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(54) **SOLAR MODULE COMPRISING A STONE FRAME**

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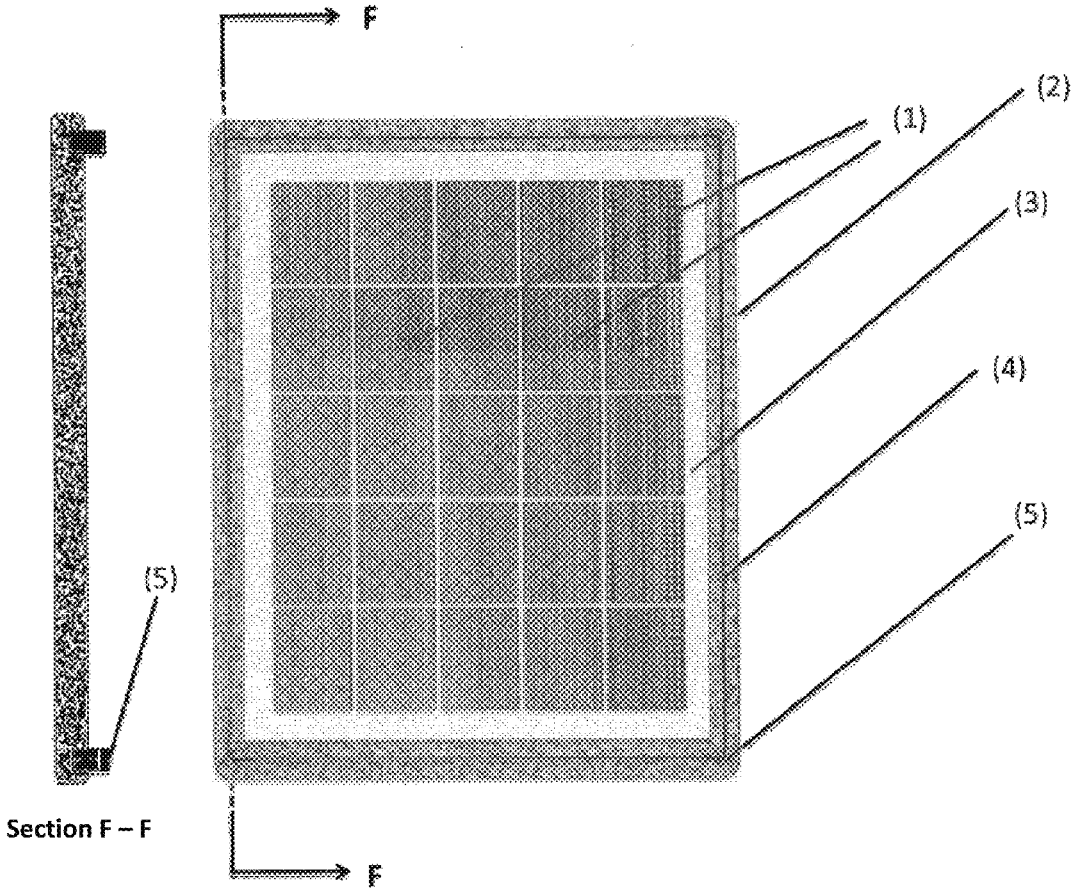
(57) **ABSTRACT**

The invention relates to a new way of stabilizing and mounting solar panels in the form of conventional heat exchangers comprising a trough and a glass cover or of a photovoltaic panel on house walls with the aid of frames made of natural or artificial stones which are made break-resistant using fiber materials and are stabilized in such a way that the panels are also break-resistant on impact and can be mounted as self-supporting structures on a wall; furthermore, the panels in particular satisfy high standards in respect of esthetics and are low-maintenance and thus permanently appealing. Multiple solar panels comprising stone frames can form entire stone-solar panel facades.



