US 20060011194A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0011194 A1**

Hensley et al. (43) **Pub. Date: Jan. 19, 2006**

(54) **SOLAR ENERGY COLLECTION DEVICE AND ASSOCIATED METHODS**

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(21) Appl. No.: **10/120,320**

(22) Filed: **Apr. 10, 2002**

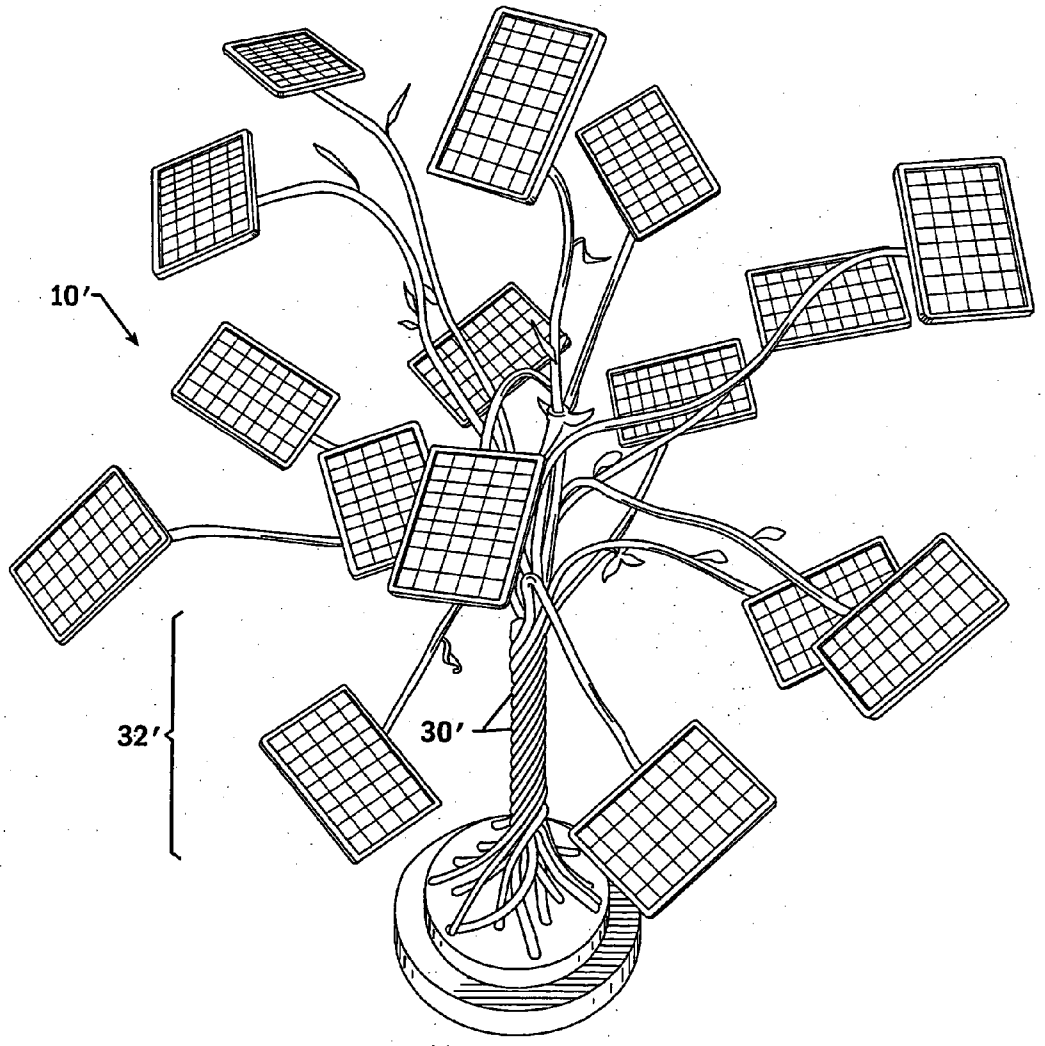
Publication Classification

(51) **Int. Cl.**
F24J 2/24 (2006.01)

(52) **U.S. Cl.** **126/655**

(57) **ABSTRACT**

A decorative solar energy collector includes tubular elements extending from the base at a bottom end. The tubular elements extend closely adjacent each other along a middle section to form a trunk-like appearance, and then diverge at a top section, so that each tubular element forms a branch-like appearance. Solar panels are provided, with one solar panel affixable adjacent a top end of a tubular element. Each solar panel collects solar energy and converts the solar energy into electricity. The solar panel includes a connector and circuitry for transmitting electricity to the connector. The number of solar panels is no greater than the number of tubular elements. Cables are also provided, one cable extending through a lumen of each tubular element in connecting relation between a solar panel connector at the cable's top end and the base at the cable's bottom end.



