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CONTROL OF SOLAR POWER SYSTEMS

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Abstract: *The goal of this work is to supplement the swivelling solar system for battery and the solar regulator so that the system was independent of the electrical network. The theoretical part of this work deals with the description of the principle of photovoltaic panels, their kinds and the methods of use. The solar controller that I made it regulates charging battery from the solar panel and also checks its status. The procedure of proposition controller, its parameters and properties, are described together with the adjustment of the system in the practical part.*
Key words: *Solar system, solar charger controller, microcontroller*

1. INTRODUCTION

Nearly all the energy that we have on the Earth comes from the Sun. On the Earth annually about 1540 peta kWh of solar energy land on. This is about 15 000 times more than the global energy consumption. In view of this finding there are taken the steps to use the largest energy source. Generating electricity directly from sunlight is environmentally friendly and cleanest way of its production. To convert sunlight into electricity there are widely used the solar cells, which comprise the solar panels of various sizes.

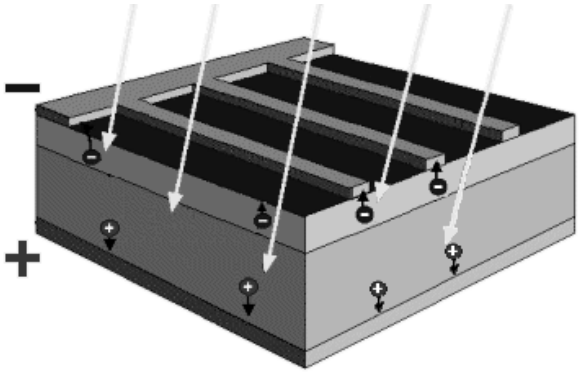

Fig. 1. Ultrasonic detectors kit

Fig. 2. Polycrystaline cell

Active layer of the solar panel is made of silicon crystals. According to the scheme, in which the crystals are arranged, solar panels can be divided into three groups. This is the monocrystal, polycrystalline and amorphous crystals.

Panels based on silicon are also sometimes called as PV-Si systems. PV-Si systems are divided into PV-c-Si systems and PV-a-Si. The first category includes panels based on monocrystalline and polycrystalline silicon. Another category, called PV-a-Si includes single-or multi-layer panels based on amorphous silicon.

Fig. 3. Panel of amorphous silicon

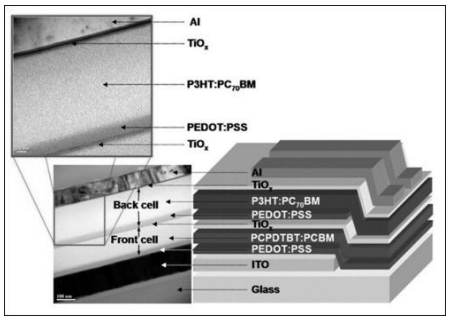

Fig. 4. Cross section of a tandem solar cell structure of organic polymers

2. SOLAR SYSTEMS

The solar systems can be divided into four groups. Each group has distinctive features, but some parts are identical in all groups (Mahdal, 2008). The most important group are clearly network systems (grid-on). The solar systems can be divided as follows:

- Minor applications
- Island systems (grid – off)
- Network systems (grid – on)
- BIPV – Building Integrated Photovoltaics.

3. DEVELOPMENT OF AUTONOMOUS SOLAR SYSTEM

A model of the solar panel consists of eight solar cells made from monocrystalline silicon. The cells are mounted on a

plastic plate of 500 x 260 mm and a thickness of 5 mm. The panel is attached to the massive structure, which enables the shooting of the two axes (Chudy, 1999). Propulsion is provided by two DC motors with gears. The entire system is controlled by a microcontroller, which evaluates the signals from the sensor position of the sun and simultaneously controls the integrated circuit for motor control (Fraden, 2004). Energy produced by solar panel is used for charging the battery from which the entire system is powered on. We can say that it is an island system (grid-off).

3.1 Sun position sensor

Sun's position is monitored by two sensors, which are closely aligned with the horizontal axis of the solar panel. The first sensor monitors the vertical position and a second horizontal position. Sensors are made of photoconductive cells, which are involved in bridge (Dado,1999).