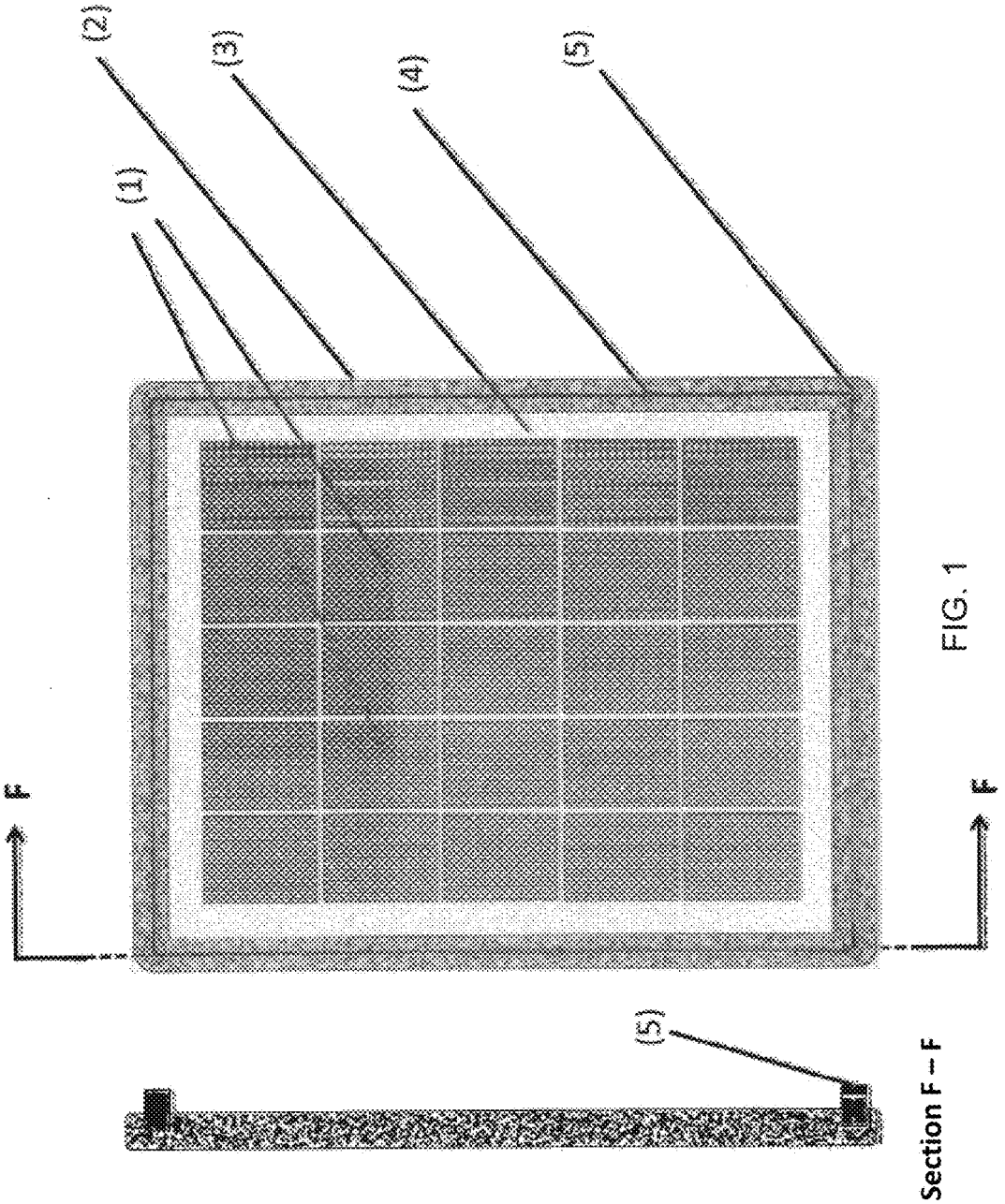


FIG. 1

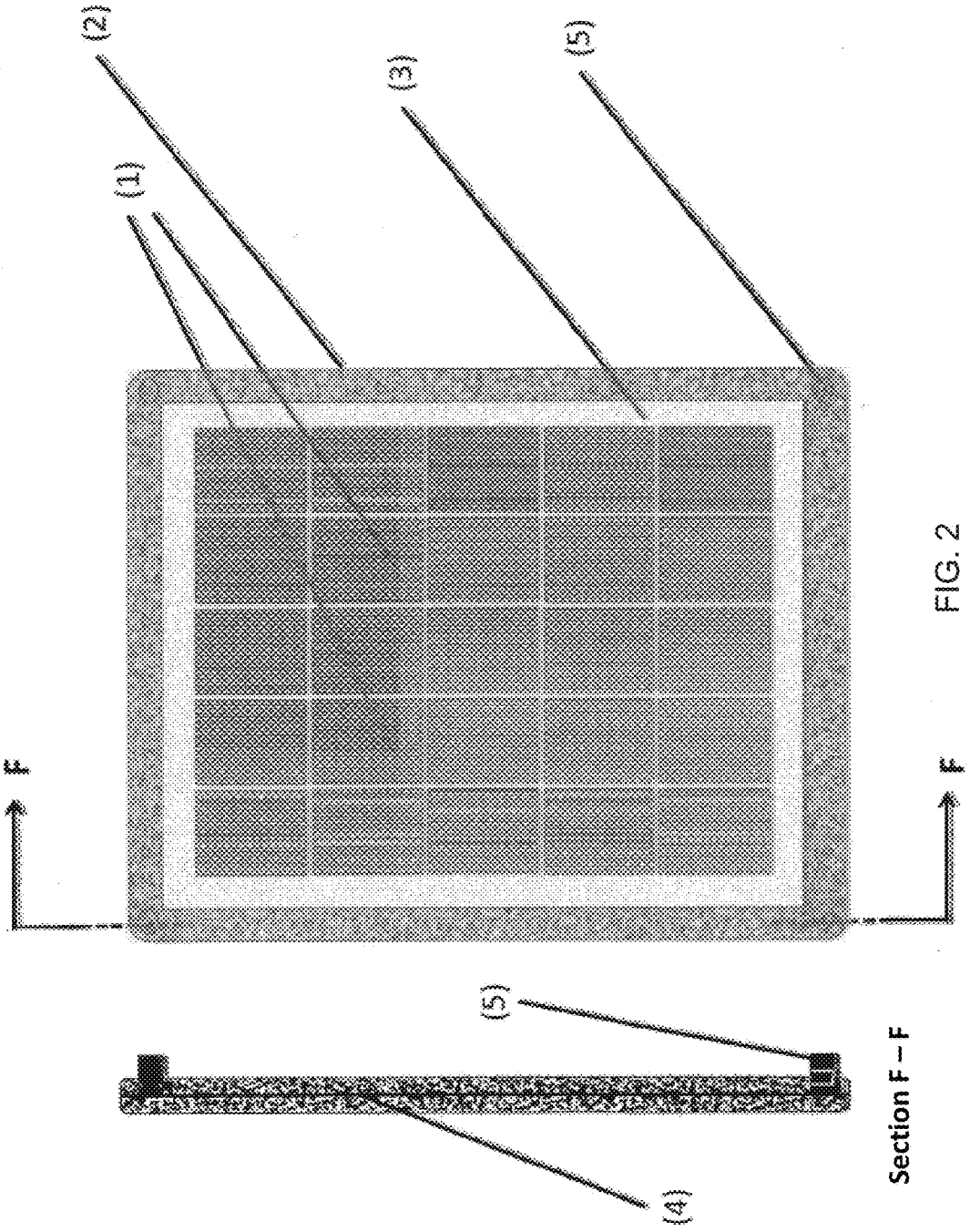


FIG. 2

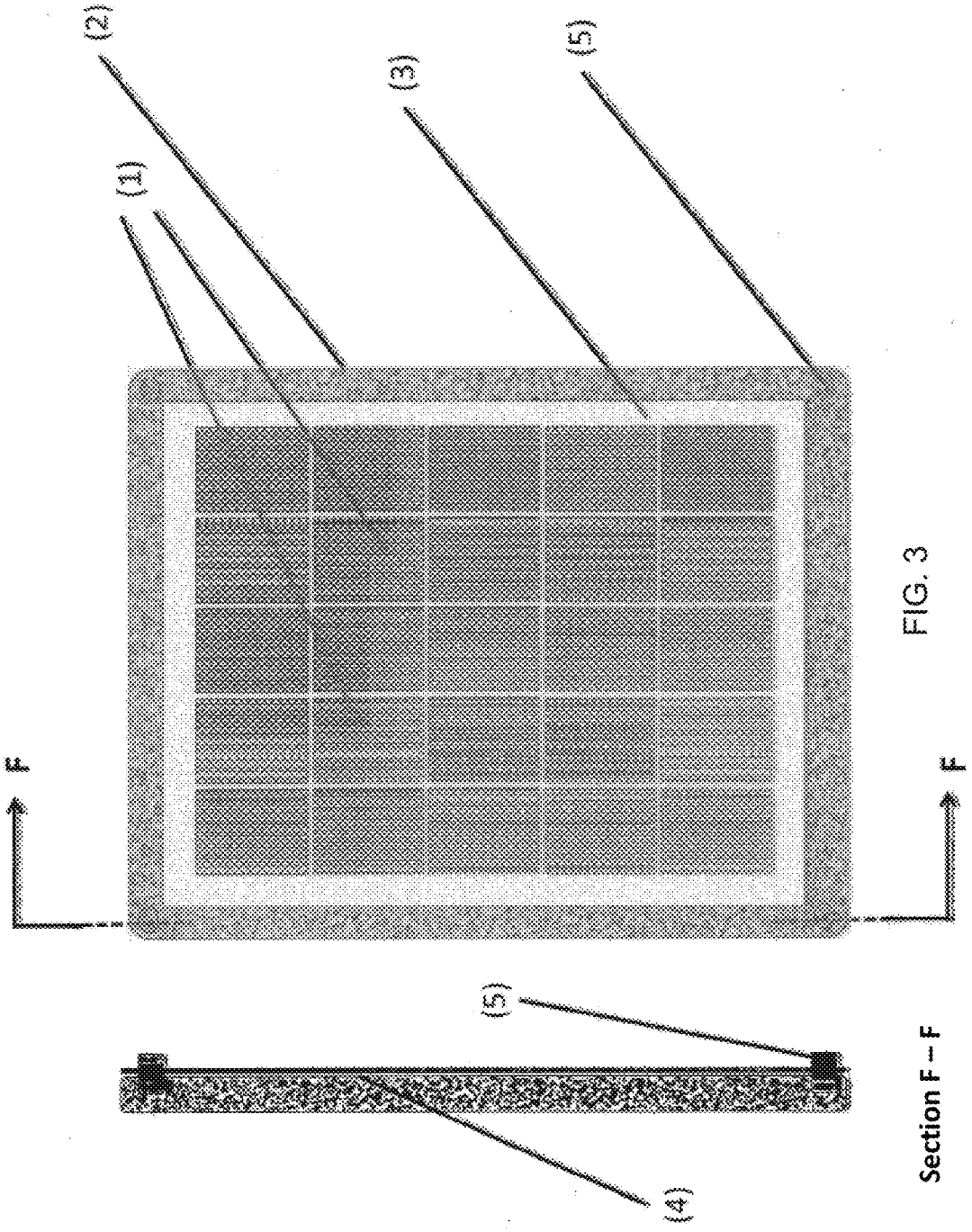


FIG. 3

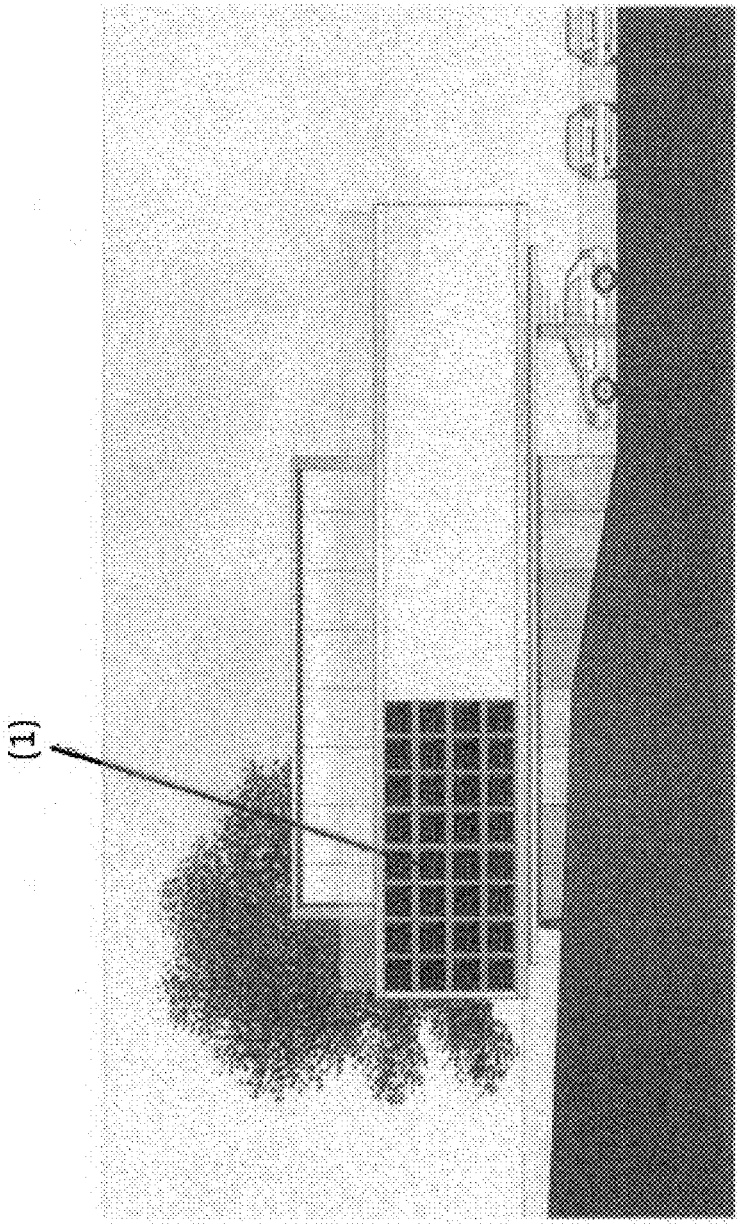


FIG. 4

SOLAR MODULE COMPRISING A STONE FRAME

[0001] Conventional solar modules have a frame made of synthetic substance, aluminum or other metals, in which thin sheets are bent from, or deep drawn or extruded for example from aluminum. Aluminum is no longer considered to be environmentally friendly, because the mining of bauxite is currently responsible for the production