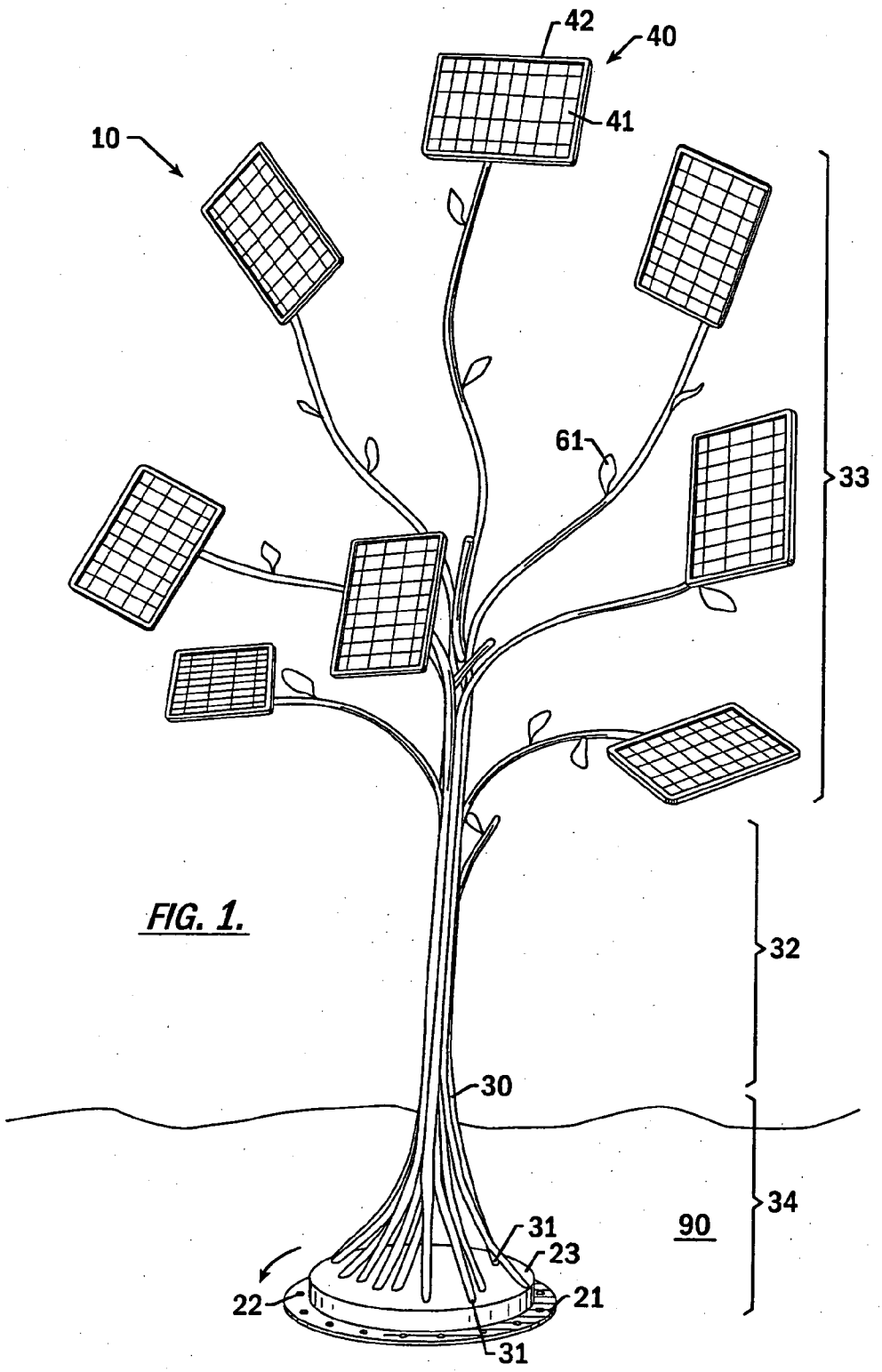


FIG. 1.

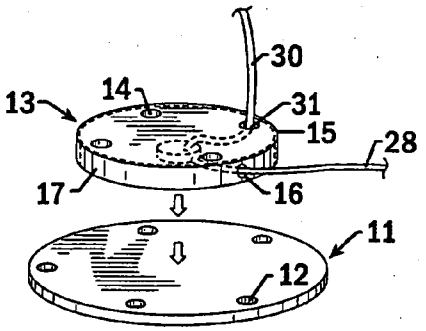


FIG. 2.

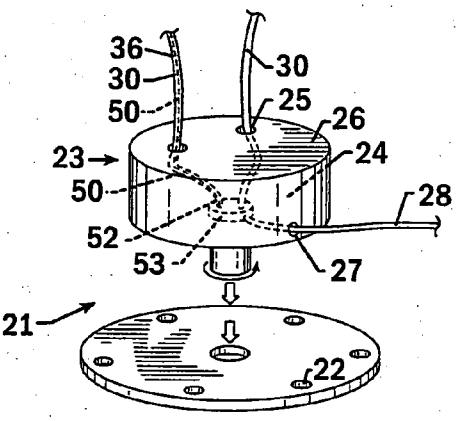


FIG. 3.

