

ECOLOGICALLY-SAFE STRUCTURES FOR THE BUILDING OF ACTIVE-ENERGY FAÇADE WALLS

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ABSTRACT

Here are reviewed the ways of fabrication of ecologically-safe structures of wall elements, intended for the construction of active-energy walls. In the structure of these wall elements in a suitable way is integrated a pipeline for solar heating. The basic advantage of these structures is the separate mounting and dismounting of the structure layers and the integrated pipeline elements. In case of wearing-out or expiry of the exploitation term of the structure layers, the elements of the pipeline could be separately collected and stored in depots according to the building material.

Keywords: ecological safety, structures, active-energy façade walls.

1. INTRODUCTION

The separate collection of ecologically-safe light panel structures, made according to the so-called “layer-by-layer” mounting could be used in solutions, which could be implemented in the building of two-storey solar houses. On the basis of the conclusions, made in the dissertation work (1) are designed two ecological solutions, submitted as patents for invention.

2. TECHNICAL ESSENCE OF THE SOLUTIONS

According to figures 1 and 2 from the two patents: (2 and 3)

- № 109378 “Ecologically-safe structure of an active-energy panel, made by using “layer-by-layer” mounting, partially accomplished on the building site”
- № 109379 “A way of separate mounting and dismounting of ecologically-safe active-energy walls structures by using energy-accumulating panels”

is implemented the separate collection of the light panel structure layers which are used for the construction of the so-called “solar house”.

2.1 The solar house is represented with the help of an exemplary model, intended for building of two-storey ecological houses (the framework is made of natural materials, e.g. wood), with:

- façade walls (with wooden sides with rectangular or step-like transverse section, gypsum plates for noise reduction, insulation of mineral wool, expanded cork),
- floor constructions (wooden flooring, insulation of mineral wool, expanded cork, gypsum plates for noise reduction),
- roofs (wooden roof constructions and “natural” roof-tile or stone covering, etc.),
- a system for aerial and water solar heating – Architecture internet competition, 2005.

• The heating system, implemented in the above-mentioned two-storey ecological

buildings is registered as a patent № 109049 of 16.02.2005 “Solar house.” (4)

