SOLAR COLLECTOR SUPPORT WINGS FOR EFFICIENT STORAGE AND DEPLOYMENT OF SOLAR COLLECTORS ON A MOBILE STRUCTURE

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ABSTRACT

Deployable wings supporting solar collector arrays for mobile structures and associated methods of use are disclosed that provide significant power generation capacity, easy deployment, shaded work areas, and protection for solar collector arrays during transport. Some embodiments include a support surface configured to be hingedly coupled to a vehicle, a plurality of support rails extending away from the support surface to form at least one cavity, a solar collector array coupled to the support surface and within the at least one cavity, and at least one retractable cover configured to selectively cover the at least one cavity.
SOLAR COLLECTOR SUPPORT WINGS FOR EFFICIENT STORAGE AND DEPLOYMENT OF SOLAR COLLECTORS ON A MOBILE STRUCTURE

RELATED APPLICATIONS

[0001] This application claims priority to U.S. provisional patent application No. 61/271,925, entitled Sustainable, Mobile, Expandable Structure, filed Jul. 28, 2009, which is incorporated herein by reference in its entirety.

FIELD

[0002] This application relates generally to solar collector mounts, and particularly to solar collector mounts for vehicles.

BACKGROUND

[0003] Solar power is becoming increasingly desirable and necessary as other fuel sources become harder to find and more expensive. Solar power provides the advantage that the energy source (the Sun) is freely available throughout the planet, requiring only solar collectors to harvest the power. Solar collectors are getting thinner, lighter, and more efficient as time goes on, making them more viable for more applications.

[0004] However, mobile solar collector applications have been limited because of the relatively low power output per area and the necessity of heavy batteries for utilizing solar power at night or when the Sun is otherwise obstructed. Because of the required surface area of solar collectors to provide more than a trivial amount of power, solar collectors have been generally impractical for vehicles such as cars, trucks, trailers, etc.

[0005] Additionally, the potential for damage to the collectors when transporting them on the exterior of vehicles by road debris, requiring the collectors to be stored on the interior of the vehicle for transport, or simply bearing the increased risk of damage. Since solar collectors can be expensive, frequent damage to collectors by road debris is very undesirable, lessening the utility of solar collectors on vehicles and reducing the availability of mobile, solar-powered remote solutions for a multitude of problems.

SUMMARY

[0006] Deployable wing supporting solar collector array for mobile structures and associated methods of use are disclosed that provide significant power generation capacity, easy deployment, shaded work areas, and protection for solar collector arrays during transport. Some embodiments include a support surface configured to be hingedly coupled to a vehicle, a plurality of support rails extending away from the support surface to form at least one cavity, a solar collector array coupled to the support surface and within the at least one cavity, and at least one retractable cover configured to selectively cover the at least one cavity.

[0007] In some embodiments, the support structure is configured to be rotated between a stored configuration and a deployed configuration. In the stored configuration, the support surface can be parallel with a side of the mobile structure and with the at least one retractable panel covering the at least one cavity to protect the solar collector array. The support structure can be generally parallel with a roof of the mobile structure in the deployed configuration. The solar collector array can also extend out of the at least one cavity for solar energy collection in the deployed configuration.

[0008] Some embodiments include support legs configured to selectively hold the support surface in a generally horizontal position. The support legs can be coupled to the vehicle and to the support surface, and can include hydraulic actuators. The support structure can also provide a covered work space below the support surface in the deployed configuration.

[0009] Some embodiments, the support structure can include an eave coupled to an end of the support surface. The end of the support surface coupled to the eave can be opposite an end of the support structure configured to be hingedly coupled to the vehicle. The at least one retractable panel can extend out of the eave. The at least one retractable cover can be a sectioned metal door. The vehicle can be a trailer, such as a semi-trailer.

[0010] The support structure can be transported and the solar array deployed by; providing a vehicle with deployable wings hingedly attached to the vehicle, the deployable wings including a solar collector array and retractable covers for covering the solar collector array; placing the deployable wings in a transportation configuration; transporting the vehicle; and deploying the solar collector array.

[0011] The deployable wings can be placed in a transportation configuration by; moving the deployable wings to a vertical position parallel to a vertical surface of the vehicle; placing each collector of the solar collector array flat against a support surface of the deployable wings; and covering the solar collector array with at least one retractable cover.