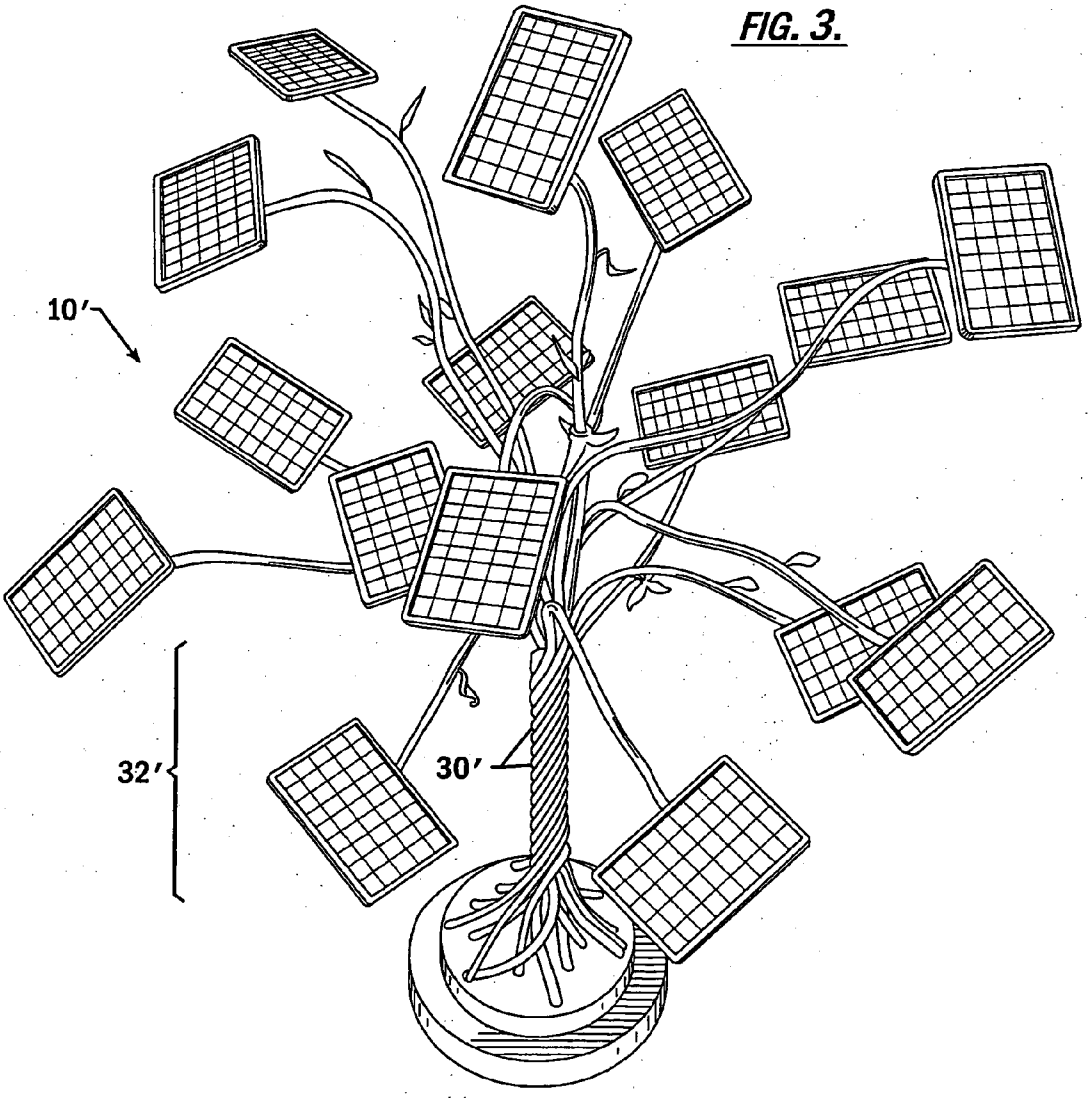


FIG. 4.

