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(54) **SOLAR STAND**

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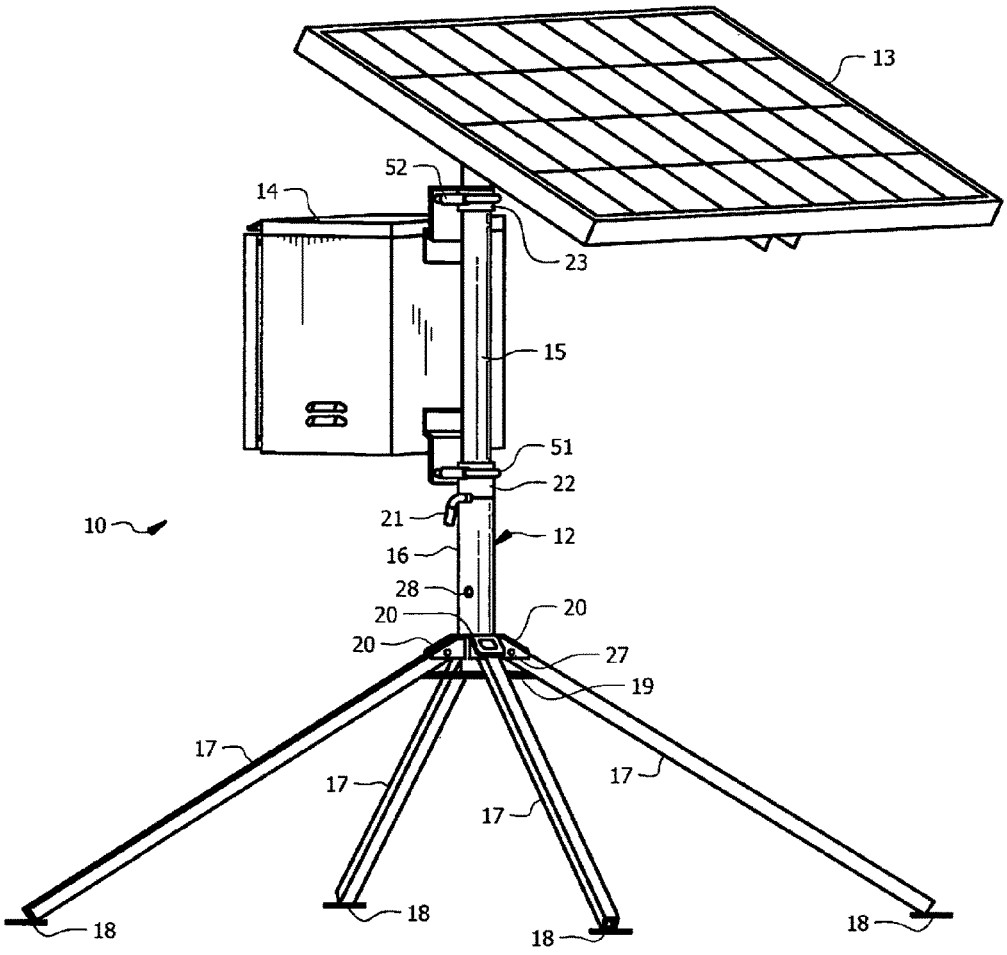
(57) **ABSTRACT**

A stand for mounting a solar panel and an electronics enclosure includes a pole having a spreader attached to a bottom end of the pole, where the pole includes a first hole and second hole sized to accept a hitch pin. The first hole corresponds to a collapsed state of the stand and the second hole corresponds to an deployed state of the stand. A hub is slidably mounted to the pole and includes a first hole corresponding to the first hole in the pole and the collapsed state of the stand and a notch corresponding to the second hole in the stand and the deployed state of the stand. A plurality of legs are pivotably attached to the hub, where the legs spread outward from the hub by the spreader when the stand is in the deployed state. In the deployed state, the hitch pin is inserted through the second hole in the pole and rests in the notch in the hub, where the notch preventing the pole from rotating relative to the hub.