[0012] Similarly, the solar collector array can be deployed by; uncovering the solar collector array by retracting the at least one retractable cover; extending the solar collector array away from the support surface of the deployable wings; and rotating the deployable wings to a generally horizontal position such that the solar collector array is positioned to capture solar energy. The deployable wings can provide a work area when deployed, with light fixtures to provide light to the work area.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The following description can be better understood in light of Figures, in which:

[0014] FIG. 1 is a perspective drawing of trailer with an exemplary deployable wings in transport configuration;

[0015] FIG. 2 is a perspective drawing of the deployable wings of FIG. 1 with the solar collectors uncovered;

[0016] FIG. 3 is a perspective drawing of the deployable wings of FIG. 1 with the solar collector array ready for deployment;

[0017] FIG. 4 is a perspective drawing of the deployable wings of FIG. 1 in a deployed configuration;

[0018] FIG. 5 is a perspective drawing of an exemplary deployable wings unattached from a vehicle;

[0019] FIG. 6 is a perspective drawing of exemplary deployable wings attached to a semi-trailer; and

[0020] FIG. 7 is a perspective drawing of the deployable wings of FIG. 6 in a deployed configuration.

[0021] Together with the following description, the Figures demonstrate and explain the principles of deployable wings for vehicles and associated methods of use. In the Figures, the size, number and configuration of components may be exag-
gerated for clarity. The same reference numerals in different Figures represent the same component.

DETAILED DESCRIPTION

[0022] The following description supplies specific details in order to provide a thorough understanding. Nevertheless, the skilled artisan would understand that embodiments of deployable wings and associated methods of using them can be implemented and used without employing these specific details. Indeed, exemplary embodiments and associated methods can be placed into practice by modifying the illustrated units and associated methods and can be used in conjunction with any other devices and techniques conventionally used in the industry. For example, while the description below generally focuses on embodiments of deployable wings for trailers, similar support structures can be used with RV's (i.e. motorhomes, travel trailers, campers), mobile homes, boats, mobile clinics, mobile classrooms, mobile work trailers (such as those commonly used at construction sites), etc., or other applications where it would be advantageous to have a deployable solar collector array with a protective covering.

[0023] FIGS. 1-4 illustrate an embodiment of deployable wings 100 attached to trailer 110. Deployable wings 100 can be attached to trailer 110 with a hinge (not shown) at a top exterior corner on the side of trailer 110. Trailer 110 can include frame 112 and wheels 114. Trailer 110 may be any conventional trailer outfitted with connection reinforcements for coupling with deployable wings 100.

[0024] Deployable wings 100 can include support surface 120, solar collector array 130, and protective covers 140. Support surface 120 can include support rails 142 extending from support surface 120 to form one or more cavities. Support rails 142 can provide support and pathways for individual panels of protective cover 140 to be deployed and retracted. As shown in FIGS. 1 and 2, protective cover 140 can include one or more individual metal sectional doors that can be rolled into a generally cylindrical shape or accordion configuration, similar to the retracted doors on a beverage truck. Protective cover 140 can be stored in the rolled form when retracted inside of eaves 144.

[0025] In some embodiments, protective cover 140 may be formed of any material and configuration sufficiently strong to prevent damage to solar collectors 132 by road debris. Additionally, protective covers 140 may also provide a theft deterrent similar to the protective covers of beverage trucks. FIG. 2 shows protective covers 140 retracted into eaves 144, revealing individual solar collectors 132.

[0026] Solar collectors 132 of solar collector array 130 may be placed in the cavities formed by support surface 120 and support rails 142. Solar collectors 132 may be hidden during transport, covered with protective cover 140, as shown in FIG. 1. As shown in FIG. 3, solar collectors 132 of solar collector array 130 may be deployed and positioned in preparation for deploying wings 100 into the deployed configuration shown in FIG. 4.

[0027] To deploy, support surface 120 can be rotated up to a generally horizontal position and supported by support legs 124. In the deployed position, support surface 120 can provide shaded working area 180 under support surface 120, while positioning solar array 130 to collect solar power for use in trailer 110 and shaded working area 180. In some embodiments, nets, curtains, or temporary wall may be used to provide additional cover and enclosure for shaded working area 180.

[0028] FIG. 5 illustrates deployable solar collector support structure 200 detached from a vehicle and supported by multiple support legs 224. Light fixtures 226 can provide light to shaded working area 280. In this and similar embodiments, a vehicle similar to those shown in FIGS. 1-4 or 6-7 brings deployable solar collector support structure 200 to a location, deploys similar to as is discussed above with additional support legs 224, and then detached from vehicle to allow the vehicle to move to a different location, for example, to retrieve additional supplies for use in shaded working area 280.