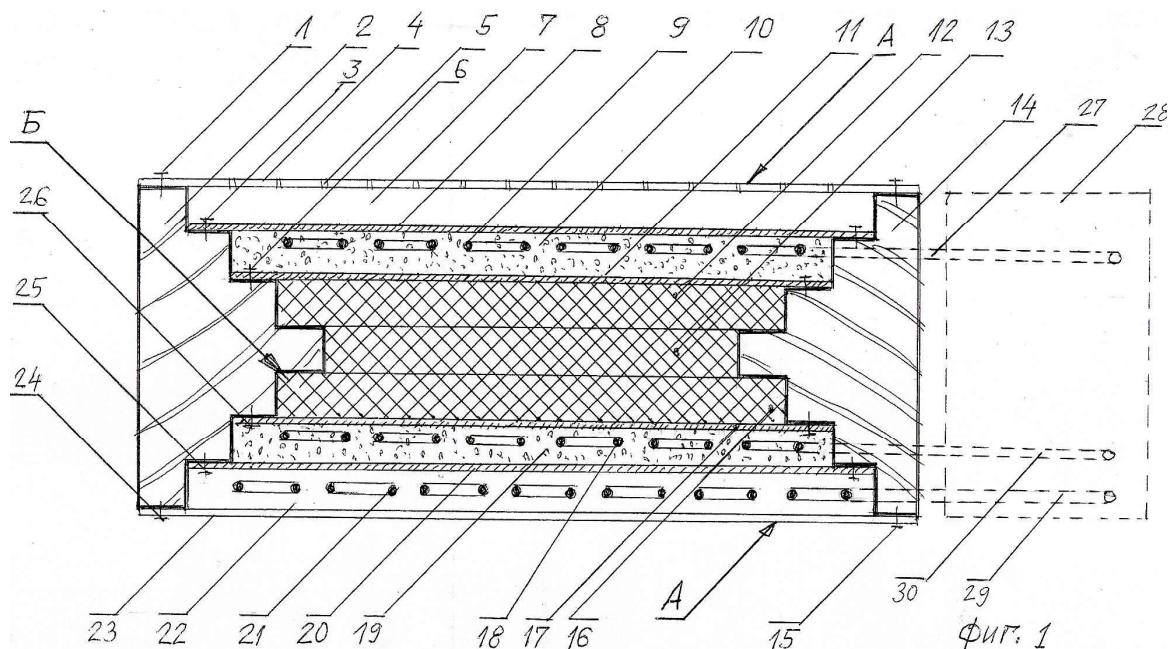


Fig.1. Patent application № 109378 and № 109379. Horizontal section over the panel.

Description of the positions on fig.1. A

- main panel, B - panel.

1-connection element, 2- left side, 3- other connection elements, 4-perforated layer, 5- openings, 6- connection element, 7- internal space, 8- energy-accumulating layer, 9- radiating tubular serpentine, 10- internal energy-accumulating substance, 11- energy-accumulating layer, 12- triple-layer insulation, 13- triple-layer insulation, 14- right side, 15- connection element, 16-

triple-layer insulation, 17- energy-accumulating layer, 18- absorbing tubular serpentine, 19- external energy-accumulating substance, 20- energy-accumulating layer, 21- second absorbing tubular serpentine, 22- external space, 23- external space, 24- connection element, 25- connection element, 26- connection element, 27- first circulation outline, 28- water accumulator, 29- third circulation outline, 30- second circulation outline.