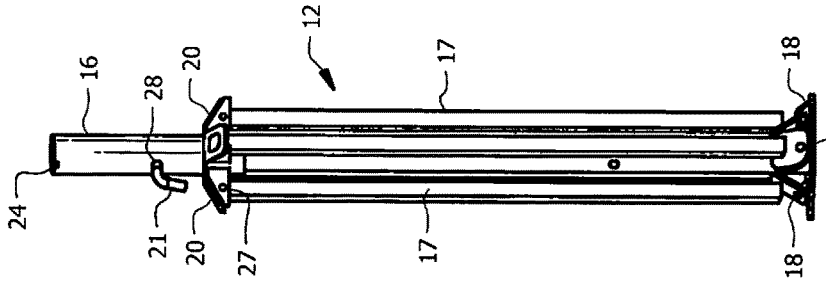

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FIG. 2

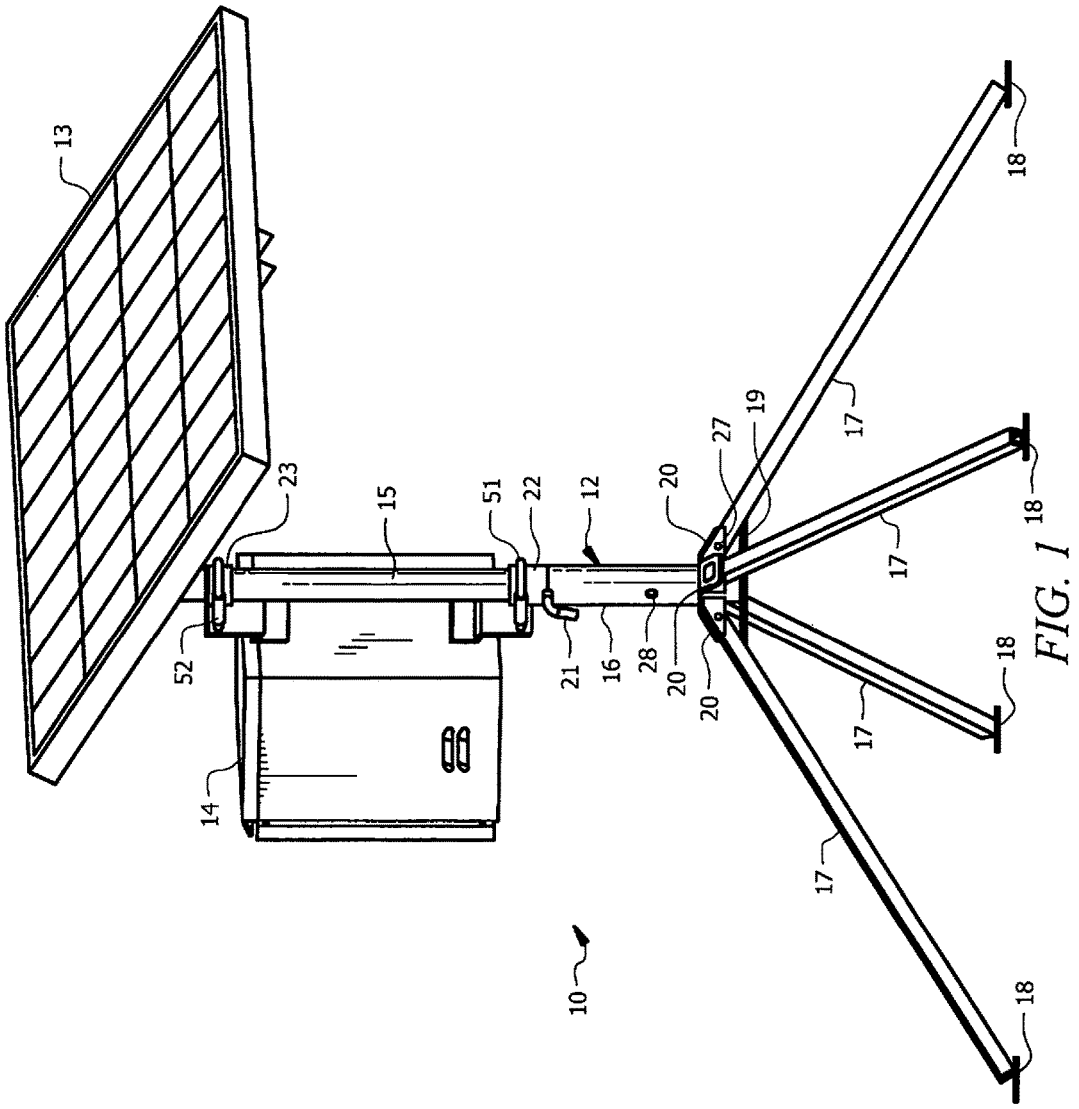
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FIG. 1