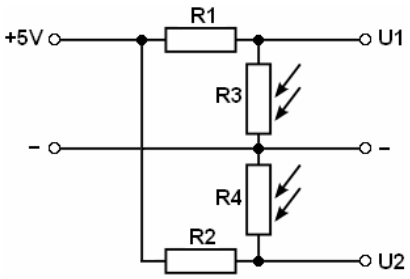

Fig. 5. Bridge involving the sun position sensor

The core of the swivel solar system is a single-chip microcontroller Motorola MC68HC908QY4 (Novak, 2007). Provides input-voltage sensing using eight bit A/D converter of solar sensors and evaluate their values (Babiuch, 2002).

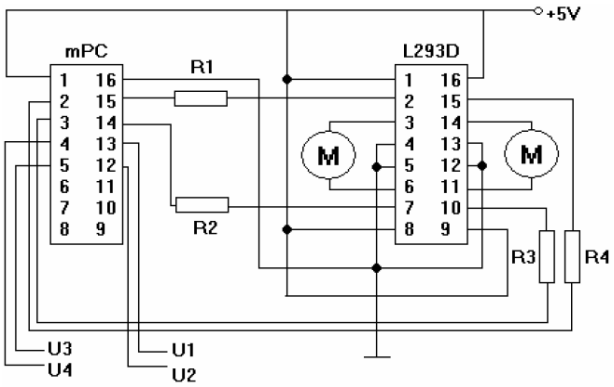

Fig. 6. Involving control circuit

3.2 The solar controller

Solar regulator is used for recharging batteries. Diagram of the controller is shown in the picture (Formanek, 2006).

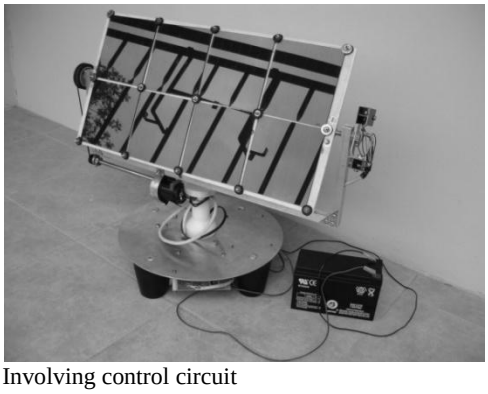

Fig. 7. Involving control circuit

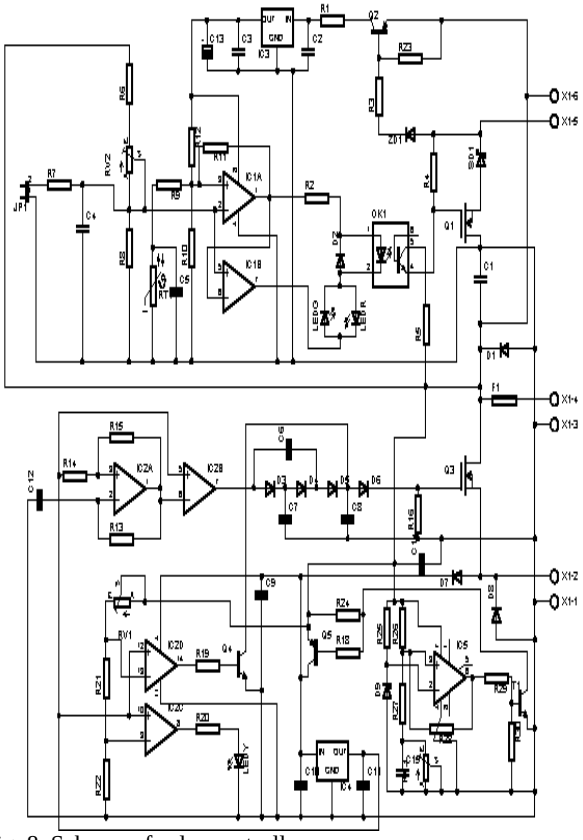

Fig. 8. Scheme of solar controller

4. CONCLUSION

System is designed only for demonstrational purposes, but in case connecting more efficient FP panel, it could be used to produce energy to power other appliances. The device is completed maintenance free lead accumulator from Sunnywey with the rated voltage 12V. So that is not depended on the electricity grid.

5. ACKNOWLEDGEMENTS

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