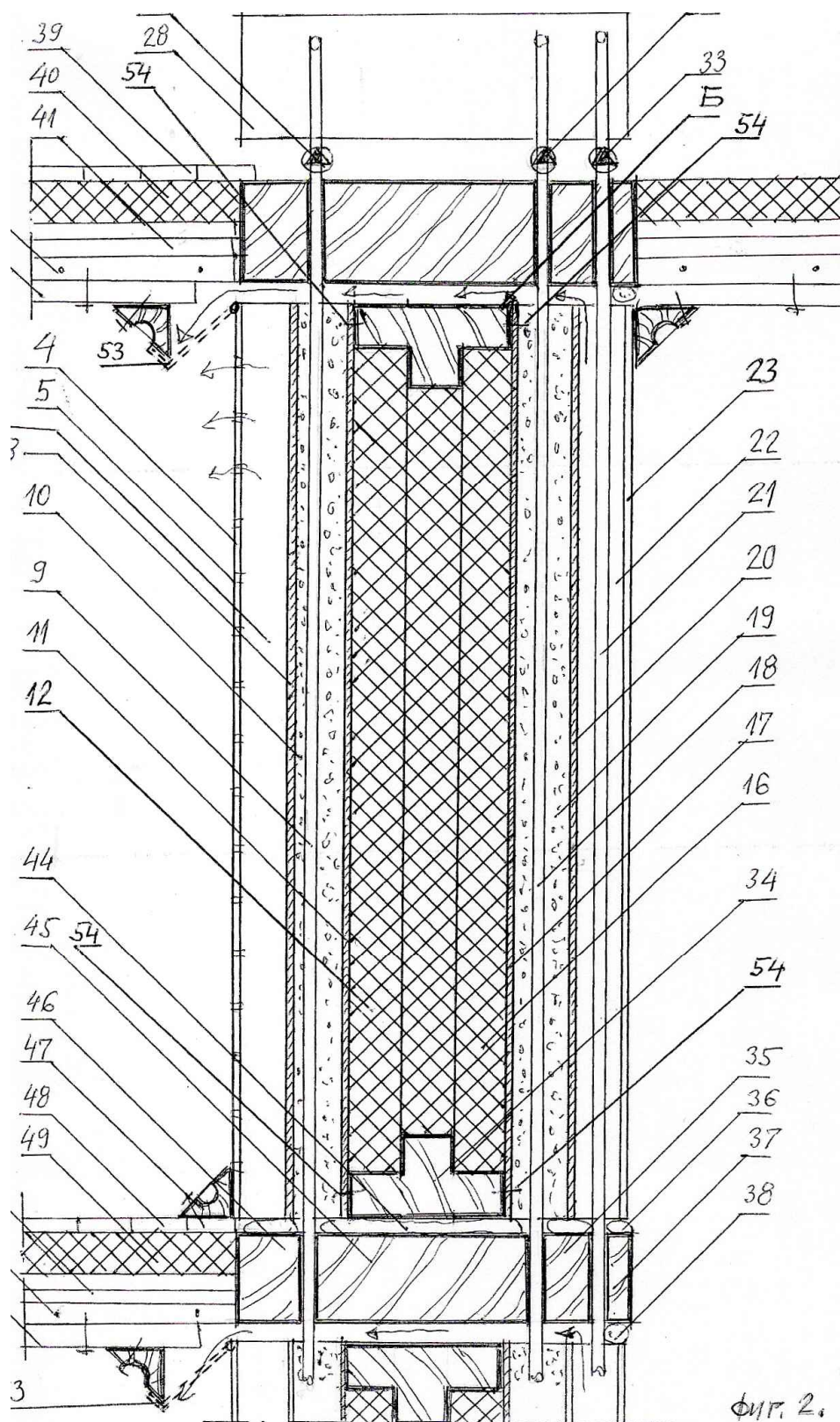


Fig.2. Patent application № 109378 and № 109379. Vertical section over the panel.

Description of the positions on fig.2.

31- first circulation pump, 32- second circulation pump, 33- third circulation pump, 34- lower and upper sides, 35- closing laths, 36- elastic gasket, 37- closing laths, 38- elastic gasket, 39- wooden floor, 40- ceiling insulation, 41- gypsum layers, 42- wood screw, 43- casing, 44- horizontal soft elastic tubes, 45- distance element, 46- closing laths, 47- screw, 48- wooden flooring, 49- floor insulation, 50- gypsum layers, 51-

wood screw, 52- covering, 53- valves, 54-
connection devices.

One façade wall variant is shown on fig.3.

Here is used the “layer-by-layer” mounting as a way of mounting and dismounting of the structure layers of the façade walls. The vertical sections show the main elements of the system for heating and hot water-supply.

(Fig. 3, 4)

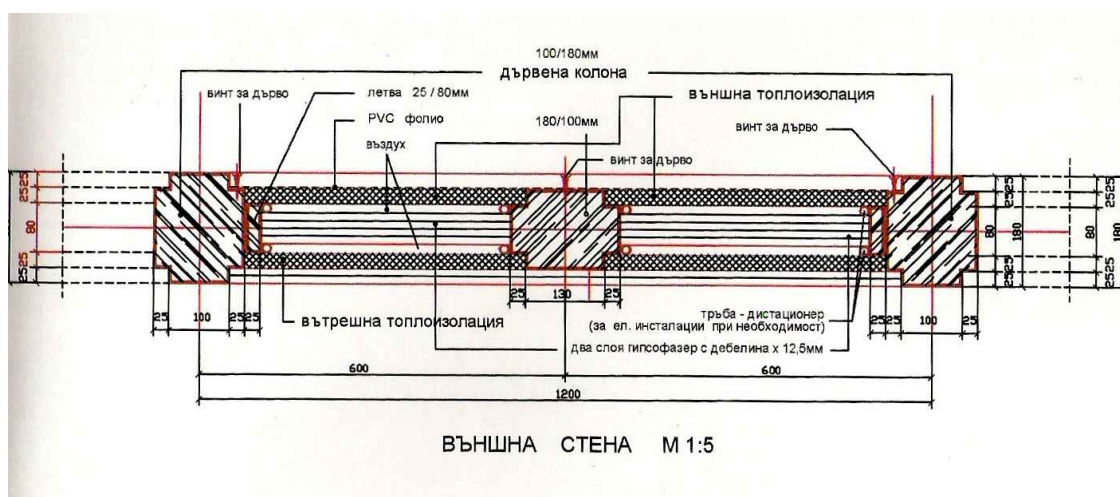


Fig.3. Façade wall variant made with the help of “layer-by-layer” mounting.