of new aluminum from rainforests, which is very energy-intensive and is loaded with CO2 emissions in the process. Metals generally have the disadvantage that their surface becomes corroded, and soiled, and the surfaces can no longer be cleaned and polished without great effort.

[0002] This situation leads to the fact that many solar module systems become unsightly over time and leave a very negative impression. On the roofing this disadvantage is rather insignificant, but on walls and facades, it becomes more than a disturbing occurrence.

[0003] For this reason, the invention proposed here goes one step further in the provision of a solar module photovoltaic (PV) or heat exchanger modules with glass cover and tub—a stable frame which is weather-resistant, easy to clean, or is ideally self-cleansing and, above all, still looks beautiful and decorative even after years, and is nevertheless stable.

[0004] Under this situation these modules even in private areas of life, hold the promise of a wider market than pure roof installations, which are currently only partially available and is restricted by building regulations and ownership rights. Mobile units that are easily screwed to the wall and are removable when shifting house, are not yet available, but they have opened a wider market. This idea is dedicated to this invention.

[0005] If, on the outside of each house , only a single PV solar module with 250 Wp were to be hung somewhere on the wall where it is beautifully portrayed, then for 40 million houses in Germany, this would correspond to an annual electricity output of about 10 million kWh, which corresponds to the power of two mid-sized nuclear power plant blocks.