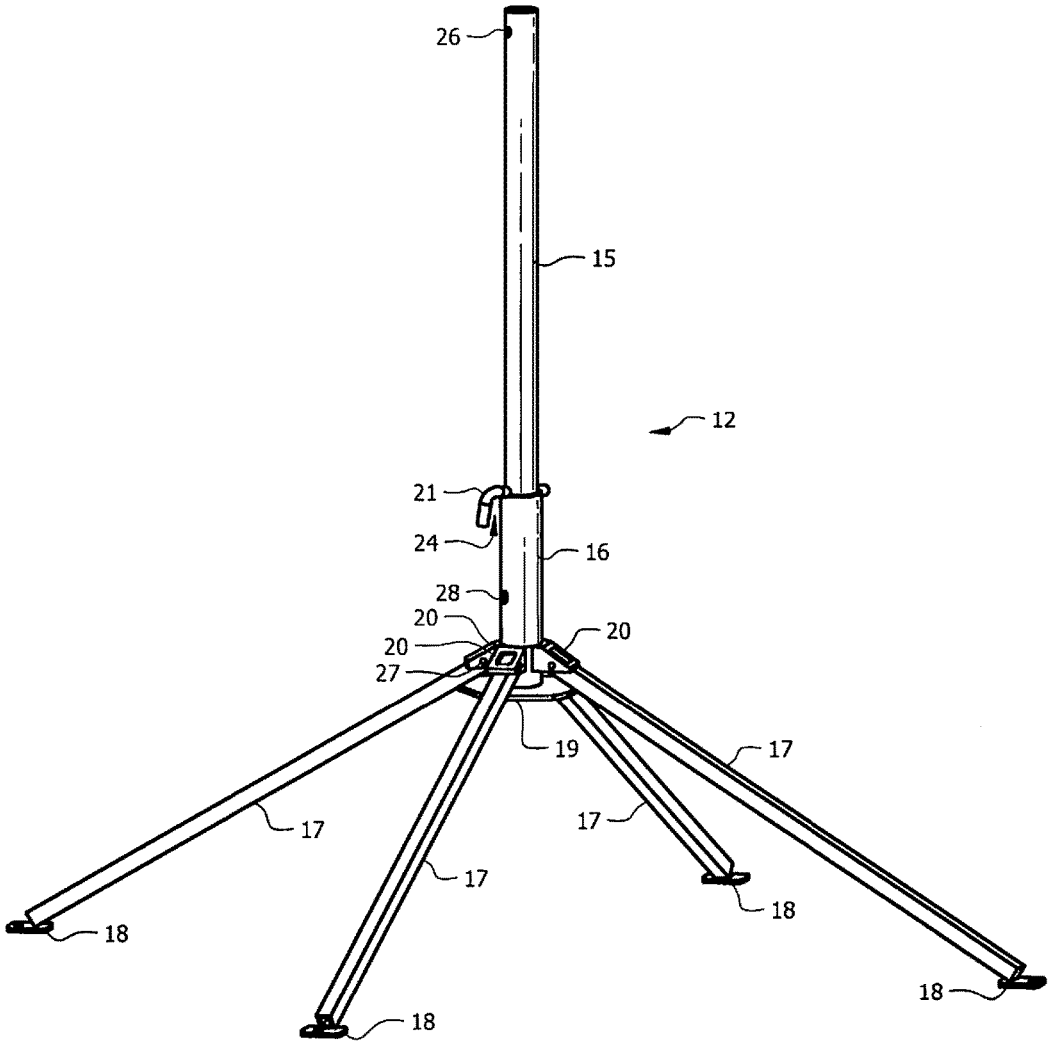

FIG. 3

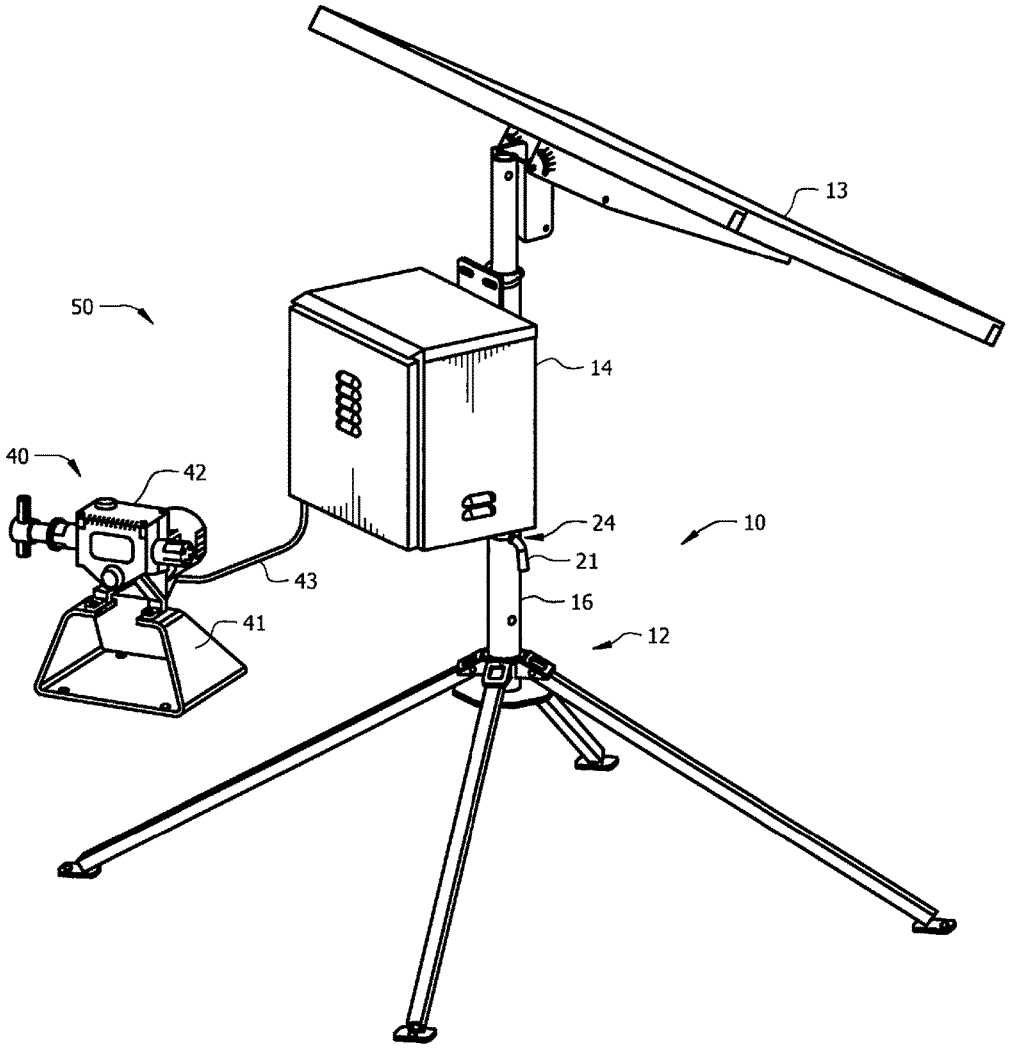

FIG. 4

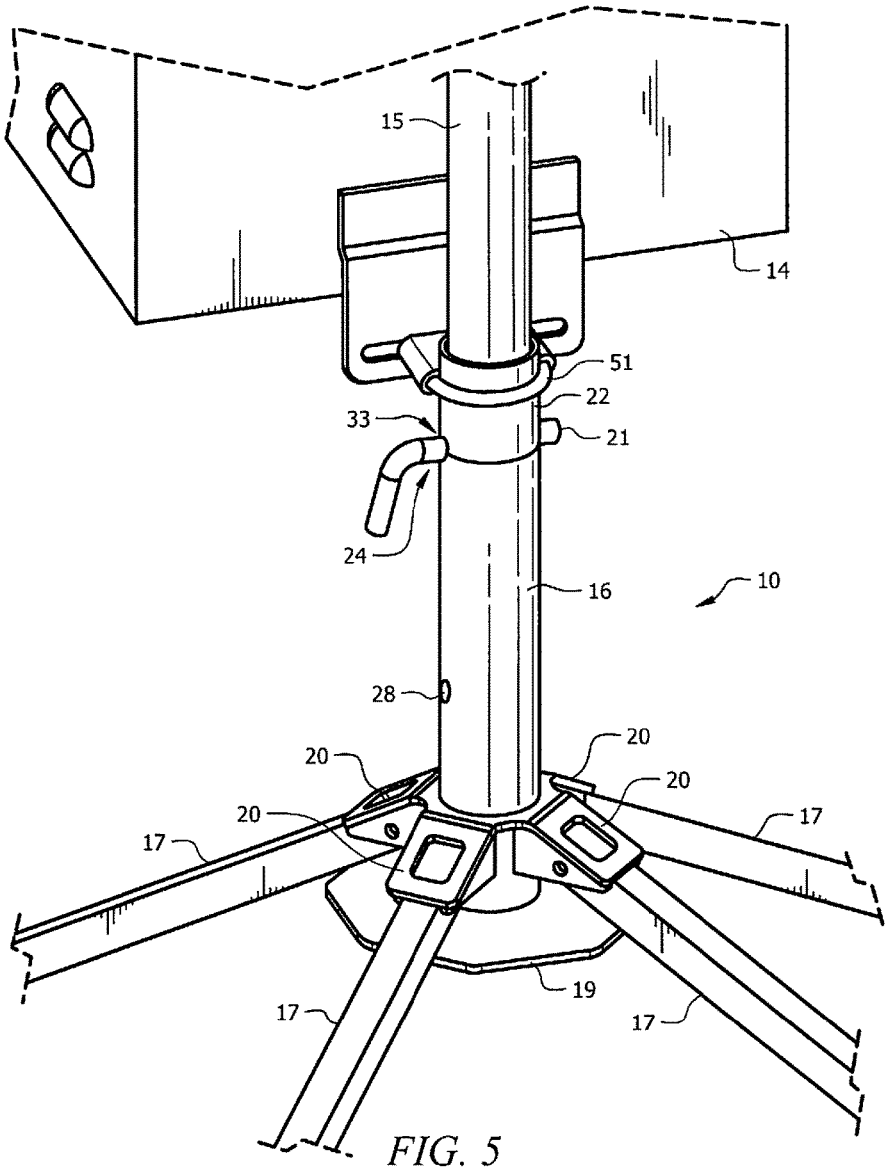

FIG. 5

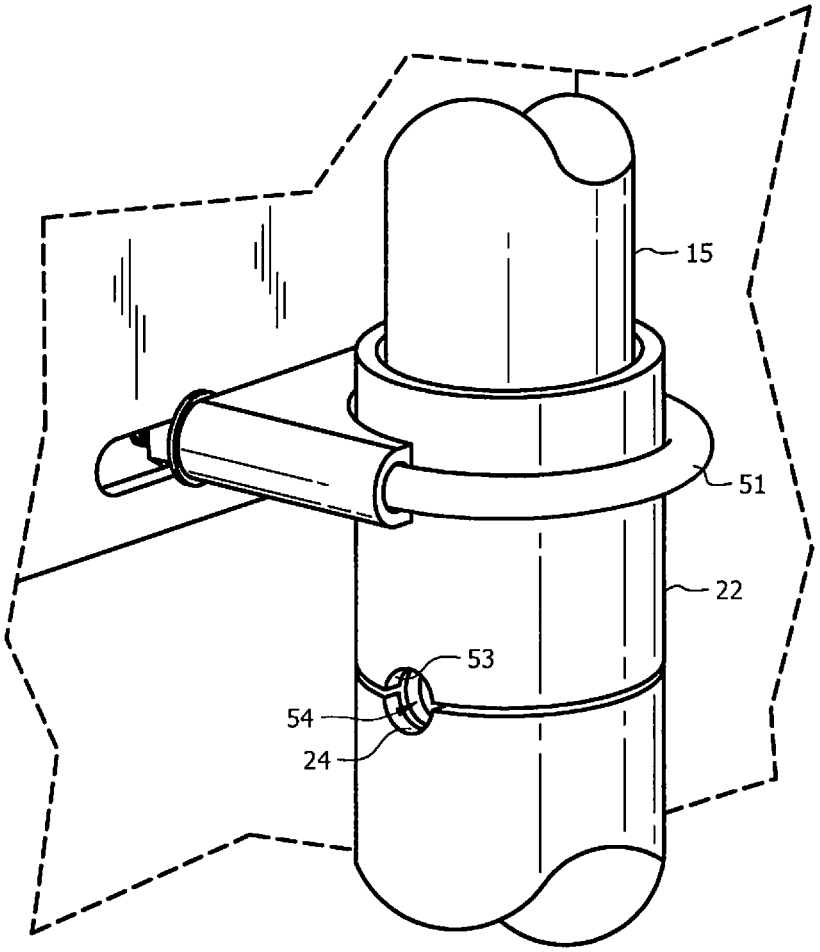

FIG. 6

SOLAR STAND

TECHNICAL FIELD

[0001] The present disclosure is directed to a stand for a solar panel, and more particularly to a collapsible stand for holding a solar panel and an electronics enclosure associated with a chemical pump in a non-rotatable orientation.

BACKGROUND OF THE INVENTION

[0002] When chemicals must be injected in remote locations, such as gas and oil wellheads or mines, a DC powered pump is commonly used. Typically a structure is provided to support one or more solar panels and an enclosure containing one or more batteries and control electronics for charging the batteries and operating a pump. A DC powered pump may be mounted on the structure as well, or on its own separate pedestal.

