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Solution for Improve the Efficiency of Solar Photovoltaic Installation

This paper present a solution for improving efficiency of solar photovoltaic installation, realized with fixed solar photovoltaic modules, placed in solar parks or individual installations. The proposed solution to increase the radiation on the solar photovoltaic panels is to use some thin plates covered with a reflective blanket, mounted in front of the solar photovoltaic modules, with the possibility of their adjustment.

Keywords: *solar radiation, photovoltaic module, improving efficiency*

1. Introduction

Once with the increase of electric energy produce in solar photovoltaic parks with installed powers of MW order, as well as those realized by individual producers with powers of kW orders, there is a higher interest to growth the produced energy, by improving the efficiency of solar photovoltaic installations. This objective can be obtained mainly by increasing efficiency of solar photovoltaic cells and modules, or by increasing the solar radiation on the existing modules. The power generation of solar PV can be increased using sun tracking technology, their design being usually very complicated and expensive. Those units are presenting difficulty in installation and shows interest to be mounted in high solar radiation areas, where the expected overall of the total energy generation with respect to fix PV, follows to increase thereby, significantly.

The growth of efficiency of solar photovoltaic plants can be obtained using sophisticated materials and technologies, but expensive, high investments are made in order to gain a little percentage in energy conversion efficiency, or instead increasing the solar radiation on the photovoltaic modules, that can be obtained through simple solutions, as proposed in this paper [1].

2. Solution for improve the radiation on solar photovoltaic modules

The solar cell efficiency is defined as being the ration between the electrical out-put of the solar cell to the incident energy, in form of sunlight [2]. So, a solar cell with certain power output, defined and measured, by convention, under standard test conditions (STC), specified a temperature of 15 °C and an irradiance of 1000 W/m², increasing the solar radiation and by increases his annual energy yield. The energy conversion efficiency (η) of a solar cell is determined as the ratio between the power output of the module at his maximum power point (MPP- P_M , in watts) by the input light (E , in W/m²) and the surface area of the solar module (A_C , in m²):

$$\eta = \frac{P_M}{E \times A_C} \quad (1)$$

The cell's conversion efficiency is affected by several factors, including reflectance efficiency, thermodynamic efficiency, charge carrier separation efficiency, and conduction efficiency values [3].

There are known systems which increase the solar radiation by solar photovoltaic installation, using tracking systems after sun. Those require sensors who command one electric motor, equipped with drive transmission of motion to axis of modules, providing movement in two planes. This solutions necessity an complex system for moving the solar photovoltaic modules and the grow of solar radiation obtained by orientation after the sun is in a great measure canceled by consummation of electric energy for the electric drive transmission plus extra investments costs for those systems.

The proposed solution consist in increasing the total solar radiation [7] by adding to the direct radiation, the reflected radiation obtained using reflective plates associate with each solar module. In this way it's possible to obtain a higher solar radiation, in any condition of insolation, so that the electric energy obtained by solar photovoltaic conversion increase and the efficiency of the system becomes better.

The solution presented in figure 1 a. represents a section and figure 1.b a view through the solar photovoltaic installation. Be noticed the thin plates **1** covered with a reflected blanket **2**, mounted before the solar photovoltaic modules **3** and fixed with adjustable pieces **4** with fasten screw **5**.

In this mode it becomes possible to increase the solar radiation and so the efficiency of the installation, but it's necessary to adjust the position of the reflected pieces.

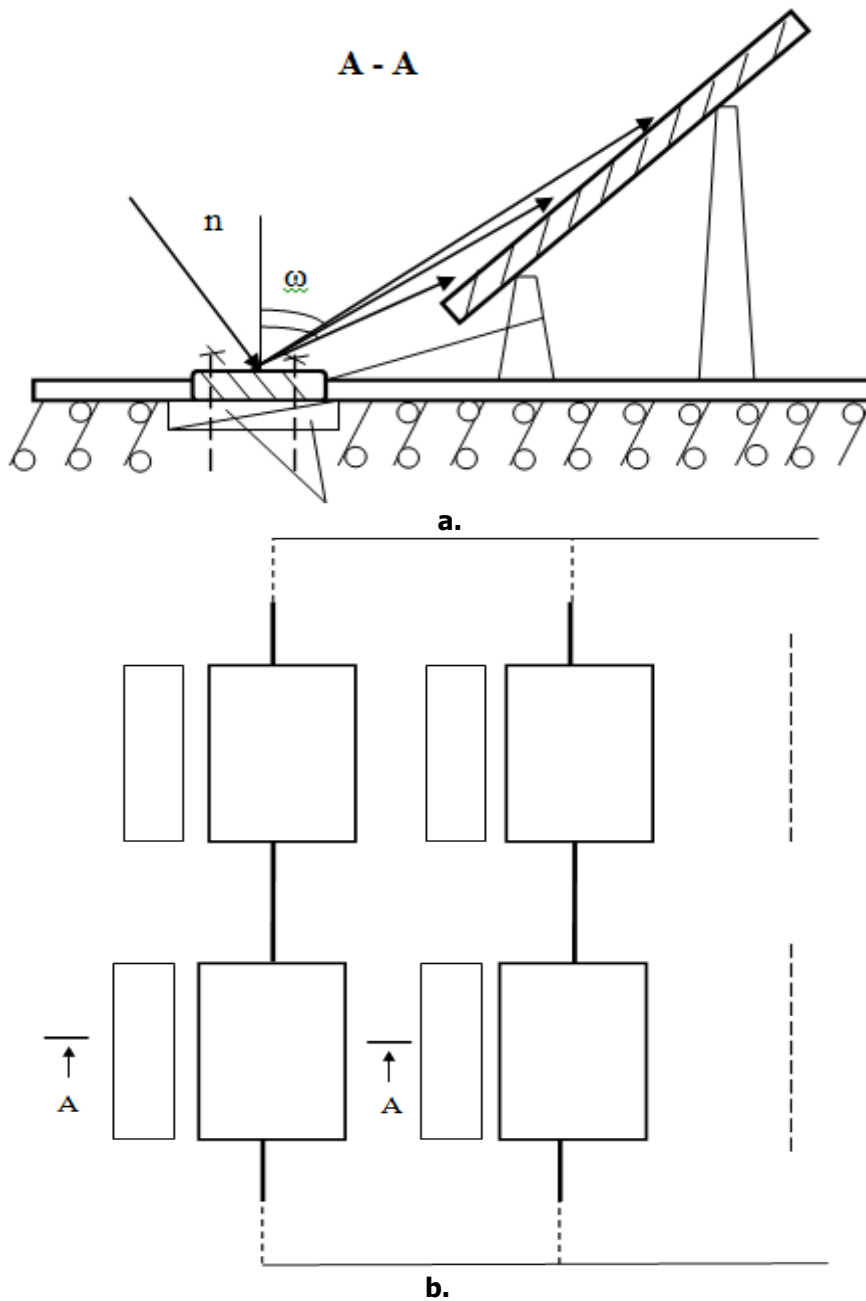


Figure 1. Section (a.) and overview (b.) of the improving the solar radiation on the solar modules

3. Conclusions

The solution for improve the efficiency of solar photovoltaic installation assure a better utilization of solar radiation through adding to the direct radiation the reflected radiation too. The main element if this device consists of the reflected plates, simple and cheap, which can be realized from different materials and dimensions had a width of approximately one quarter to thirteenth from the solar module width, as such does not require supplementary space for installation.

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