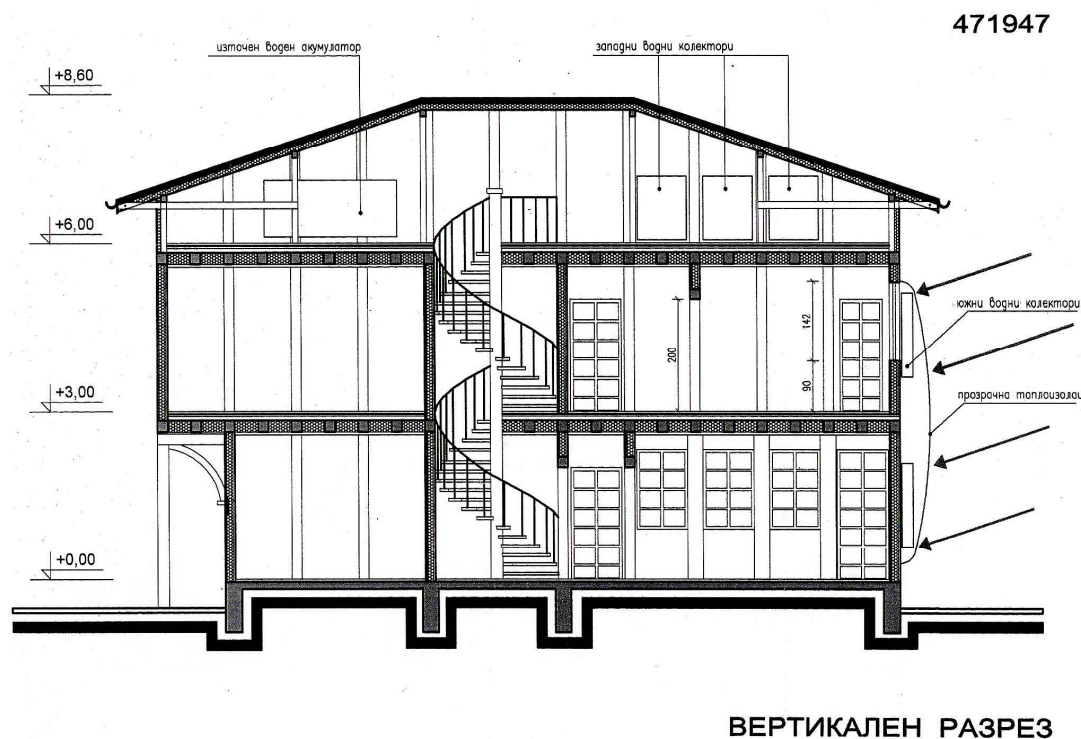


Fig.4. Vertical longitudinal section.

The wooden sectional framework has a constructive centre distance of 1,20 m. (Fig. 4 and 5)

The wooden trimmer joists are situated at a distance of 1,20 m and perpendicular to it at a distance of 60 cm are situated the joists, carrying the wooden flooring and the plates of the insulating materials. The insulation is

made of mineral wool plates and the noise reduction is implemented with the help of gypsum plates. The insulation of the outside walls is implemented with the help of the same materials.

