/246

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[57] **ABSTRACT**

A self-contained photovoltaic powered light which is a stand alone unit. The solar cells which power the light are assembled and maintained within the top, or upper, portion of the self-contained unit. The solar cells are encapsulated within a resiliently deformable material to provide for contraction and expansion of the solar cells while at the same time providing protection from the elements for the assembly.

5 Claims, 3 Drawing Sheets

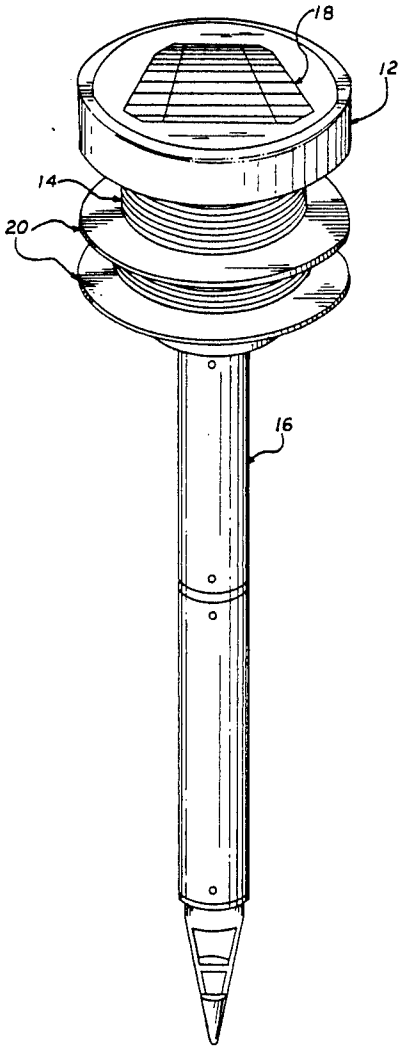
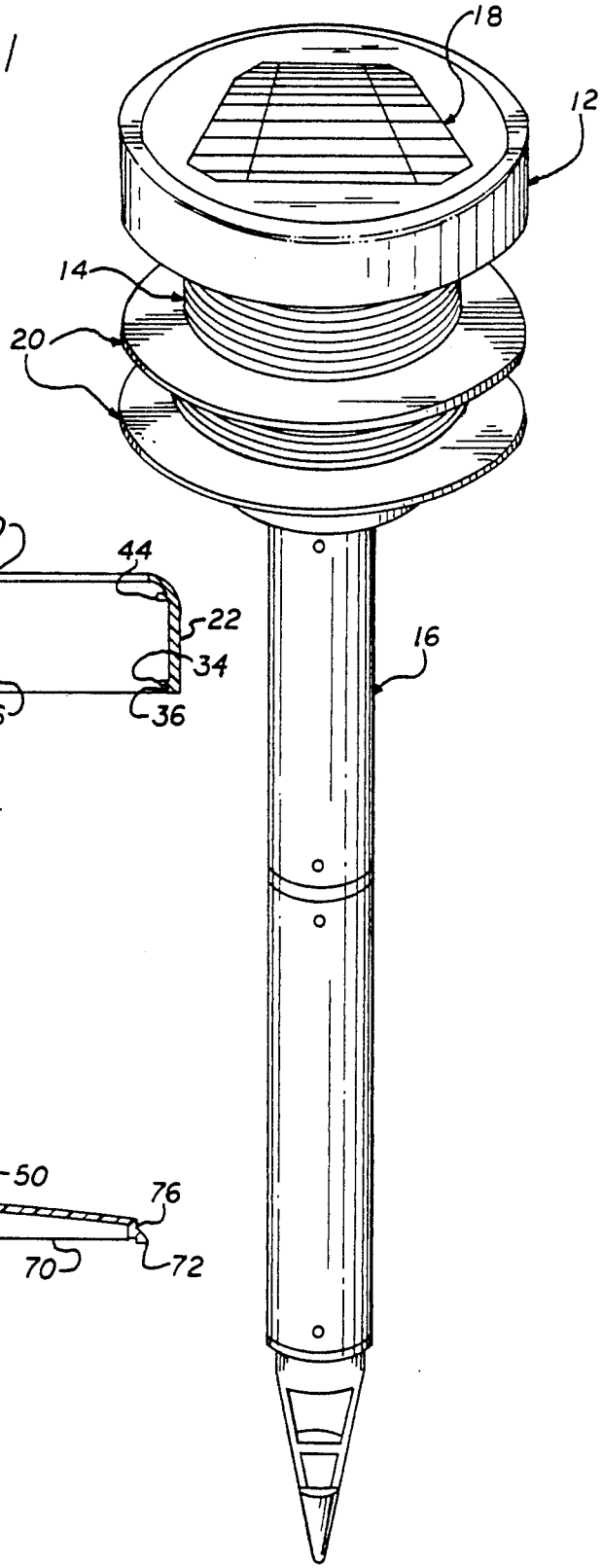


