



(11) **EP 4 273 361 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
08.11.2023 Bulletin 2023/45

(21) Application number: **21909615.3**

(22) Date of filing: **25.12.2021**

(51) International Patent Classification (IPC):
E06B 1/06 (2006.01) **E06B 1/02** (2006.01)
E06B 9/01 (2006.01)

(52) Cooperative Patent Classification (CPC):
E06B 1/02; E06B 1/06; E06B 1/12; E06B 9/01

(86) International application number:
PCT/ES2021/070936

(87) International publication number:
WO 2022/136722 (30.06.2022 Gazette 2022/26)

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **27.12.2020 ES 202032788 U**

(71) Applicant: **Conceptoq Industria Sociedad
Limitada
17520 (Puigcerda) Girona (ES)**

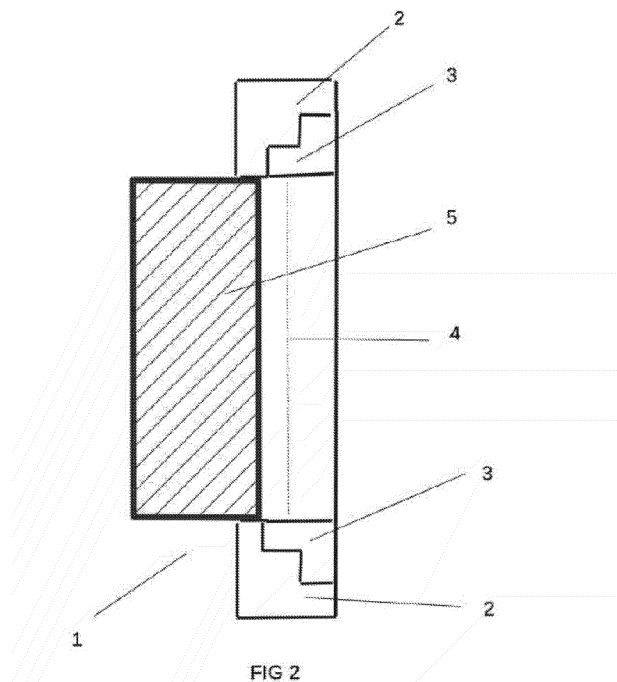
(72) Inventor: **LAUCIRICA GARI, Jorge
17520 Girona Puigcerdà (ES)**

(74) Representative: **Isern Patentes y Marcas S.L.
Avda. Diagonal, 463 Bis, 2°
08036 Barcelona (ES)**

(54) **WINDOW WITH METAL STRUCTURE**

(57) The invention describes a window with a metal structure, which comprises a frame and a sash with glass. The frame is made of an insulating material. The metal structure encircles the inner perimeter of the frame and

projects outwards. The described window is energy efficient and reduces the environmental impact. The insulating material is sapwood aged by storing outdoors exposed to the effects of solar radiation and rain.



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Description**Technical field of the invention**

5 **[0001]** The present invention describes a window with a metal structure comprising a frame and glazed sash. The frame is made of an insulating material. The metal frame encircles the inner perimeter of the frame and the metal frame projects outwards. The window described is energy efficient and reduces the environmental impact when sapwood is used in its manufacture.

10 **Background to the invention**

[0002] The aim of house construction is to reduce energy costs by improving insulation. Windows are the main source of losses, as the thermal bridge is not broken. It is necessary for the window to keep the heat in the room in winter and the cold from the air conditioning in summer.

15 **[0003]** The technical solutions used to increase the insulation in the partition system are to use hollow or foam-filled insulating profiles (polyurethane, glass wool) or frames made of an insulating material (PVC, wood) to break the thermal bridge. Frames made of materials with thermal transmittance (U) values as low as possible should be used.

[0004] The U-values for the most commonly used profiles are detailed below.