[0003] Typically, stands to support a solar panel for such an application are made with a base and a vertical pole. The base and pole are delivered apart and are joined onsite by inserting the pole into the base. A solar panel can then be mounted on the upper end of the pole. For ease of transport and to minimize cost the base is small (2'-3' square). The small base can result in instability where the solar panel is subject to windy environments. Further, joining pole to base usually requires fasteners, meaning tools are needed as well as spare fasteners to replace the inevitable lost hardware.

BRIEF SUMMARY OF THE INVENTION

[0004] In a preferred embodiment a stand for mounting a solar panel and an electronics enclosure is described. The stand includes a pole having a spreader attached to a bottom end of the pole, where the pole includes a first hole and second hole sized to accept a hitch pin, the first hole corresponds to a collapsed state of the stand and the second hole corresponds to a deployed state of the stand. A hub is slidably mounted to the pole and includes a first hole corresponding to the first hole in the pole and the collapsed state of the stand and a notch corresponding to the second hole in the pole and the deployed state of the stand. A plurality of legs are pivotably attached to the hub, where the legs spread outward from the hub by the spreader when the stand is in the deployed state. In the deployed state, the hitch pin is inserted through the second hole in the pole and rests in the notch in the hub, where the notch prevents the pole from rotating relative to the hub.

[0005] The foregoing has outlined rather broadly the features and technical advantages of the present invention in order that the detailed description of the invention that follows may be better understood. Additional features and advantages of the invention will be described hereinafter which form the subject of the claims of the invention. It should be appreciated by those skilled in the art that the conception and specific embodiment disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present invention. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the spirit and scope of the invention as set forth in the appended claims. The novel features which are believed to be characteristic of the invention, both as to its organization and method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] For a more complete understanding of the present invention, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

[0007] FIG. **1** is a perspective view of a stand system for a solar panel according to the concepts described herein;

[0008] FIG. **2** is a side view of a solar stand according to the concepts described herein in a collapsed state;

[0009] FIG. **3** is a perspective view of the solar stand of FIG. **2** in a deployed state;

[0010] FIG. **4** is a perspective view of a remote chemical pump system employing the solar stand system of FIG. **1**; and

[0011] FIGS. **5** and **6** are perspective views of the solar stand of FIG. **3** with an electronics enclosure attached.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Existing designs for solar panel stands utilize a small base and a pole that inserts into the base and is usually attached using nuts and bolts or other connecting hardware. The small base can make the stand unstable when a solar panel is attached since the solar panel can function as a sail in windy conditions. Further, keeping up with and transporting the separate components and connecting hardware can be tricky in the remote environments in which the solar stand is used.

[0013] The present design according to the concepts described herein uses a single piece design and can be transported in a very compact state. It can be erected very easily and quickly without the need for tools or connecting hardware. It has a broader footprint than competitive products, thereby providing much greater stability in high winds.

[0014] Referring now to FIGS. **1-3**, an embodiment of a solar panel stand system (FIG. **1**) and an embodiment of a solar stand (FIGS. **2** and **3**) according to the concepts described herein are shown. Stand system **10** includes a stand **12** with a solar panel **13** and electronic enclosure **14** attached. A preferred embodiment of stand **12** includes pole **15** to which solar panel **13** and electronics enclosure **14** can be attached. The solar panel is used to produce electricity that can be used to power equipment such as a chemical pump. The electronics enclosure contains power supply circuitry and a battery used to store electricity produced by the solar panel. Equipment, such as the chemical pump, can be plugged into the power supply circuitry and powered by the solar panel and/or battery.

[0015] Pole **15** is slidably inserted into hub **16** which has a number of legs **17** attached. In a preferred embodiment, stand **12** has four legs for increased stability but the stand may have three legs or five or more legs without departing from the scope of the concepts described herein. Legs **17** are attached to hub **16** by leg supports **20**. Leg supports **20** include pivot points **27** around which the legs can move relative to the hub. Leg supports **20** also set a maximum angle for the legs when fully deployed. Feet **18** at the end of

each leg **17** provide for increased stability when the stand is in use. At the end of pole **15** is spreader **19** which forces the legs outward as hub **16** is slide down pole **15** into its deployed position.

[0016] Stand **12** is shown in a collapsed position in FIG. **2** and a deployed or erect position in FIG. **3**. As described, pole **15** slides through hub **16** that has legs **17** permanently attached to it using leg supports **20** and pivots **27**. In its collapsed state, hub **16** is drawn up pole **15** (or pole **15** is inserted into hub **16**), this allows legs **17** to pivot downward and rest against pole **15** and hub **16**, as can be seen in FIG. **2**. Stand **12** can be held in the collapsed state by inserting a hitch pin **21** through a hole **28** in hub **16** and a corresponding hole in pole **15**.

