Solar energy agricultural irrigation system comprising a photovoltaic cell module

The present invention discloses a solar energy agricultural irrigation system comprising a photovoltaic cell module, a control inverter and a pump load, and the photovoltaic cell module is electrically connected to the pump load by means of a control unit. Preferably, the pump load comprises an a submerged pump that communicates with the irrigation line with a submersible pump. Further, it may also include a power storage unit electrically connected to the photovoltaic cell module and the pump load by means of a control unit. The invention has the advantages of no need of arranging the power supply line and eliminating the need of additional cost of coal, oil and electric energy, which is energy saving and environmental protection, low cost, stable running performance and high energy utilization rate, and is suitable for wide use in a variety of environments.

Technical field

The present invention relates to an agricultural irrigation system, and more particularly to a solar agricultural irrigation system.

Background technique

Irrigation agriculture is a stable and high-yielding agriculture all over the world, mainly through various agricultural irrigation facilities to meet the needs of crops for moisture, adjust the land temperature, humidity and soil air, nutrients, improve land production capacity. The traditional manpower, Xuzhou pump load due to the existence of low efficiency and other defects, it has been basically a modern internal combustion drive, electric drive pump load, etc., but the modern pump load in the application there are still many defects, for example, Need to arrange long-distance power supply network, or need to spend a lot of gasoline, kerosene energy, energy consumption, high cost.

The contents of the invention

It is an object of the present invention to provide a solar energy agricultural irrigation system which has the advantages of

environmental protection, energy saving, stable operation performance, high energy efficiency and wide range of use, thereby overcoming the deficiencies of the prior art.
In order to achieve the above object, the present invention adopts the following technical scheme:

A solar energy agricultural irrigation system characterized in that it comprises a solar cell module, a control unit and a pump load, said solar cell module being electrically connected to the pump load by means of a control unit.

As one of the preferred embodiments, the inverter comprises a DC-DC boost circuit and a frequency converter electrically connected to the DC-DC boost circuit, and the DC-DC boost circuit is electrically connected to the solar cell module The inverter is electrically connected to the pump load.
As one of the preferred embodiments, the DC-DC boost circuit includes a push-pull forward circuit, an ASIPM module, and a control unit, which are connected to the solar cell module and the control unit by a push-pull forward circuit and an isolation drive circuit with.

As one of the preferred embodiments, the ASIPM module further includes a combination of any one or more of a fault output circuit, an overheat protection circuit, an undervoltage protection circuit, and an overcurrent short circuit protection circuit, and the fault output circuit Protection circuit, under voltage protection circuit, overcurrent short circuit protection circuit are connected with the control unit.

As one of the preferred embodiments, the control unit is also connected to at least one of an alarm circuit, an array bus voltage detection module, and a water level detection module.

As one of the preferred embodiments, the control unit uses a built-in DSP microcontroller.

As one of the preferred embodiments, the solar agricultural irrigation system further comprises a power storage unit electrically connected to the solar cell module and the pump load by means of a control unit.

As one of the preferred embodiments, the pump load includes an a submerged pump that communicates with an irrigation line with a submersible pump.

The working principle of the invention is as follows: when the sunlight is irradiated on the solar cell module, the component generates electric energy through the photovoltaic effect, and the electric energy is converted into the current and voltage required for the pump load to realize the efficient and stable operation of the farmland irrigation.

Sun light boosted Solar PV integrated in building façade

The invention is located in the technical sectors of renewable energies, specifically photovoltaic solar energy, energetic efficiency and integration of energy generation in the enveloping of buildings or urban or street elements (BIPV). Prior art The majority of urban and street elements, such as for example street lamps, bus stops, parking meters, motorway toll booths, charging facilities, kiosks and advertising sites, amongst others, need electricity supply to feed the various electric and/or electronic devices thereof, such as lighting, chargers, advertising or informative screens, etc. Although generally, said elements are connected to the network, it is increasingly more common for them to incorporate an electricity generation system, normally solar photovoltaic, and even a storage system which can allow autonomy.

There are a multitude of examples of urban elements with photovoltaic technology incorporated. One example of solar street lamps is provided by Chong and Kong in the patent, WO/2014/126453, Wang and Wang (patent ON 101009071 A), Hao et al. (patent ON 101781939 A), or Freitas et al.
(patent US 2014/0080406 Al) can be named as an example of bus stops; solar kiosks are also found, such as for example that proposed by Hixson and Creswell in the patent, US 2013/0033222 Al. Many of these can even be applied to assembly systems for solar modules, as Depaw proposes in the patent EP 2 369 266 A2. It is also usual for said systems to be

able to incorporate intelligent management devices, as Freitas et al. propose in the patent already mentioned.

One element common to all these is the difficulty of combining the urban or street element with the photovoltaic solar module, both aesthetically and technically. Given that for the most part, standard, commercially available, photovoltaic modules are provided, the modules are an element external to the urban or street element. This involves orientations and inclinations which break the aesthetic of the element, even sometimes not allowing the integration CA 02961287 2017-03-14 thereof in accordance with the urban environments.
Although there are architectonic integration solutions, these are generally energetically inefficient and also have a higher cost.

The examination of the prior art reports that a significant improvement both in the performance as well as in the aesthetic of the urban and street elements, which generate energy, would be to achieve the architectonic integration of the solar module at low cost. The present invention proposes to use the versatility of the holographic solar concentration (HSC) modules with the urban and street elements. The HSC modules have, amongst other elements, a hologram and solar cells, and the hologram always directs the light towards these solar cells, whatever the orientation of the module.

There exist various versions of HSC modules developed by the applicant, such as for example the 3rd generation in the patent US20080257400 from Mignon and Han, in which a flat HSC module is presented; the 4th generation with a tridimensional module with a concentration factor between 3 and 10x in the patent ESP 201331199 from Cab o et al.; or the document "Modular system for solar concentration without tracking by means of combining conventional optics and holographic optical elements (HOES)" from Rodriguez et al. and pending patenting, which presents the 5th generation, a flat HSC module capable of reaching concentration factors from 10x and which separates the optics from the generation part. All these HSC modules can act independently or architectonically integrated, and at a lower cost than that of the conventional flat solar modules, which can even reach 0.25 euros per watt peak. The versatility of these

HSC modules is translated into the form and orientation which they can adopt, since the hologram which they integrate, allows the light from the sun to be captured at a multitude of orientations, without tracking, with high efficiency. Thus, they can be adapted to various forms (straight, curved, round, etc.) and orientations (horizontal, vertical, north, south, east and/or west)