[0029] Turning now to FIGS. 6 and 7, deployable wings 300 can be attached to semi trailer 310 and transported with semi tractor 318. Deployable wings 300 can function similar to and have similar components to deployable wings 100 and 200 described above. Each of deployable wings 300 can include support surface 320, solar array 330 formed from solar collectors 332, protective covers 340 storable in eaves 344 and guided by support rails 342 between deployed and retracted positions, each shown in FIG. 6.

[0030] Support legs 324 can be used to automatically deploy wings 300 to the deployed configuration as shown in FIG. 7. Support legs 324 can be driven by a cable retraction system, hydraulic or pneumatic cylinders, or any other actuator system for rotatable raising objects having similar size and mass.

[0031] Embodiments of deployable wings, such as those discussed above, can be used with conventional vehicles, such as semi trailers, to quickly and efficiently deliver a self-powered work station where needed. For example, immediately following a natural disaster, such as an earthquake, tornado, hurricane, tsunami, etc., a trailer with attached deployable wings can be loaded with supplies, brought to the disaster location and deployed to quickly and effectively provide powered work areas for disaster relief efforts. Of course, other uses and modifications for embodiments of deployable wings will be apparent to those of ordinary skill in the art within the scope of the invention.

[0032] In addition to any previously indicated modification, numerous other variations and alternative arrangements can be devised by those skilled in the art without departing from the spirit and scope of this description, and appended claims are intended to cover such modifications and arrangements. Thus, while the information has been described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred aspects, it will be apparent to those of ordinary skill in the art that numerous modifications, including, but not limited to, form, function, manner of operation and use can be made without departing from the principles and concepts set forth herein. Also, as used herein, examples are meant to be illustrative only and should not be construed to be limiting in any manner.

1. A solar collector array support structure, the support structure comprising:
   a pair of wings, each of the pair of wings being made to support a solar collector array; and
   a connector coupled to each wing, the connector being made to hingedly connect the wing to a mobile structure.
2. The solar collector array support structure of claim 1, further comprising supports configured to selectively maintain each of the pair of wings in a generally horizontal position.
3. The solar collector array support structure of claim 2, wherein the supports include hydraulic actuators.
4. The solar collector array support structure of claim 2, wherein the supports are coupled to the vehicle and to each wing.
5. The solar collector array support structure of claim 1, wherein each of the wings swings outward from a stored configuration to a deployed configuration.
6. The solar collector array support structure of claim 5, wherein each wing is parallel with a side of the mobile structure when each of the wings are in the stored configuration.
7. The solar collector array support structure of claim 5, further comprising at least one retractable panel for protecting the solar collector array when each of the wings are in the stored configuration.
8. The solar collector array support structure of claim 5, wherein each of the wings is substantially parallel with a roof of the mobile structure when each of the wings are in the deployed configuration.
9. The solar collector array support structure of claim 5, wherein solar collectors of the solar collector array extend outwardly from the wings when each of the wings is in the deployed configuration.
10. The solar collector array support structure of claim 5, wherein each of the wings provides a sheltered work space below the wings when each of the wings is in the deployed configuration.
11. The solar collector array support structure of claim 7, further comprising an awning coupled along an outer edge of each of the wings.
12. The solar collector array support structure of claim 11, wherein the at least one retractable panel is retractable into the awning.
13. The solar collector support structure of claim 1, wherein the mobile structure is a trailer.
14. The solar collector support structure of claim 13, wherein the trailer is a semi trailer.
15. A method for transporting and deploying a solar collector array, the method comprising:
   providing a mobile structure with a pair of wings hingedly attached to the vehicle, each of the pair of wings including a solar collector array and retractable covers for covering the solar collector arrays;
   placing the wings in a transportation configuration by:
      moving the wings to a downward position parallel to a side of the mobile structure;
   placing the solar collectors of each solar collector array flat against a support surface of each of the wings; and
   covering each solar collector array with at least one retractable cover;
   transporting the mobile structure; and
   deploying each solar collector array by:
      uncovering each solar collector array by retracting the at least one retractable cover;
      extending each solar collector array away from the support surface of each of the wings; and
      swinging the wings outwardly to a generally horizontal position such that the solar collector array is positioned to capture solar energy.
16. The method of claim 15, wherein the mobile structure is a trailer.
17. The method of claim 16, wherein the trailer is a semi trailer.
18. The method of claim 15, wherein the at least one retractable cover is a sectioned metal door.
19. The method of claim 15, wherein the wings each provide a sheltered work area when deployed.
20. The method of claim 15, further comprising detaching the wings from the vehicle.

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