An example of a solar electrical generator in accordance with the present invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a first generator;

Fig. 2 is a perspective top view of the first example;

Fig. 3 is a schematic plan view of the first generator; and

Figs. 4 to 6 are schematic views of second, third and fourth examples of generators.

The generator consists of three main components, namely first 1 and second 2 solar panels and a central hub 3. The generator can be free-standing on the ground or may be mounted to a pole or other piece of equipment.

The two panels 1, 2 have the same construction and only one of these will be described below.

A significant proportion of each convex outer face 4 of each panel is covered with solar cells 5.

The concave inner face 6 of each of the panels may similarly be covered with solar cells 5. Alternatively or additionally, it may be covered in one or more reflectors 7.

The two curved panels 1, 2 are arranged generally concentrically such that they form a substantially cylindrical construction with a vertical axis. There are, however, a pair of gaps 8 formed between adjacent ends of the panels. In a preferred example, each of the curved panels subtends an angle of around 150° on each gap subtends of angle of around 30° at the hub. In use, it is intended that the generator will be mounted in an orientation with the gaps 8 facing in a direction to provide maximum power generation. This allows light to be incident on the inner concave faces 6 either through the top of the generator or through the gaps 8.

The hub 3 is shown with a spherical shape in Figs. 1 and 2. This may have other shapes such as a cylinder or a dome. In any event, it is preferred that the upwardly facing surface 9

of the hub is provided with solar cells. The peripheral surfaces which generally face the inner concave face 6 may either be provided with solar cells, reflectors or a combination of both. If the inner concave faces 6 are provided with reflectors, it would be preferable to provide more solar cells on the peripheral surface on the hub 3 as any light reflected from the inner concave face 6 will be concentrated on the peripheral face of the hub 3. On the other hand, if the inner concave face 6 is provided with a high proportion of solar cells, the periphery of the hub 3 may be provided with a high proportion of reflectors to reflect light onto the inner concave face 6. The exact arrangement of reflectors and cells can be determined through trial and error and may depend upon the local conditions. Nevertheless, the arrangement described offers a very efficient means of generating electricity in that there is always a part of the outer face 4 for which the solar cells 5 will be in the optimum position for any given time of day and year. The arrangement of the inner concave faces and hub also provides an efficient way of utilising the opposite face to the outer face 4 in a manner which can again receive a significant amount of solar energy again with surfaces at multiple different angles so that, again, there will often be solar cells which are in the optimal position to collect the energy at any particular time.

In the preferred example shown in Figs. 1 to 3, the first 1 and second 2 curved panels are formed by producing a rigid curved frame. To this, a thin film flexible solar fabric can be applied. This is supplied on rolls and can be readily attached to the frame in order to form a very simple and lightweight structure. A second layer of thin film flexible solar fabric can be applied to the inner concave surface 6. In this case, this may not be applied fully across the surface, but instead, some of the regions may instead be provided with reflective material. A number of variations of this design are shown in Figs. 4 to 6.

As an alternative to the arrangement shown in Fig. 1, the first and second panels may effectively be joined such that there is one large curved panel extending in a substantially C shape around the hub 3 with only a single gap 8.

The uppermost surface of the hub is preferably vertically positioned above the mid-point of the outer wall such that it is not unduly shaded by the outer wall. Preferably the maximum width of the hub is less than half and preferably less than one third of the maximum width of the cavity. This ensures that the hub does not unduly shade the inner face of the wall. The hub can be lower and, if so, its width can be increased as, the lower it is, the less it will shade the inner face of the wall. In a limiting case, the hub can effectively cover the base of

the cavity. Another possibility is for a raised hub as described above with additional solar cells positioned across the base of the cavity.

In Fig. 4, each of the first 1 and second 2 curved panels is effectively split into two such that there are four separate panel 1A, 1B and 2A, 2B. This introduces two further gaps 8'. Again, the exact arrangement of panels and gaps can be determined experimentally and may vary depending on local conditions. There may, for example, be three or more panels and a corresponding number of gaps.

The arrangement shown in Figs. 4 and 5 shows the panels 1, 2 separate from the hub 3. This may be suitable larger scale installations where the panels can be staked for transportation and assembled in situ. However, as shown in Fig. 3, the panels 1, 2 are connected to the hub 9 by a pair of spokes 10. There may be more than one spoke per panel, for example as shown at 10A in Fig. 6. The generator may either be pre-assembled in this configuration, which is more appropriate for small installations. Alternatively, the panels 1, 2 and hub 3 may still be transported separately and the spokes 10 assembled in situ to help fix the optimal geometrical relationships between the components.

As shown in Fig. 4, the hub 3 contains a battery 11 to store the energy generated by the solar cells. In Fig. 5, the energy storage is in the form of a fly wheel 12. The hubs 10, 10A provide a convenient connection between the solar cells 5 and the storage device 11, 12.