[0017] To erect the stand, hub **16** is slid to the bottom of pole **15** and pinned in place by inserting a hitch pin **21** through a u-shaped notch **24** in the hub and into a matching hole in pole **15**. A spreader **19**, which is welded, or otherwise attached, to pole **15**, forces the legs **17** into position and prevents the legs from folding back down. When upright, gravity holds the hitch pin in notch **24** in the top edge of hub **16** to prevent the pole (and the solar panel attached to its top) from rotating relative to the hub. The electronics enclosure **14** has a top ring **23** and bottom ring **22** attached to it with U-bolts **52** and **51**, to allow it to slide over pole **15**. Another notch **53** (shown in FIGS. **5** and **6**) in the bottom edge of the bottom ring **22** prevents the enclosure from rotating around pole **15**, as is shown in greater detail with reference to FIGS. **5** and **6**.

[0018] To collapse for transport or storage, the solar panel **13** and its mount are removed and the electronics enclosure **14** with its attached rings is slid off the top of the pole **15**. The hitch pin **21** is removed and the hub **16** with its attached legs **17** is slid up the pole **15**. The hitch pin **21** is inserted into hole **28** in the hub and its corresponding hole **26** in pole **15** to hold the stand **12** in its collapsed state. When collapsed, preferred embodiments of stand **12** reduce to a roughly cylindrical volume that is 7" in diameter by 4' long. This is a significant benefit, allowing more systems to be loaded for transport to sites without requiring return trips. The stand system described herein can be erected in seconds with no tools. When erect, the legs extend to a footprint of 4' on a side. The legs **17** are locked in place to retain stability when high winds rock the system.

[0019] Referring now to FIG. **4**, a preferred embodiment of a remote pump system is shown. Pump system **50** includes solar stand assembly **10**, as shown in FIG. **1** and pump assembly **40**. Solar stand assembly **10** includes stand **12**, solar panel **13** and electronics enclosure **14**. As stated above, electronics enclosure **14** and solar panel **13** mount on stand **12**. Hitch pin **21** inserted through pole **15** secures stand **12** in the erect or deployed position. Notch **24** in hub **16** and a corresponding notch in the bottom ring described with reference to FIGS. **1-3**, prevent the electronics enclosure **14** and the solar panel **13** from rotating relative to stand **12**.

[0020] Pump assembly **40** consists of pump **42** mounted on pump stand **41**. Cable **43** connects pump **42** to electronics enclosure **14**. Cable **43** and electronics enclosure **14** provide power to pump **42**. Additionally, in certain embodiments, control circuitry for pump **42** could be included in electronics enclosure **14** with control signals also passing through cable **43**. In other embodiments, the control circuitry for pump **42** is included on pump **42**.

[0021] Referring now to FIGS. **5** and **6**, a detailed view of a preferred embodiment of the relationship between hub **16**, bottom ring **22** and pole **15** is shown. FIG. **5** shows the hitch pin **21** installed while FIG. **6** shows the assembly without hitch pin **21** inserted into hole **54**. Hitch pin **21** prevents electronics enclosure **14** from rotating by having notch **53** on bottom ring **22** engaged with hitch pin **21**. In order to rotate, electronics enclosure would have to lift up to free notch **53** from hitch pin **21**. The weight of electronics enclosure **14** prevents the lifting by the force of wind or unintentional contact with electronics enclosure **14**. Similarly notch **24** in hub **16** prevents pole **15** and thereby the solar panel from rotating in the same fashion. To rotate, pole **15** holding the solar panel would have to lift to free itself from notch **24** even without electronics enclosure **14** installed. With electronics enclosure installed the weight of the enclosure adds to the force required to rotate the solar panel.

[0022] Although the present invention and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the invention as defined by the appended claims. Moreover, the scope of the present application is not intended to be limited to the particular embodiments of the process, machine, manufacture, composition of matter, means, methods and steps described in the specification. As one of ordinary skill in the art will readily appreciate from the disclosure of the present invention, processes, machines, manufacture, compositions of matter, means, methods, or steps, presently existing or later to be developed that perform substantially the same function or achieve substantially the same result as the corresponding embodiments described herein may be utilized according to the present invention. Accordingly, the appended claims are intended to include within their scope such processes, machines, manufacture, compositions of matter, means, methods, or steps.

