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ENERGY-EFFICIENT WIND-SOLAR INSTALLATION " UMBRELLA " AND ITS APPLICATION AREAS IN ENERGY

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Hybrid power supply systems created on the basis of renewable alternative energy sources with different principles of generating electric energy are the most energy-efficient compared to systems built on the same type of energy sources. Combinations of different types of renewable sources in one installation make it possible to increase both the reliability of power supply to consumers and to increase the quantitative and qualitative indicators of the processes of generating electric energy. The most successful today are combined installations that combine wind generators and photovoltaic panels, the so-called wind-solar installations.

The wide variety of wind turbine and photovoltaic installation designs makes it possible to implement various engineering solutions for their combinations in one installation. One of such solutions is the wind-solar installation "Umbrella", which is shown in Fig. 1[1].

The hybrid wind-solar installation "Umbrella" shown in Fig. 1 contains a support axis 1, on which the frame 2 of the rotor wind generator is attached using bearing supports. The wind generator itself is combined, in the lower cylindrical part it has air blades 3 of the Savonius rotor type, and the upper part is an elongated cone with air blades 4, on which flexible thin-floating photovoltaic panels 5 are installed. In the upper part of the frame 2, a restrictive air outlet damper 6 is installed on the outside.



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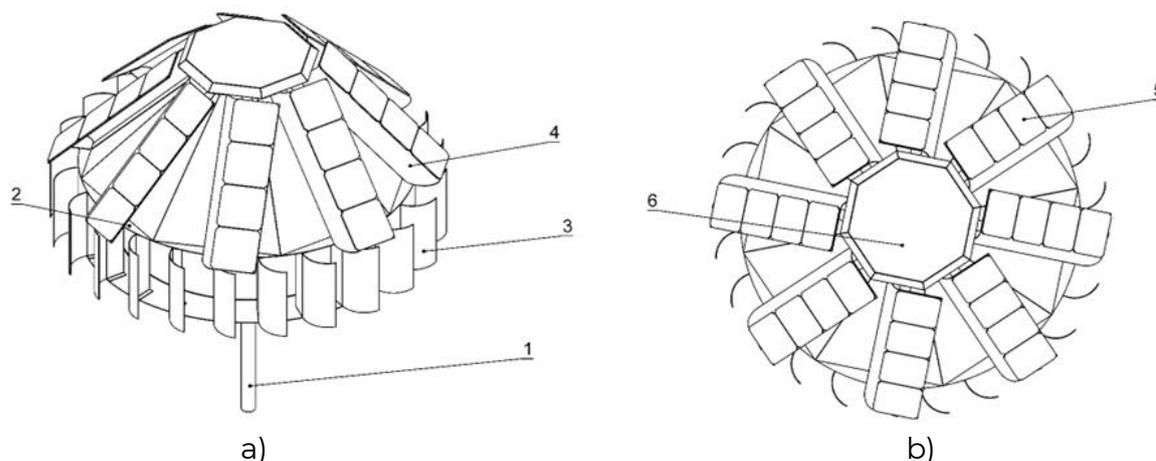


Fig. 1. **Wind-solar installation "Umbrella": a) general view; b) top view**

This composition of the installation allows for the simultaneous or separate conversion of solar and wind energy into electrical energy, and also makes it possible for it to operate both in autonomous mode and in the mode of joint generation with the centralized electrical network.

A special feature of such an installation is the possibility of its production with an optimal angle of inclination of the sides of the conical part relative to the axis of the wind generator, depending on the geographical location of the installation, which will ensure maximum generation of electrical energy by solar panels located on the blades.

The proposed hybrid wind-solar installation has the following advantages [1,2]:

- fixed surface of solar illumination of photovoltaic modules and additional cooling of the surface of photovoltaic modules during rotation of the wind rotor;
- increased reliability of power supply due to duplication of alternative energy sources;
- due to the conicity of the rotating structure, we have increased resistance to wind loads;
- increased environmental friendliness of the installation; - increased efficiency.

The technical solutions proposed in the wind-solar installation "Umbrella" allow its use in various areas of electric power engineering, namely in autonomous power supply systems, in mobile power supply installations, in autonomous lighting installations, in Smart Grid and MicroGrid power supply systems.

Conclusions and suggestions. Based on the presented material, we can conclude that the presented design solution of the wind-solar installation "Umbrella" is highly energy efficient, which is also relevant today and opens up

great prospects for widespread use in various types of power supply systems for various objects. It should also be noted that the developed design has high indicators of power supply reliability, quality of generated electrical energy and environmentally friendly processes.

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