[0006] Annual electricity consumption in Germany is currently around 640 TWh. Realistically, two solar modules per household or apartment could cover approximately 3% of this output.

[0007] If even more wall surfaces of the houses were used extensively, all nuclear power plants could be replaced in Germany. Wall surfaces are easier to fit than roofers, as of now the optical effect and the material shortcoming is an obstacle to installing such modules on the wall as aluminum clamps become time worn and the surface becomes unsightly.

[0008] This is solved via this invention by the use of a stone frame, the stone being protected against breakages by fiber stabilization. In addition, all facade solutions that are currently made with stone slabs can simply be replaced by the modules described here, and the invention becomes a new facade solution, in that multiple solar modules with stone frames can be shaped out of solar module facades entirely built out of stone.

[0009] Possible technical designs of a PV solar cell module frame are shown in FIGS. **1** to **3**, which illustrate how this frame can be constructed,

[0010] FIG. **4** shows a complete facade solution.

[0011] FIG. **1** shows a glass-glass solar module (**1**), which is stabilized with a granite frame (**2**) the frame (**2**) protects the glass (**3**) against impact at the edges and simultaneously receives fastening sockets, or fastening sockets or threads (**5**) made of stainless steel. The frame borders are stabilized with a layer of fiber material (**4**) in the middle of the stone border, this layer is located in a configuration, which is orthogonal to the level of the module, in the longitudinal orientation in the direction of the border.

[0012] FIG. **2** shows a glass-synthetic material solar module (**1**), which is stabilized with a frame of limestone (**2**), frame (**2**) protecting the glass and the synthetic material (**3**) against impact at the edges and simultaneously receives fastening sockets, or fastening sockets or threads (**5**) made of stainless steel. The frame borders are stabilized with a layer of fiber material (**4**) in the middle of the stone border, this layer is located in a configuration, which is orthogonal to the level of the module, in the longitudinal orientation in the direction of the border.

[0013] FIG. **3** shows a glass-glass solar module (**1**), which is stabilized with a frame of quartzite (**2**), frame (**2**) protecting the glass (**3**) against impact at the edges and simultaneously receives fastening sockets, or fastening sockets or threads (**5**) made of stainless steel. The frame borders are stabilized with a layer of fiber material (**4**) in the middle of the stone border, this layer is located in a configuration, which is orthogonal to the level of the module, in the longitudinal orientation in the direction of the border.

[0014] FIG. **4** shows a facade solution (**1**) of a family house, consisting of several PV-Solar modules.

[0015] All three cases can be employed as a fiber layer resin-bonded fiber, consisting of carbon fibers, glass fibers, aramid fibers or stone fibers and these keep the stone material ideally under pre-stress.

Listing of claims:

1. Configuration of a planar or arched solar module panel or solar module tub consisting of either a conventional heat exchanger or a PV light converter with a sandwich of glass, and plastic or a further glass layer—hereinafter called the solar module —is characterized in that the solar module is buttressed at the edge with a frame made of fiber-stabilized stone.

2. The configuration according to claim **1**, is characterized in that the stone is a natural stone or artificial stone or concrete.

3. The configuration according to claim **1**, is characterized by the fact that the fibers which stabilize the stone are either carbon fibers, glass fibers, stone fibers, aramid fibers or other fibers, or a mixture of these fibers.

4. The configuration according to claim **1**, is characterized by the fact that the stone layers of the frame are pre-stressed by the fiber.

5. The configuration according to claim **1**, is characterized in that the fibers are bound with resin.

6. The configuration according to claim **1**, is characterized in that the frame is either firmly bonded to the solar module, preferably with thermosetting epoxide resins, or is glued to the solar module, preferably by means of silicone-based adhesive compounds.

7. The configuration according to claim **1**, is characterized in that the frame has mounting arrangements which make it possible to secure the solar modules with the help of stone frames on walls or other facade fixtures.

8. The configuration according to claim **1**, is characterized in that multiple solar modules can be formed in a house front.

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