1. A stand comprising:

a pole having a fixed disk attached to a bottom end of the pole, the pole including a first hole and second hole sized to accept a hitch pin, the first hole corresponding to a collapsed state of the stand and the second hole corresponding to a deployed state of the stand;

a hub slidably mounted to the pole, the hub including a first hole corresponding to the first hole in the pole and the collapsed state of the stand and a notch corresponding to the second hole in the stand and the deployed state of the stand; and

a plurality of legs pivotably attached to the hub, the legs spread outward from the hub by the fixed disk when the stand is in the deployed state;

wherein, in the deployed state, the hitch pin is inserted through the second hole in the pole and rests in the notch in the hub, the notch preventing the pole from rotating relative to the hub.

2. The stand of claim **1** further comprising an electronics enclosure mounted to the stand using a top ring and a bottom ring attached to the electronics enclosure, the top ring and the bottom ring sliding onto the pole.

3. The stand of claim **2** wherein the bottom ring includes a notch that engages with the hitch pin and prevents the electronics enclosure from rotating.

4. The stand of claim **1** wherein the plurality of legs comprises four legs.

5. The stand of claim **1** wherein the plurality of legs attach to the hub using a plurality of leg supports, each of the plurality of leg supports corresponding to one of the plurality of legs, wherein the plurality of leg supports holds the plurality of legs at a desired angle from the hub when the stand is in the deployed state.

6. The stand of claim **1** further comprising a solar panel mounted to the top of the pole.

7. A method for deploying a portable stand, the method comprising:

sliding a hub along a pole, the pole having a fixed disk attached to a bottom end of the pole, the pole including a first hole and second hole sized to accept a hitch pin, the first hole corresponding to a collapsed state of the stand and the second hole corresponding to an deployed state of the stand and the hub including a first hole corresponding to the first hole in the pole and the collapsed state of the stand and a notch corresponding to the second hole in the stand and the deployed state of the stand wherein a plurality of legs pivotably attached to the hub spread outward from the hub by the fixed disk when the stand is in the deployed state; and

inserting the hitch pin through the second hole in the pole such that the hitch pin rests in the notch in the hub, the notch preventing the pole from rotating relative to the hub.

8. The method of claim **7** wherein the stand further comprises an electronics enclosure mounted to the stand using a top ring and a bottom ring attached to the electronics enclosure, the top ring and the bottom ring sliding onto the pole.

9. The method of claim **8** wherein the bottom ring includes a notch that engages with the hitch pin and prevents the electronics enclosure from rotating.

10. The method of claim **7** wherein the plurality of legs comprises four legs.

11. The method and of claim **7** wherein the plurality of legs attach to the hub using a plurality of leg supports, each of the plurality of leg supports corresponding to one of the plurality of legs, wherein the plurality of leg supports holds the plurality of legs at a desired angle from the hub when the stand is in the deployed state.

12. The method of claim **7** wherein the stand further comprises a solar panel mounted to the top of the pole.

13. A power supply for a remote pump comprising:

a stand, the stand comprising: a pole having a fixed disk attached to a bottom end of the pole, the pole including a first hole and second hole sized to accept a hitch pin, the first hole corresponding to a collapsed state of the stand and the second hole corresponding to an deployed state of the stand; a hub slidably mounted to the pole, the hub including a first hole corresponding to the first hole in the pole and the collapsed state of the stand and a notch corresponding to the second hole in the stand and the deployed state of the stand; and a plurality of legs pivotably attached to the hub, the legs spread outward from the hub by the fixed disk when the stand is in the deployed state; wherein, in the deployed state, the hitch pin is inserted through the second hole in the pole and rests in the notch in the hub, the notch preventing the pole from rotating relative to the hub;

a solar panel mounted to the stand;

an electronics enclosure mounted to the stand and electrically connected to the solar panel, the electronics enclosure including a battery and power supply circuitry.

14. The power supply of claim **13** wherein the electronics enclosure mounts to the stand using a top ring and a bottom ring attached to the electronics enclosure, the top ring and the bottom ring sliding onto the pole.

15. The power supply of claim **14** wherein the bottom ring includes a notch that engages with the hitch pin and prevents the electronics enclosure from rotating.

16. The power supply of claim **13** wherein the plurality of legs comprises four legs.

17. The power supply and of claim **13** wherein the plurality of legs attach to the hub using a plurality of leg supports, each of the plurality of leg supports corresponding to one of the plurality of legs, wherein the plurality of leg supports holds the plurality of legs at a desired angle from the hub when the stand is in the deployed state.

18. The power supply of claim **13** wherein the solar panel mounts to the top of the pole.

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