FIG. 1



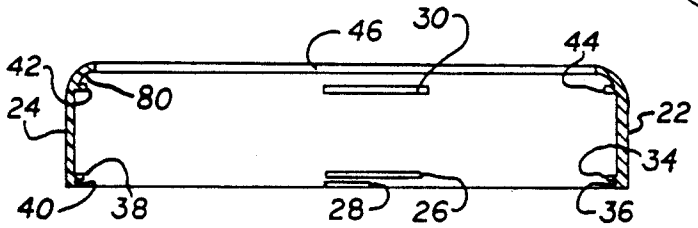


FIG. 3

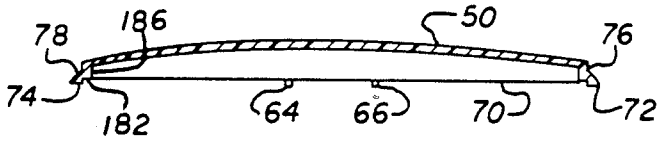
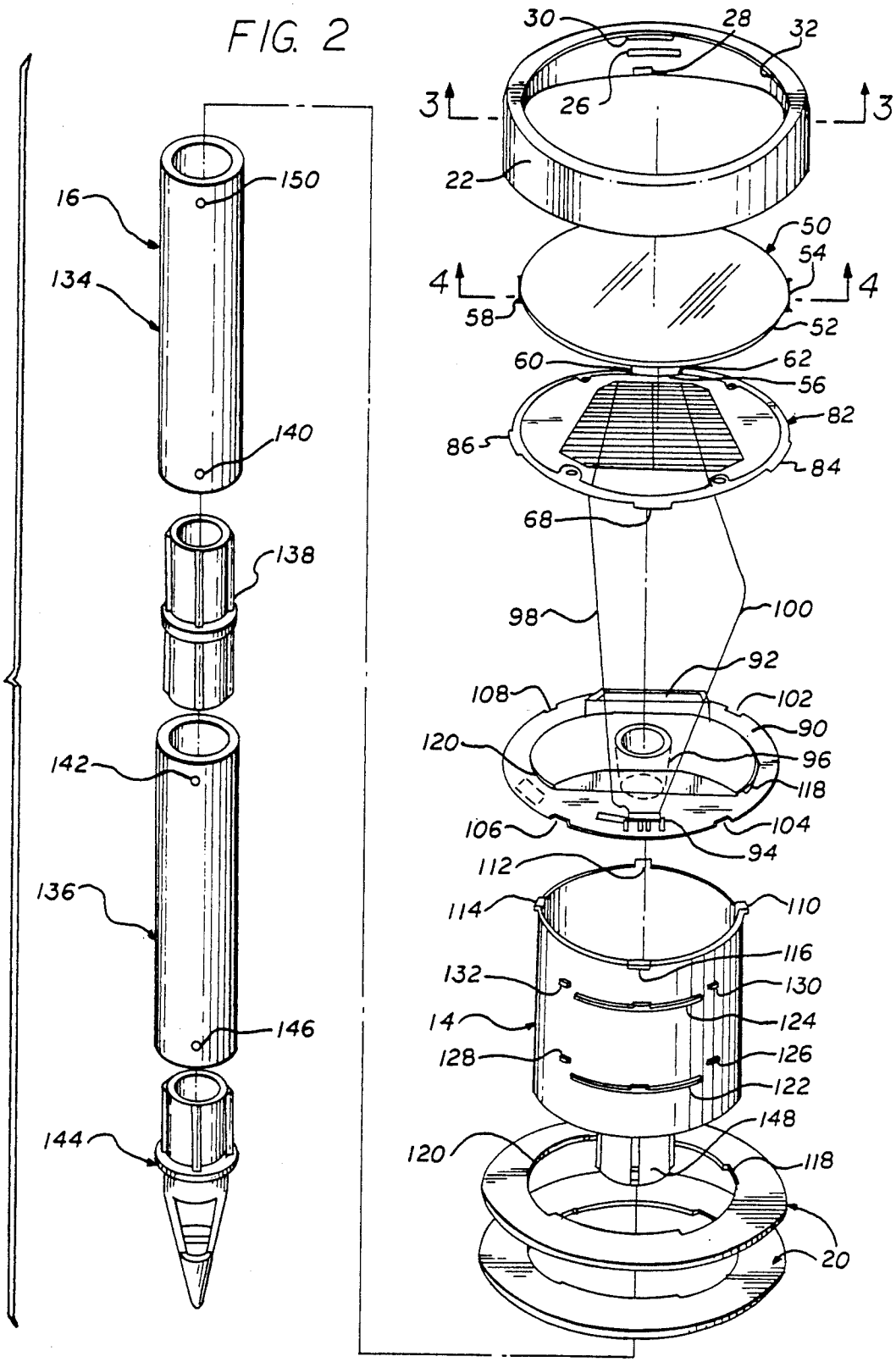