20	Profile material	Thermal transmittance U (W/m ² K)
	Polyurethane with metal core.	
	PUR thickness > 5 mm	2, 80
	PVC hollow sections (2 chambers)	2, 20
	PVC hollow sections (3 chambers)	2, 00
25	Hardwood (ρ = 700 kg/m ³ , A = 0, 18 W/m K), profile thickness 50 mm	2, 20
	Softwood (ρ = 500 kg/m ³ , A = 0, 13 W/m K), profile thickness 50 mm.	2, 20
30	Metal without RPT (thermal break)	5,70
	Metal with thermal break, breakage: 4 mm < d < 12mm	4, 00
	Metal with thermal break, breakage: d > 12 mm	3, 20
35		

[0005] Wood has a very good thermal transmission coefficient, comparable only to PVC.

[0006] However, the use of wood is limited as it deteriorates and needs constant maintenance with varnishes, fungicides, fixatives, etc. This fact is corroborated by US2019145154, which suggests avoiding the use of wood in windows.

40 **[0007]** On the other hand, EP1966462 suggests not to use metallic elements.

[0008] Logs contain two distinct parts: the sapwood and the heartwood. The heartwood is harder, more resistant and darker than the sapwood. The sapwood is lighter, porous and softer. The woodworking industry uses the heartwood and discards the sapwood, which is used as fuel. When sapwood is stored outdoors in the sun and rain, it darkens to the colour of heartwood.

45 **[0009]** WO9741329 details the same technical problem as the invention. WO9741329 discloses an insulating frame and an outer metal frame, but the outer frame is not in contact with the wall. In addition, there is an insulating material between the two frames. WO9741329 does not disclose any support plate for the insulating frame.

[0010] US201914515 describes a heat seal that is supported on the wall, but the heat seal is not metallic.

50 **[0011]** EP1221525 describes a wood-aluminium window with an aluminium casing attached to the outside of a wooden frame, but the aluminium casing is not perpendicular to the glass and does not encircle the window.

Object of the invention

55 **[0012]** The problem solved by the present invention is to improve thermal insulation in windows by breaking the thermal bridge.

[0013] The solution found by the inventors is to place a metal structure around the inner perimeter of the frame and the metal structure projects outwards.

[0014] The metal structure that encircles the window frame and projects outwards:

- improves insulation,
- allows the insertion of protective elements (grilles, mosquito nets, blinds),
- prevents or reduces the frame from getting wet in the rain.

[0015] Preferably, the window includes metal reinforcing plates. The presence of plates avoids the use of the glazing bead, a common element in windows to allow clearance in its installation and thus favour dilatation. The plates allow metal to metal contact, the expansion is the same and does not require expansion space.

[0016] Preferably, the window comprises a pre-frame that encircles the frame on the outside. The pre-frame facilitates the assembly and adjustment of the window, as the window can be adjusted to the opening by sanding the pre-frame, which is easier and quicker than trimming the frame.

[0017] In another embodiment, the window frame is made of naturally aged wood. Most preferably, sapwood is used. Since sapwood is discarded in the woodworking industry and used as fuel, the environmental impact is reduced by using a waste material.

[0018] In another aspect, the invention describes the window mounted in a partition. The width of the metal structure is at least the width of the partition. Preferably, the partition wall has insulating foams on the inside, which are in contact with the metal structure or in contact with the supporting plates.

Brief description of the figures

[0019]

Figure 1 shows the usual windows.

Figure 2 shows a profile view of the window with the metal frame projecting outwards.

Figure 3 shows a front view of the window with the metal structure projecting outwards.

Figure 4 shows a profile view of the window with the metal frame projecting outwards and a metal frame projecting inwards.

Figure 5 shows a front view of the window with the metal structure projecting outwards with protective elements.

Figure 6 shows the window inserted in a partition, which corresponds to the preferred embodiment.

Figure 7 shows the sapwood and heartwood of a log.

Detailed description of the invention

[0020] The windows known to the person skilled in the art consist of a frame (2) to be fixed to the partition wall and a casement (3) containing the glass (4). Figure 1.