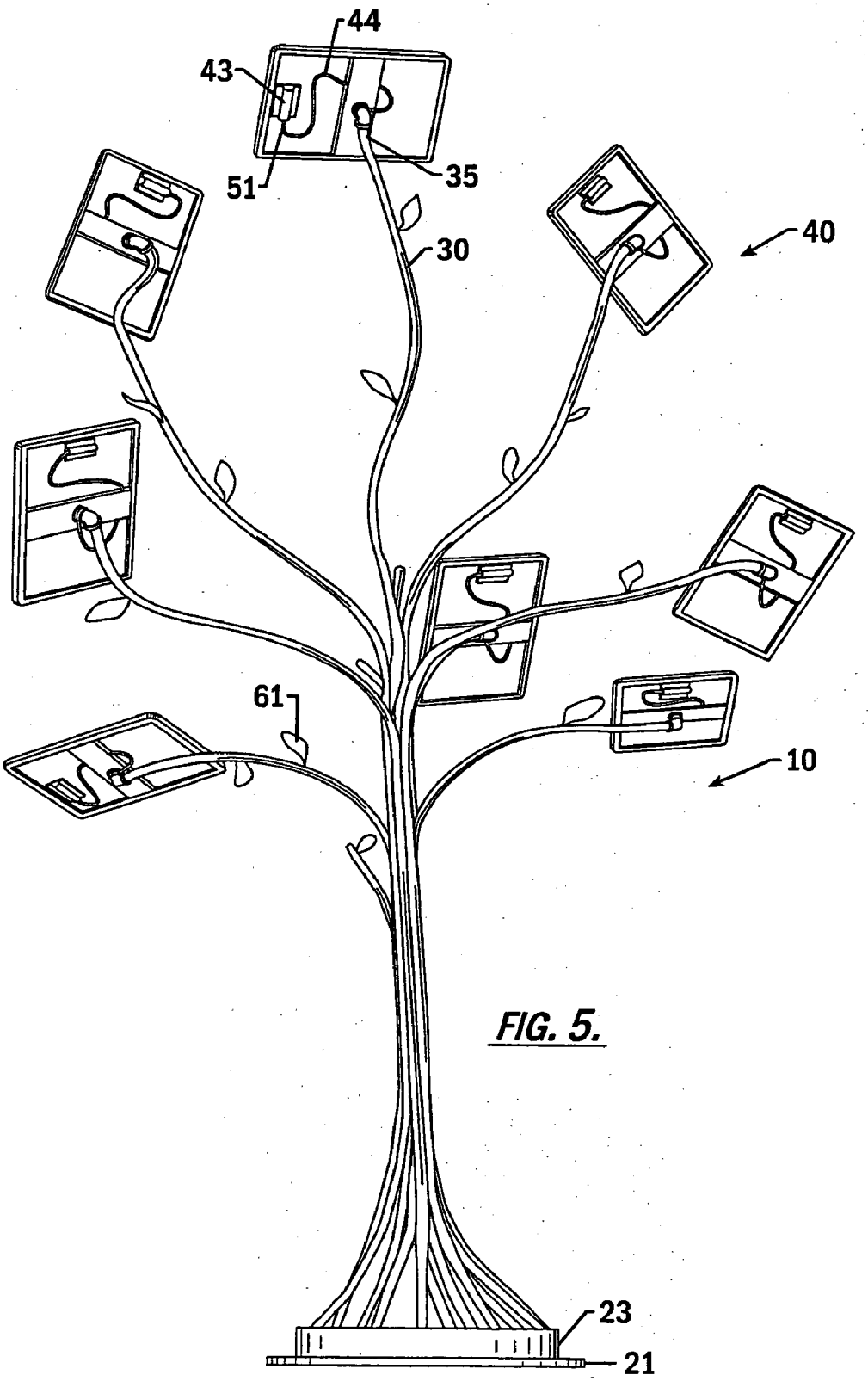


FIG. 5.

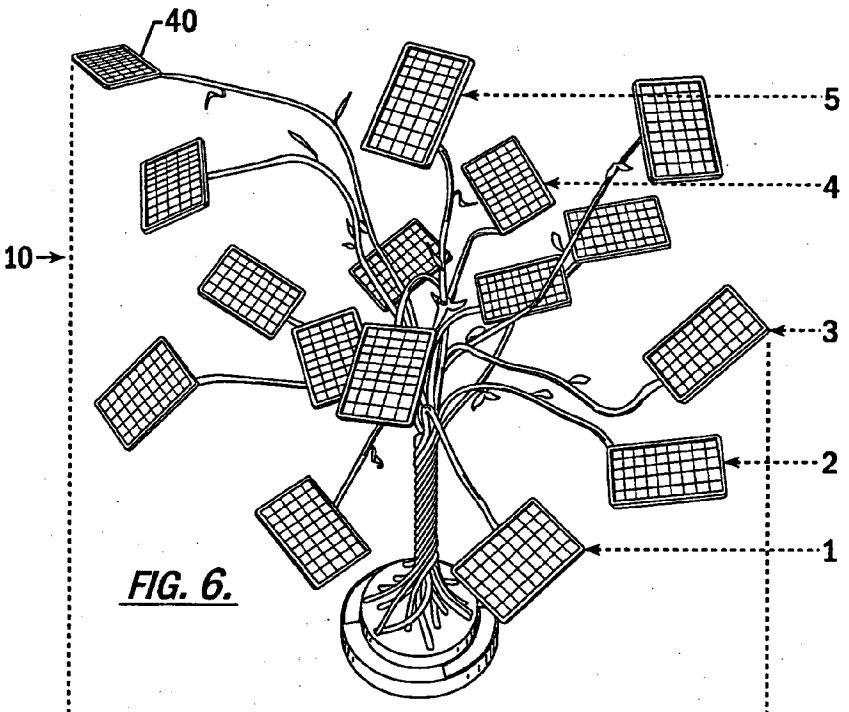


FIG. 6.

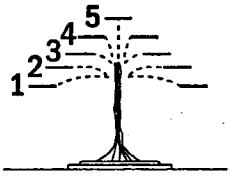


FIG. 8.

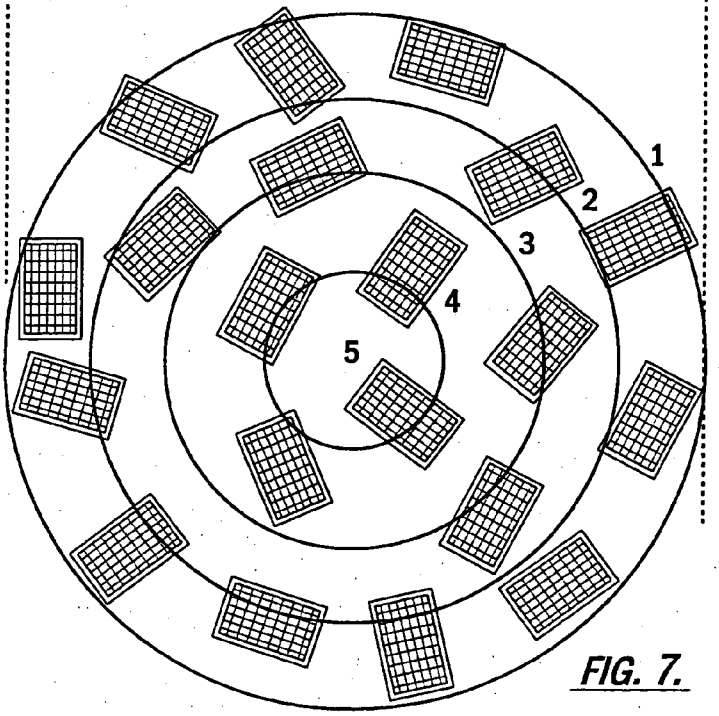


FIG. 7.

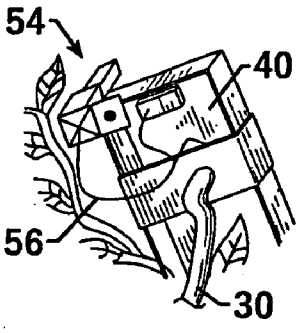


FIG. 9.