FIG. 4

FIG. 2



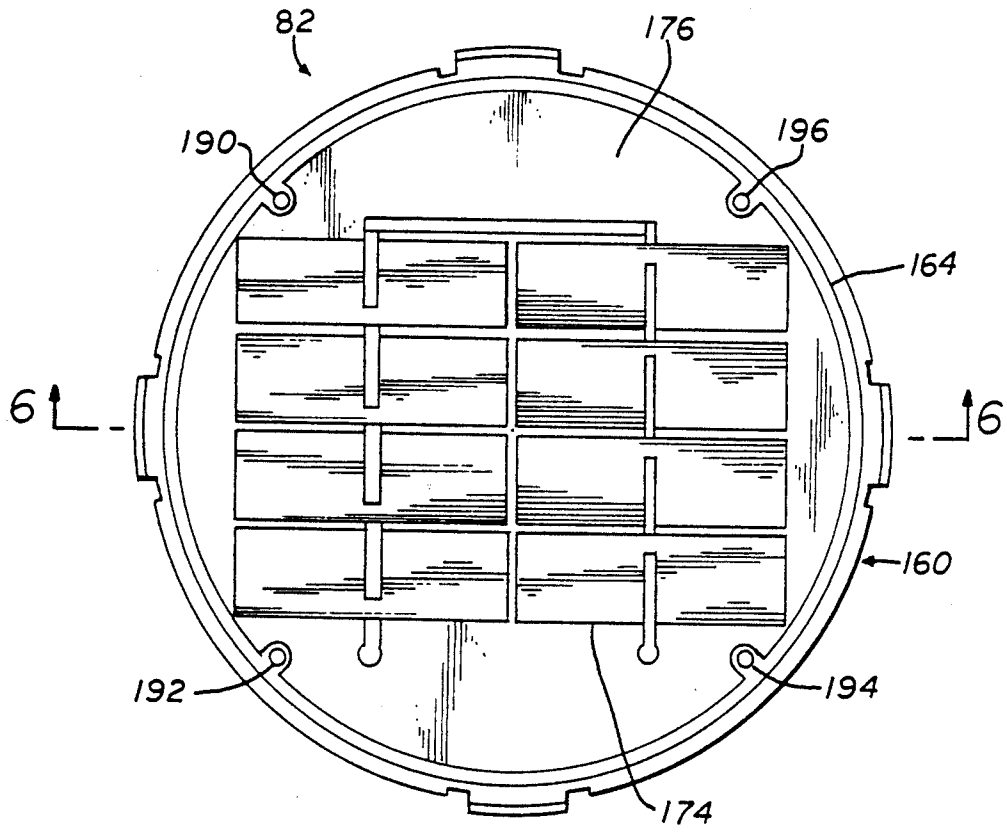


FIG. 5

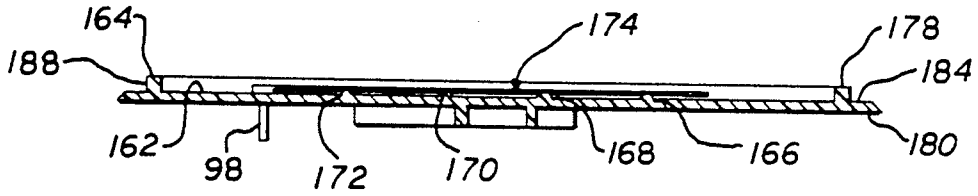


FIG. 6

SOLAR CELL PACKAGING ASSEMBLY FOR SELF-CONTAINED LIGHT

BACKGROUND OF THE INVENTION

This invention relates generally to lighting devices and more particularly to a self-contained photovoltaic powered light. More specifically, the invention is directed to a packaging assembly for the solar cells.

In the prior art, there exists many electrically powered outdoor lighting systems which are utilized to illuminate pathways, yards, certain areas of parks, or other predetermined areas. Typically such lights are connected to the public utility system, or similar source of electrical power and are controlled by preset timing devices so that they illuminate at nightfall and extinguish at a predetermined time, such as approaching daybreak, or the like. Such lights require extensive cabling, including conduits as well as appropriate timing mechanisms and are thus relatively expensive to install and maintain. In addition thereto, by utilizing electric power generated in the traditional manners, such as by the burning of fossil fuels, additional contamination of the environment occurs as well as depletion of fossil fuel sources. Therefore, there is a need to provide a source of illumination for predetermined outdoor areas which does not require connection to a public utility source of power or the like and which is relatively easy and inexpensive to install and requires no maintenance.