The third example of Fig. 5 shows a implementation with the invention more conventional solar panel technology in which a number of flat rigid panels 13 are connected together to form the panels 1C, 2C. The inner faces of these panels may also be provided with solar cells or reflectors as previously described. The flat panels could equally be slightly separated from one another.

The previous examples show the first 1 and second 2 panels having an arcuate configuration centred around the centre of the hub 3. As shown in the third example of Fig. 6, the panels may deviate from an arcuate configuration and may, for example, have a parabolic or other non-circular shape as shown as 1D and 2D in the fourth example of Fig. 6.

As would be apparent from the above description, although a number of modifications having been incorporated into individual examples, individual modifications can be used in other examples. Thus, the presence or absence of spokes, the use of a power storage device within the hub, the use of more than two panels, the use of conventional flat panels or curved panels and the general shape of the panels may all be used independently of one another.

In a fifth example of a generator the hub is in the form of a curved panel which is titled upwardly towards one of gaps 8. However, the main new feature in the fifth example is that the first 1 and second 2 curved panels are formed of an inner wall and an outer wall, with the outer wall of each panel being made of three separate sections. There could, however, be more or less than three sections. Each of the sections is hinged at a point at the central region of its uppermost edge with respect to the inner wall.

The sections may be manually movable, but could also be motorised so as to be movable from the expanded configuration a retracted configuration in which all of the sections lie against the inner wall such that the generator resembles the generators described above in relation to the earlier examples. A timer is preferably provided to control the movement of the sections. The inwardly facing inner wall and the hub will remain in their fixed position and will function as before (although hub could optionally be mounted so as it be rotatable). When the sun is relatively low in the sky in the morning and evening, the sections are in the retracted configuration against the inner wall. However, in the middle part of the day when the sun is high in the sky, the sections are rotated into the expanded configuration such thatthe panels present a much a larger incident surface when the sun is at or close to a position directly above the generator.

The sections do not necessarily all need to be movable together. Instead, when the sun is relatively low in the sky, the sections which face the direction of the sun could be in the retracted position against the inner wall, while the other sections are rotated into the generally horizontal plane shown in the drawings, or even well beyond the horizontal plane such that they face in the general direction of the sun at this time.

In order to fully optimise the position of the sections, sun tracking technology could be employed. However, this is expensive and our intention is to use a timer to control the

position of the sections as this provides a reasonable degree of optimisation of the position of the section for relatively little cost.

A sixth example of a generator is based on the generator of the fifth example, but this principal could apply to any of the previously described generators. In particular, a pair of wind turbines are attached to an upper edge of the panels 1, 2. Any suitable wind turbine design may be used. Such an arrangement is particularly useful when the generators are being used individually to produce power for a localised purpose such as charging a vehicle in a remote location. The use of one or more wind turbines under these circumstances provide a means of supplementing the power produced by the solar cells which should be particularly useful during winter months or on cloudy days when, although less solar energy will be available, it is likely that more wind energy can be harvested.

CLAIMS

1. A solar electrical generator comprising an outer wall arranged to partially surround a cavity,

a hub within the cavity wherein the outer face of the wall is provided with solar cells and wherein the hub has an upper face which is provided with solar cells.

2. A generator according to claim 1, wherein the inner face of the wall is provided with solar cells.

3. A generator according claim 1 or claim 2, wherein at least one of the hub and inner face of the outer wall are provided with a reflector.

4. A generator according to any one of the preceding claims, wherein the outer wall is formed of a curved frame to which a flexible solar fabric is attached.

5. A generator according to any one of the preceding claims, further comprising a power storage device within the hub.

6. A generator according to any one of the preceding claims, wherein the outer wall is connected to the hub via one or more spokes.

7. A generator according to any one of the preceding claims, wherein the outer wall subtends an angle of greater than 250° at the centre of the hub.

8. A generator according to claim 7, wherein the outer wall subtends an angle of greater than 280° at the centre of the hub.

9. A generator according to any preceding claim, wherein the outer wall subtends an angle of less than 320° at the centre of the hub.

10. A generator according to any preceding claim, wherein the outer wall is provided by a first panel and a second panel, each panel having a concave inner face and a

convex outer face, the panels being horizontally spaced so that the concave faces face one another thereby defining the central cavity.

11. A generator according to any preceding claim, wherein the maximum width of the hub is less than half of the maximum width of the cavity.

12. A generator according to claim 11, wherein the maximum width of the hub is less than one third of the maximum width of the cavity.

13. A generator according to any preceding claim, wherein at least part of the outer wall is movable from a first position into a second position in which its outer face is closer to a vertical plane.

14. A generator according to claim 13, wherein the outer wall has an inner portion and an outer portion and the outer portion is movable, while the inner portion is static.

15. A generator according to claim 13 or claim 14, wherein the movable part of the outer wall is rotatable about a substantially horizontal axis adjacent to its uppermost edge.

16. A generator according to claims 13 to 15, wherein the movable part of the outer wall comprises a plurality of sections.

17. A generator according to any preceding claim, further comprising a time to control the movement of the movable part of the wall.