[0021] The window (1) described in the invention includes a metal structure (5) which encircles the inside of the window frame (2) and projects outwards. Figures 2, 3. Likewise, the metal structure (6) can be projected inwards (Figure 4).

[0022] The window frame (2) and the sash (3) are generally made of an insulating material. The insulating materials are known to the person skilled in the art, these can be polymeric material (PVC), mineral wool, fibreglass. Preferably, given the high environmental impact of PVC, which is to be discouraged, the insulating material used is aged wood. In a more preferable way the wood is sapwood (14) and in a still more preferable way the wood is oak, pine, walnut, beech or chestnut.

[0023] The use of naturally aged wood avoids the maintenance of wood.

[0024] The process for obtaining aged wood includes:

- storage of the wood outdoors under the action of sunlight and rain for at least 1 month,
- separation of sapwood (14) from heartwood (15),
- machining of the sapwood.

[0025] The metal structures (5, 6) are made of any metallic material, preferably galvanised steel.

[0026] The window contains the casements (7) that encircle the frame (2) on the outside. The casements (7) are made of the same wood as the frame (2) and the sash (3). During construction, the subframes (7) are fitted and once the building work is completed, the windows (1) are attached with screws. The installation process avoids damage to the windows, there are no gaps and can be carried out by anyone without any knowledge of masonry.

[0027] The window (1) described can be attached to any type of partition wall (8): natural stone, concrete, facing brick, stucco, etc. The width of the metal structure (5) must be at least the thickness of the partition wall (8), so that the metal structure protrudes from the partition wall (8). This method of execution allows protective elements (10) such as grilles, mosquito nets, blinds, etc. to be inserted into the metal structure without having to drill holes in the outer wall. In addition, it prevents or reduces rain from wetting the window or glass. Figure 5.

Preferred embodiment of the invention

[0028] Figure 6 shows the preferred embodiment of the invention. The window (1) consists of the frame (2) and the casement (3). The sash (3) contains the glass (4). The metal structure (5) has plates (13) at its ends. The plates (13) are in contact with the inside of the frame (2). The outer metal structure (5) encircles the inside of the frame (2). The window (1) also has an inwardly projecting metal structure (6) that is in contact with the frame (2) and the sash (3).

[0029] The window (1) has pre-frames (7) that encircle the frame (2) on the outside. The casements (7) facilitate the installation of the window (1) and improve thermal insulation. The window (1) is placed directly in the opening of the partition (8). The partition wall (8) is covered with a polyurethane foam (9) which acts as insulation. One section of the support plates (13) is in contact with the polyurethane foam while another section is in contact with the frame (2).

[0030] The width of the outer metal structure (5) is at least the width of the partition wall (8). The partition wall (8) is covered with natural stone (12). Additionally, a water drain (11) is inserted. The outer metal structure (5) is joined together with protective elements (10). The frame (2) and the leaf (3) are made of walnut sapwood that has been weathered for 1 month.

[0031] The metal structures (5, 6) were made of galvanised steel.

[0032] The installation process was:

1. Construction of the partition wall (8) with its corresponding window opening.
2. Fitting the subframe (7).
3. Once the work has been completed, the window is fixed to the frame (7) with screws, without the need for masonry work, leaving the window undamaged and without gaps.

[0033] The claims cited below are part of the description and are embodiments.