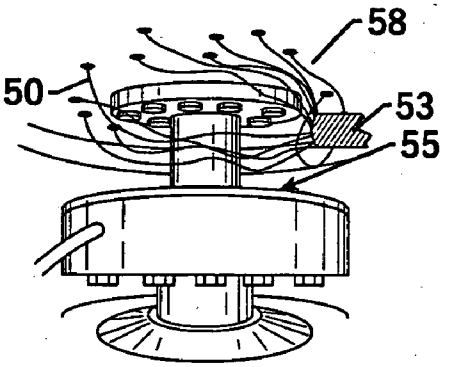


FIG. 10.

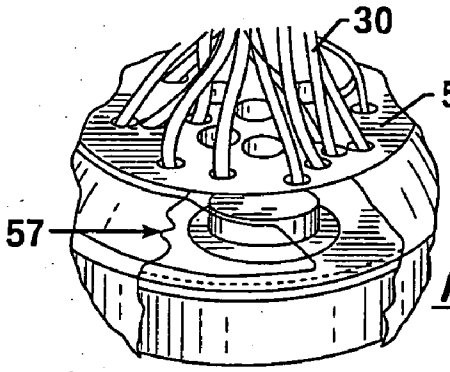


FIG. 11.

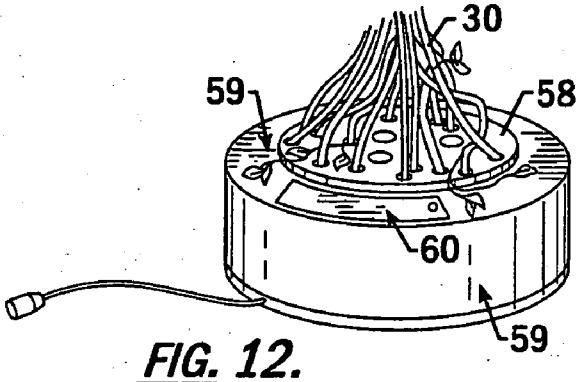


FIG. 12.

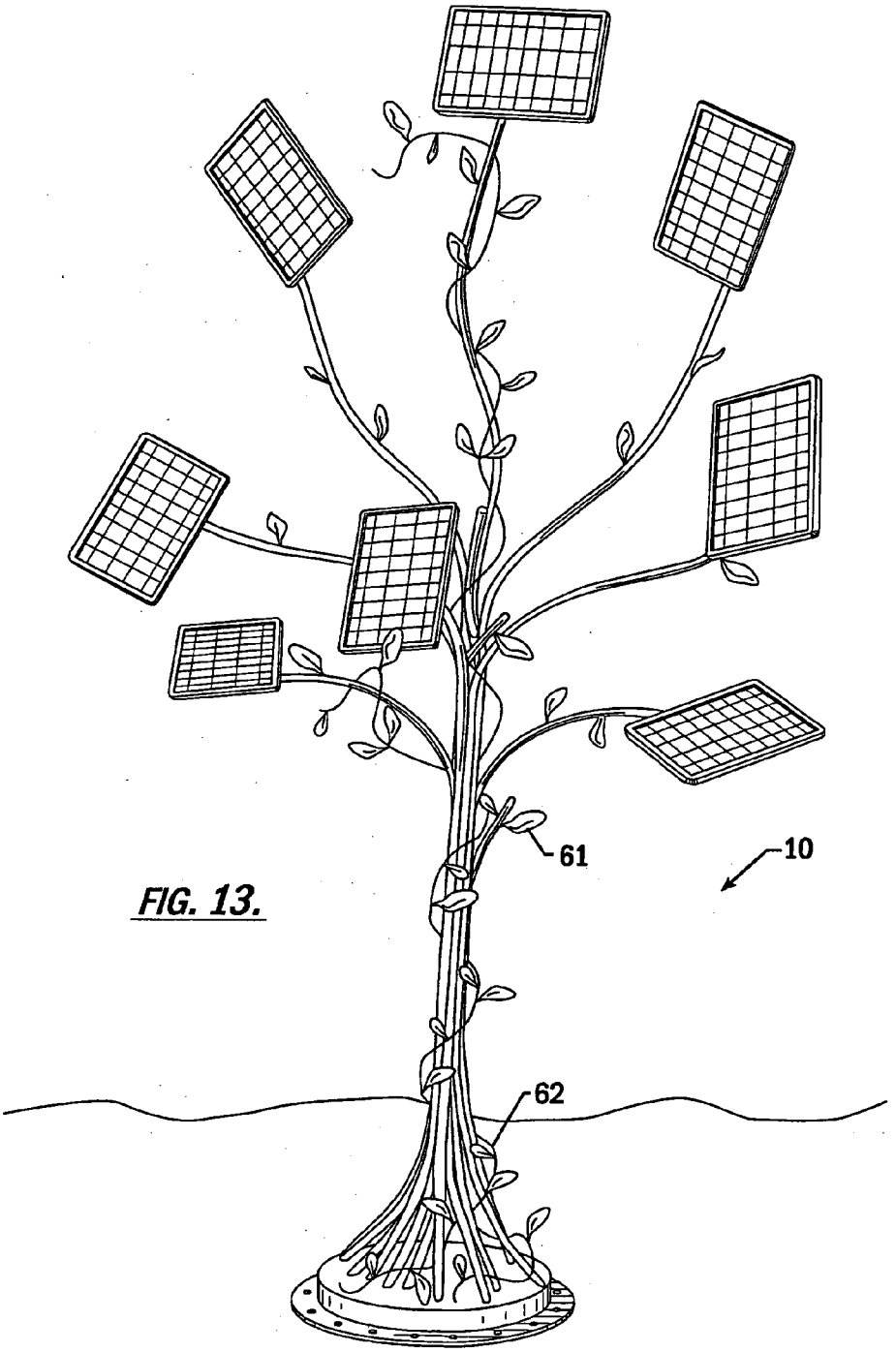


FIG. 13.