The façade walls (fig. 6-10) could be made according to the above-mentioned patents:

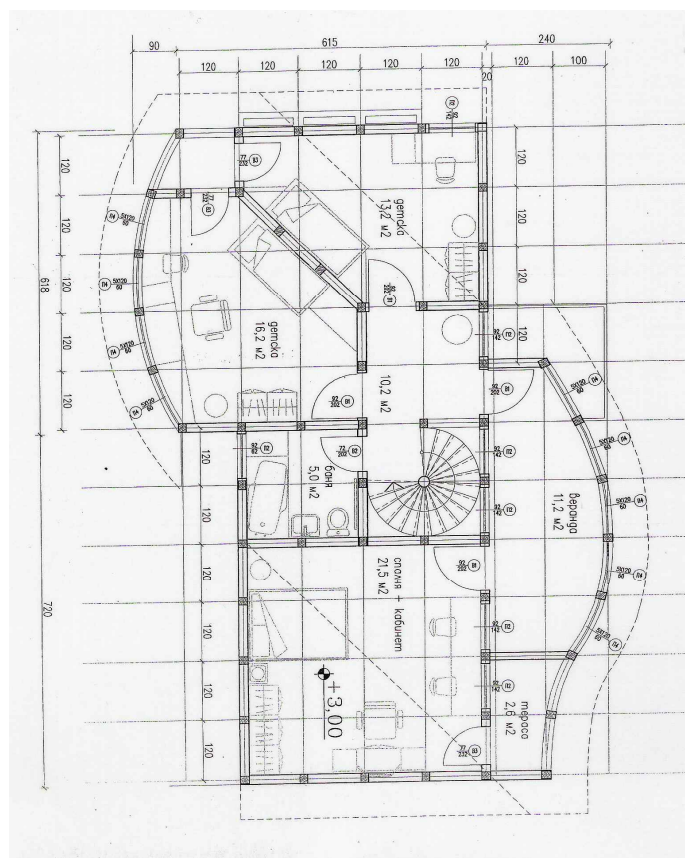


Fig. 5. Plan of the second floor.



Fig. 6. South façade.



Fig. 7. North façade.

- № 109398, 14.12.2005 "Ecologically-safe structure of an active-energy panel, made by using "layer-by-layer" mounting, partially accomplished on the building site "

- № 109399, 14.12.2005 " A way of separate mounting and dismounting of ecologically-safe active-energy walls structures by using energy-accumulating panels.