SUMMARY OF THE INVENTION

A solar packaging assembly including a tray having a floor and a side wall. A plurality of electrically interconnected solar cells are disposed within the tray. The solar cells are surrounded by an optically clear, resiliently deformable material supported upon the floor of the tray and retained within the side walls thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view illustrative of a light constructed in accordance with the principles of the present invention;

FIG. **2** is an exploded view showing the various component parts of the structure as illustrated in FIG. **1**;

FIG. **3** is a cross-sectional view of the bezel taken about the lines **3**—**3** of FIG. **2**;

FIG. **4** is a cross-sectional view of the cover taken about the lines **4**—**4** of FIG. **2**;

FIG. **5** is a top plan view illustrating the encapsulation of the solar cells; and

FIG. **6** is a cross-sectional view of the solar cell encapsulation taken about the lines **6**—**6** of FIG. **5**.

DETAILED DESCRIPTION

The self-contained lamp **10** is illustrated in FIG. **1** and is a stand alone lamp which includes a self-contained electrical power source such as a battery which is maintained in a charged condition by a solar cell array and includes an electrical circuit which controls application of electrical power to an electric light bulb contained therein. The electrical power from the battery is supplied to the light bulb when the solar cell array is not producing electricity, that is, when the ambient light falls below a predetermined level. The lamp **10** includes top portion **12** having a lens **14** affixed thereto. A stake **16** is, in turn, attached to the lens **14** and is used to position the lamp **10** in the desired area such, for example, as by inserting the stake **16** into the earth. A solar cell assembly **18** is retained within the top portion **12** while decorative disks **20** are retained upon the lens **14**. The entire lamp assembly **10**, as illustrated in FIG. **1**, may be moved from place to place and positioned at any particular point which may be desired for any particular application. For example, a plurality of the lamps **10** may be positioned to illuminate a pathway as well as to delineate the same. In addition, such a plurality of lamps **10** may be placed to illuminate a given area during nighttime hours.

By reference to FIG. **2**, a more detailed understanding of the structure of the lamp **10** may be obtained. The upper portion **12** of the lamp includes a bezel **22** which is preferably constructed of a molded plastic, such as ASA (acrylic styrene acrylonitrile) or the like, which is sturdy yet somewhat flexible for the purposes to be described below.

The bezel **22** defines an inner surface **24** from which there inwardly extends a plurality of spaced apart latching ribs as shown at **26** and **28**. Similar ribs, such as those illustrated at **26** and **28**, are angularly disposed about the inner surface **24** of the bezel **22**. Preferably, the latching ribs are disposed at 90° intervals about the surface **24**; however, they may be disposed at different angular positions such as 120° or 60° depending upon the number desired. Also inwardly directed from the surface **24** are a plurality of snap lock retainers as shown at **30**. Again, such snap lock retainers are angularly disposed about the surface **24** and preferably at 90° intervals although other intervals may be utilized as desired.

The bezel **22** also defines an upper opening **32** within which the solar cell array is disposed to receive the sunlight during daylight hours to charge the battery contained within the light. The details of construction of the bezel **22** may be better understood by reference to FIG. **3** which more clearly shows the position and relationships of the latching ribs and the snap lock retainer. As is therein shown, additional latching ribs **34**, **36**, **38** and **40** are shown extending inwardly from the inner surface **24** of the bezel **22**. Additional snap lock retainers **42** and **44** are also illustrated. As is more clearly shown in FIG. **3**, the snap lock retainer **30** is displaced downwardly from the edge **46** of the bezel which defines the opening **32**. As will be described more fully hereinafter, such spacing permits the solar cell assembly **18** to be snapped into place within the bezel **22** and securely held there.

By reference, again, to FIG. **2** and also to FIG. **4**, there is illustrated a cover which fits over the solar cells and which forms a part of the solar cell assembly. The cover **50** is optically clear and is preferably constructed of a polycarbonate plastic material which is impact resistant. The polycarbonate material thus protects the solar cells from incidental contact and also from dust. As is shown, the cover **50**, at its outer rim **52**, includes a plurality of lugs as shown at **54**, **56** and **58**. Each of the lugs includes spaced apart protrusions as shown at 60 and 62 with respect to the lug **56**. Again, the lugs are angularly disposed about the cover **50** and preferably at 90° spacing to match the spacing of the snap lock retainers **30** formed on the bezel **22**. The protrusions **60** and **62**, when the cap **50** is positioned in place within the bezel **22**, are spaced one on each side of a snap lock tongue formed on the solar cell assembly such, for example, as shown at **68** and to be described more fully below. As is more clearly shown in FIG. **4**, the protru-

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