SOLAR ENERGY COLLECTION DEVICE AND ASSOCIATED METHODS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to solar energy collection devices and, more particularly, to such devices that are ornamental.

[0003] 2. Description of Related Art

[0004] Solar panels are known for converting solar energy into dc electricity. Such panels are known to be placed on, for example, roof structures, and are typically not particularly attractive.

[0005] Artistic uses have been made of solar panels in landscaping applications, such as the "Solarscaping®" products of Amelia Amon (Alt.Technica, New York, N.Y.), including a fountain incorporating solar panels. G. Curci has also created sculptures that are solar-powered and kinetic. In his "Solar Flower Blossom" sculptures, the flower portion opens and closes under solar power.

SUMMARY OF THE INVENTION

[0006] It is an object of the present invention to provide a decorative device for collecting solar energy for conversion into electricity.

[0007] It is a further object to provide such a decorative device that is environmentally mimetic.

[0008] It is another object to provide such a decorative device that is environmentally adaptive.

[0009] It is an additional object to provide such a decorative device that is phototactic.

[0010] It is yet a further object to provide such a decorative device that is environmentally coherent.

[0011] It is yet another object to provide a method of constructing such a decorative device.

[0012] It is yet an additional object to provide a method of collecting solar energy.

[0013] These and other objects are achieved by the present invention, a decorative solar energy collection device. The device comprises a base and a plurality of tubular elements affixed at a bottom end to the base. The tubular elements extend closely adjacent each other along a middle section to form a trunk-like appearance, and then diverge at a top section, so that each tubular element forms a branch-like appearance.

[0014] A plurality of solar panels are provided, with one solar panel affixable adjacent a top end of a tubular element. Each solar panel comprises means for collecting solar energy and for converting solar energy into electricity. The solar panel further comprises a connector and circuitry for transmitting electricity from the collecting and converting means to the connector. The number of solar panels comprises no more than the number of tubular elements.

[0015] The device further comprises a plurality of cables. One cable extends through a lumen of each tubular element in connecting relation between a solar panel connector at the cable's top end and the base at the cable's bottom end.

[0016] The features that characterize the invention, both as to organization and method of operation, together with further objects and advantages thereof, will be better understood from the following description used in conjunction with the accompanying drawing. It is to be expressly understood that the drawing is for the purpose of illustration and description and is not intended as a definition of the limits of the invention. These and other objects attained, and advantages offered, by the present invention will become more fully apparent as the description that now follows is read in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] **FIG. 1** is a side front perspective view of a first embodiment of the solar energy collection device.

[0018] **FIG. 2** is an exploded view of a nonrotating embodiment of a base.

[0019] **FIG. 3** is an exploded view of a rotating embodiment of a base.

[0020] **FIG. 4** is a top/side front perspective view of a second embodiment of the solar energy collection device.

[0021] **FIG. 5** is a side rear perspective view of the first embodiment.

[0022] **FIG. 6** is a top/side perspective view of the second embodiment illustrating the solar panel levels.

[0023] **FIG. 7** is a top plan view of the solar panels of **FIG. 6**.

[0024] **FIG. 8** is a side view of the solar panel levels.

[0025] **FIG. 9** is a rear view of a solar panel with a solar sensor thereon.

[0026] **FIG. 10** is a side view of a tracking rotor.

[0027] **FIG. 11** is a top-side, partially cutaway view of a third embodiment of a base.

[0028] **FIG. 12** is a top-side view of the assembled base of **FIG. 11**.

[0029] **FIG. 13** is a side perspective view of a first embodiment of the solar energy collection device, with added foliage.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] A description of the preferred embodiments of the present invention will now be presented with reference to **FIGS. 1-13**.

[0031] The solar energy collection device **10** of the present invention is designed to resemble a tree. The device **10** comprises a base, which in a first embodiment (**FIG. 2**) includes a placement base **11** having bolt or screw holes **12** for permitting the placement base **11** to be affixed to a surface **90**. Alternatively, the placement base **11** may simply rest on a surface **90**. Above the placement base **11** is affixed a trunk platform **13** having a plurality of holes **14** through a top end **15** thereof and a cable opening **16** through a side wall **17** thereof. Alternatively, this base embodiment could comprise a unitary element comprising the placement base and trunk platform.

[0032] A second embodiment of the base (**FIGS. 1 and 3**) comprises a placement base **21** having bolt or screw holes **22** for permitting the placement base **21** to be affixed to a surface **90**. Alternatively, as above, the placement base **21** may simply rest on a surface **90**.

[0033] Atop the placement base **21** is rotatably affixed a rotating base **23** that has an interior space **24**. The rotating base **23** has a plurality of openings **25** at a top end **26** extending into the interior space **24** and a cable opening **27** that extends from the interior space **24** to the exterior for passing a power cable **28** therethrough. Preferably the rotating base **23** is adapted to rotate through approximately 180°.

[0034] A plurality of tubular elements **30** extend from the base at their bottom ends **31**. The tubular elements **30** extend closely adjacent each other along a middle section **32** to form a trunk-like appearance. The tubular elements **30** diverge at a top section **33** to form a branch-like appearance. In a particular embodiment, the tubular elements **30** flare outward along a bottom section **34** to form a root-like appearance.

[0035] In one embodiment (**FIG. 1**), the tubular elements **30** extend in substantially vertical fashion along the middle section **32**. In another embodiment **10'** (**FIG. 4**), the tubular elements **30'** are twisted about one another along the middle section **32'**.