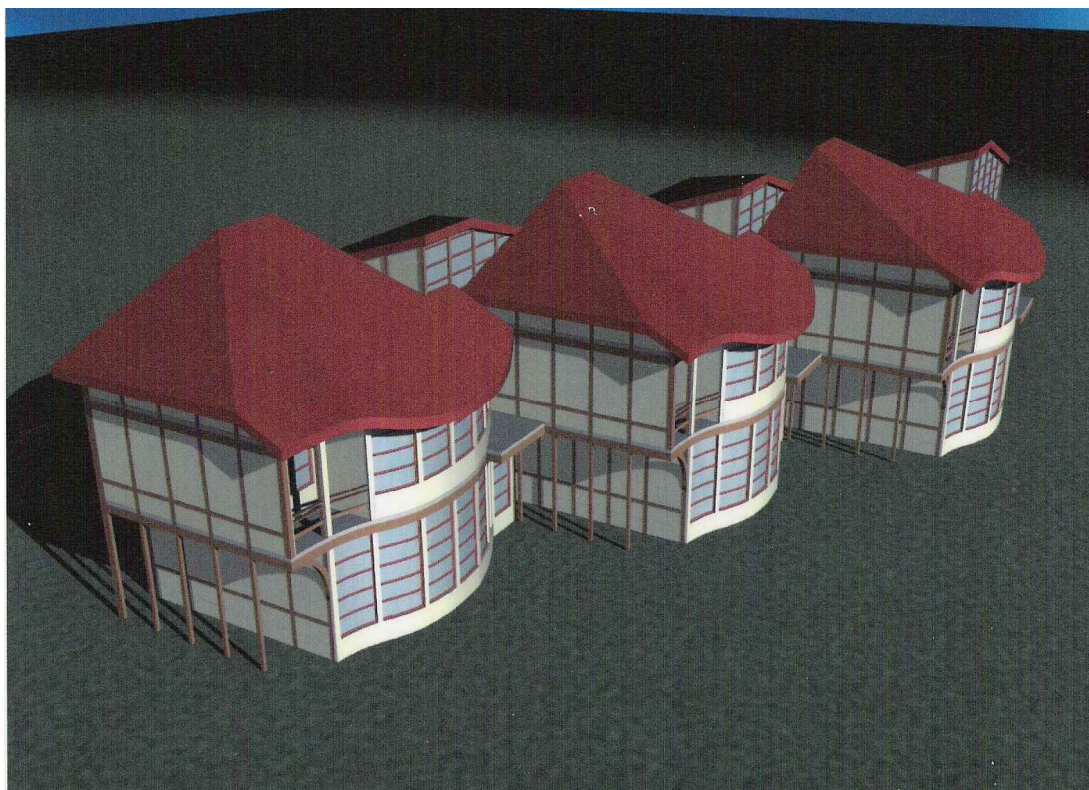


Fig. 8. Situation of solar houses. Northwest view.

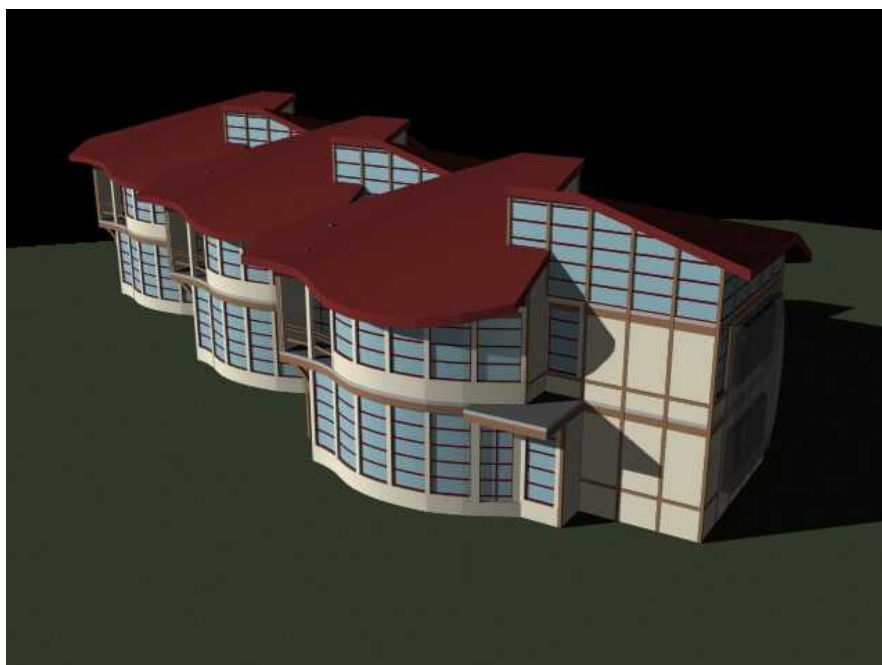


Fig.9. Situation of solar houses. Southwest view.



Fig.10. Fragment of the façade with water collectors. Three adjacent solar houses.

The houses could not only be constructed as single-standing, but also they could be built in groups, tightly adjacent one to the other. (Fig. 8-10). The water collectors are hung on the south façade wall. (Fig. 6, 10).

CONCLUSION

The respect for the ecological requirements and the implementation of ecologically-safe structures to build the enclosing structures – façade walls and floors as well as the wooden framework of the two-storey house helped to create a quite memorable design vision, in contrast to the grey environment.

REFERENCES

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2. Aleksandrov Y. Patent application № 109378, 14.12.2005 "Ecologically-safe structure of an active-energy panel, made by using "layer-by-layer" mounting, partially accomplished on the building site",
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4. Aleksandrov Y. Patent application № 109049, 16.02.2005 "Solar house"