[0036] A plurality of solar panels **40** are provided (**FIGS. 1 and 5**), in a particular embodiment KC-series solar panels of Kyocera (Japan). Each solar panel **40** comprises at least one solar cell **41** housed in a frame **42**. The solar cell **41** is adapted to collect solar energy and convert the collected solar energy into electricity. Each solar panel **40** further comprises a connector **43** and circuitry **44** for transmitting electricity from the solar cell **41** to the connector **43**. Each solar panel **40** is affixable adjacent a tubular element's top end **35**, at most preferably one solar panel **40** per tubular element **30**. Thus there are at least as many tubular elements **30** as there are solar panels **40**.

[0037] Preferably the solar panels **40** are arrayed for optimizing solar energy collection. For example, preferably the solar panels **40** are arrayed in substantially nonoverlapping fashion when viewed along an incoming solar ray vector, such as when viewed from a position approximately above the device **10**. As an example, the device **10** of **FIG. 6** is shown in top projection in **FIG. 7**, wherein the solar panel levels **1-5** are shown as extending increasingly farther out from the "trunk" as one proceeds upward. Thus a first set of solar panels **40** in a preferred embodiment extend farther outward from the tubular element middle section **32** than a second set of solar panels **40** positioned farther from the base than the first set of solar panels **40**. In particular, the solar panels **40** are arrayed to form a substantially dome-shaped aspect when viewed from the side (**FIG. 8**).

[0038] The device **10** additionally comprises a plurality of cables **50** (**FIG. 3**). Each cable **50** extends through a lumen **36** of each tubular element **30** in connecting relation between a solar panel connector **43** at the cable's top end **51** and the base at the cable's bottom end **52**. The base's holes **25** are for admitting the cable's bottom ends **52** into the rotating base interior space **24**.

[0039] The device **10** also comprises a coupler **53** that receives the cable's bottom ends **52** and outputs a unitary power cable **28**. The coupler **53** is housed in the interior space **24**, and the power cable **28** extends to the exterior through the cable opening **27**.

[0040] In order to enhance the tree-like appearance of the device **10**, a plurality of leaf elements **61** are affixed along at least some of the tubular elements **30**, either or both along the middle section **32** or the top section **33**. In addition, an ivy-like element **62** can be added along the middle section **32** and/or the top section **33**, as depicted in **FIG. 13**, to further enhance the tree-like appearance of the device **10**.

[0041] In a third embodiment (**FIGS. 9-12**), the device **10** additionally comprises a solar sensor **54** (**FIG. 9**) that is affixed to a tubular element **30** and is adapted to sense a directionality of incoming solar energy. A motor (not shown) is also provided in the interior space **57** for rotating the rotating base **58** responsive to a directionality signal transmitted by a signal cable **56** from the solar sensor **54** through the tubular element **30** to which the sensor **54** is affixed. The tracking rotor **55** is shown in **FIG. 10**, as encased in a third embodiment of the base **59** (**FIGS. 11 and 12**), the interior space **57** to which is accessed via access lid **60**. This embodiment optimizes a collection of solar energy by the solar panels **40** by turning the device **10** to position the solar panels **40** to face the sun optimally.

[0042] The solar energy collection device **10** of the present invention is thus designed to resemble a tree, which permits the device **10** to appear coherent with the environment as well as to portray an aspect of simulated form and function. Thus the "leaves," i.e., solar panels, of the "tree" collect solar energy and convert it to useful electrical energy. The "trunk" and "branches" of the tree support the energy-gathering elements, the solar panel "leaves," and also serve as conduits between the "roots" and the "leaves." It may be appreciated by one skilled in the art that additional embodiments may be contemplated, including other environmentally suggestive sculptures such as bushes and shrubbery.

[0043] In the foregoing description, certain terms have been used for brevity, clarity, and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for description purposes herein and are intended to be broadly construed. Moreover, the embodiments of the apparatus illustrated and described herein are by way of example, and the scope of the invention is not limited to the exact details of construction.

[0044] Having now described the invention, the construction, the operation and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby, the new and useful constructions, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

What is claimed is:

1. A solar energy collection device comprising:

a base;

a plurality of tubular elements extend from the base at a bottom end, the tubular elements closely adjacent each other along a middle section to form a trunk appearance, the tubular elements diverging at a top section, each tubular element thereby forming a branch appearance;

a plurality of solar panels, each solar panel comprising means for collecting solar energy and for converting solar energy into electricity, a connector, and circuitry for transmitting electricity from the collecting and converting means to the connector, a number of solar panels comprising no more than a number of tubular elements, each solar panel affixable adjacent a top end of a tubular element to form a leaf appearance; and

a plurality of cables, one cable extending through a lumen of each tubular element in connecting relation between a solar panel connector at a cable top end and the base at a cable bottom end.

2. The solar energy collection device recited in claim 1, further comprising a coupler for receiving the cable bottom ends and for outputting a unitary power cable.

3. The solar energy collection device recited in claim 1, further comprising a plurality of leaf elements affixed along at least some of the tubular elements.

4. The solar energy collection device recited in claim 1, further comprising a vine element affixed along one of the middle section and the top section.

5. The solar energy collection device recited in claim 1, wherein the tubular elements flare outward along a bottom section, the tubular elements thereby forming a root appearance.

6. The solar energy collection device recited in claim 1, wherein the base comprises:

a placement base;

a rotating base rotatably affixed atop the placement base having an interior space, an opening at a top end, and a cable opening extending from the interior space to the exterior for passing the power cable therethrough; and

a platform having a plurality of holes therethrough for admitting the cable bottom ends into the rotating base interior space, the platform affixable atop the rotating base.

7. The solar energy collection device recited in claim 6, wherein the placement base comprises means for being affixed to a surface.

8. The solar energy collection device recited in claim 6, further comprising:

a solar sensor affixed to a tubular element and comprising means for sensing a directionality of incoming solar energy; and

means for rotating the rotating base responsive to a directionality signal from the solar sensor, for optimizing a collection of solar energy by the solar panels.

9. The solar energy collection device recited in claim 1, wherein the solar panels are arrayed for optimizing solar energy collection.

10. The solar energy collection device recited in claim 9, wherein the solar panels are arrayed in substantially non-overlapping fashion when viewed along an incoming solar ray vector.

11. The solar energy collection device recited in claim 9, wherein the solar panels are arrayed in substantially non-overlapping fashion when viewed from a position approximately above the device.

12. The solar energy collection device recited in claim 9, wherein a first set of solar panels extend farther outward from the tubular element middle section than a second set of solar panels positioned farther from the base than the first set of solar panels.

13. The solar energy collection device recited in claim 12, wherein the solar panels form a substantially dome-shaped aspect when viewed from a side thereof.

14. The solar energy collection device recited in claim 1, wherein the tubular elements extend in substantially vertical fashion along the middle section.

15. The solar energy collection device recited in claim 1, wherein the tubular elements are twisted about one another along the middle section.

16. A method for collecting solar energy comprising the steps of:

extending a plurality of tubular elements substantially vertically upward along a middle section to form a trunk appearance;

extending the tubular elements to diverge at a top section to form a branch appearance; and

permitting a plurality of solar panels to collect solar energy and convert the solar energy into electricity, the solar panels affixed to the tubular elements to form a leaf appearance.

17. The method recited in claim 16, further comprising extending the tubular elements to flare outward along a bottom section to form a root appearance.

18. The method recited in claim 16, further comprising the step of rotating the solar panels to optimize solar energy collection.

19. The method recited in claim 18, further comprising the step of sensing a directionality of incoming solar energy, and wherein the rotating step comprises rotating the solar panels responsive to a directionality signal from the solar sensor.

20. The method recited in claim 16, wherein the permitting step comprises arraying the solar panels for optimizing solar energy collection.

21. The method recited in claim 20, wherein the arraying step comprises arraying the solar panels in substantially nonoverlapping fashion when viewed along an incoming solar ray vector.

22. The method recited in claim 20, wherein the Arraying step comprises arraying the solar panels in substantially nonoverlapping fashion when viewed from a position approximately above the device.

23. The method recited in claim 20, wherein the arraying step comprising positioning a first set of solar panels to extend farther outward from the tubular element middle section than a second set of solar panels positioned lower than the first set of solar panels.

24. The method recited in claim 23, wherein the solar panels are positioned to form a substantially dome-shaped aspect when viewed from a side thereof.

25. The method recited in claim 16, wherein the tubular elements extend in substantially vertical fashion along the middle section.

26. The method recited in claim 16, wherein the tubular elements are twisted about one another along the middle section.

27. A method of constructing a solar energy collection device comprising the steps of:

positioning a plurality of tubular elements adjacent a base at a bottom end, the tubular elements positioned closely adjacent each other along a middle section to form a trunk appearance;

extending the tubular elements to diverge at a top section, each tubular element thereby forming a branch appearance;

affixing a plurality of solar panels adjacent a top end of a tubular element to form a leaf appearance; and

extending a cable through a lumen of each tubular element in connecting relation between a solar panel and the base.

28. The method recited in claim 27, further comprising the step of coupling bottom ends of the cable and outputting a unitary power cable.

29. The method recited in claim 27, further comprising the step of affixing a plurality of leaf elements along at least some of the tubular elements.

30. The method recited in claim 27, further comprising the step of affixing a vine element along one of a middle section and a top section.

31. The method recited in claim 27, wherein the tubular element positioning step comprises flaring the tubular elements outward along a bottom section to form a root appearance.

32. The method recited in claim 27, wherein an upper section of the base is rotatable.

33. The method recited in claim 32, wherein a lower section of the base is affixable to a surface.

34. The method recited in claim 32, further comprising the steps of:

affixing a solar sensor to a tubular element, the solar sensor comprising means for sensing a directionality of incoming solar energy; and

providing means for rotating the rotating base responsive to a directionality signal from the solar sensor, for optimizing a collection of solar energy by the solar panels.

35. The method recited in claim 27, wherein the solar panel affixing step comprises arraying the solar panels for optimizing solar energy collection.

36. The method recited in claim 35, wherein the solar panel affixing step comprises arraying the solar panels in substantially nonoverlapping fashion when viewed along an incoming solar ray vector.

37. The method recited in claim 35, wherein the solar panel affixing step comprises arraying the solar panels in substantially nonoverlapping fashion when viewed from a position approximately above the device.

38. The method recited in claim 35, wherein the solar panel affixing step comprise extending a first set of solar panels farther outward from the tubular element middle section than a second set of solar panels positioned lower than the first set of solar panels.

39. The method recited in claim 38, wherein the solar panels form a substantially dome-shaped aspect when viewed from a side thereof.

40. The method recited in claim 27, wherein the tubular element positioning step comprises positioning the tubular elements in substantially vertical fashion along the middle section.

41. The method recited in claim 27, wherein the tubular element positioning step comprises positioning the tubular elements in twisted fashion about one another along the middle section.

* * * * *