Claims

1. Window (1) with a metal structure comprising a frame (2) and a sash (3) with glass (4) in which the frame (2) is made of an insulating material, **characterised in that** it has a metal structure (5) that encircles the inner perimeter of the frame (2) and projects outwards.
2. Window (1) according to claim 1, **characterised in that** it additionally comprises an inwardly projecting metal structure (6) which is in contact with at least the frame (2) or the sash (3).
3. Window (1) according to the previous claims, **characterised in that** the metal structure (5) comprises metal plates (13) of reinforcement perpendicular to the glass (4) of the window which are supported on the frame (2).
4. Window (1) according to the previous claims, **characterised in that** it contains wooden pre-frames (7) that surround the frame (2) on the outside.
5. Window (1) according to the previous claims, **characterised in that** the frame (2) is made of wood aged by weathering under the action of solar radiation and rain.
6. Window (1) according to claim 5, **characterised in that** the frame is made of sapwood (14).
7. Window (1) according to claims 5-6, **characterised in that** the wood is oak, pine, chestnut or beech.
8. Window (1) according to any of the preceding claims, **characterised in that** the outer metal structure (5) contains protective elements (10).
9. Partition wall (8) comprising the window (1) according to claims 1-8.
10. Partition wall (8) according to claim 9, **characterised in that** it is covered on the outside with natural stone (12).
11. Partition wall according to claims 9-10, **characterised in that** the outer metal structure (5) has a width at least equal to the width of the partition wall (8).
12. Partition wall according to claims 9-11, **characterised in that** the partition wall has an insulating foam (9) and a

section of the platens is in contact with the insulating foam (9).

13. Partition wall according to claim 12, **characterised in that** the insulating foam (9) is polyurethane.

5 14. Partition wall according to claims 9-13, **characterised in that** it comprises a water drain (11).

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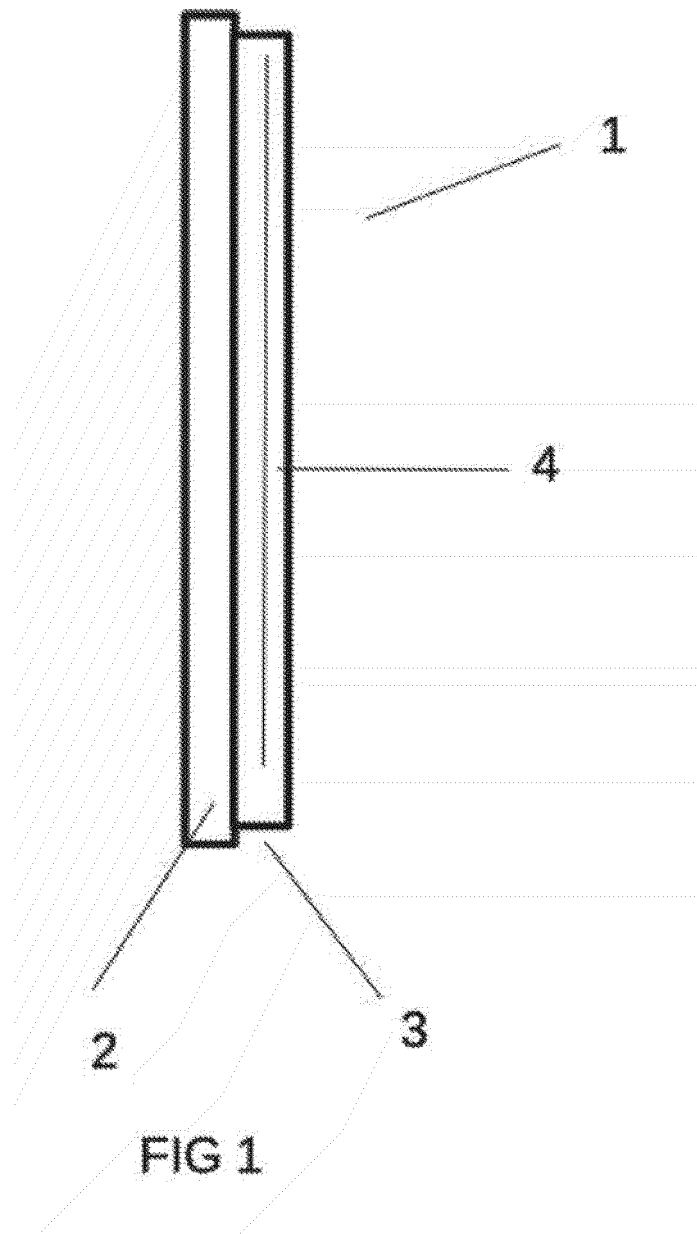
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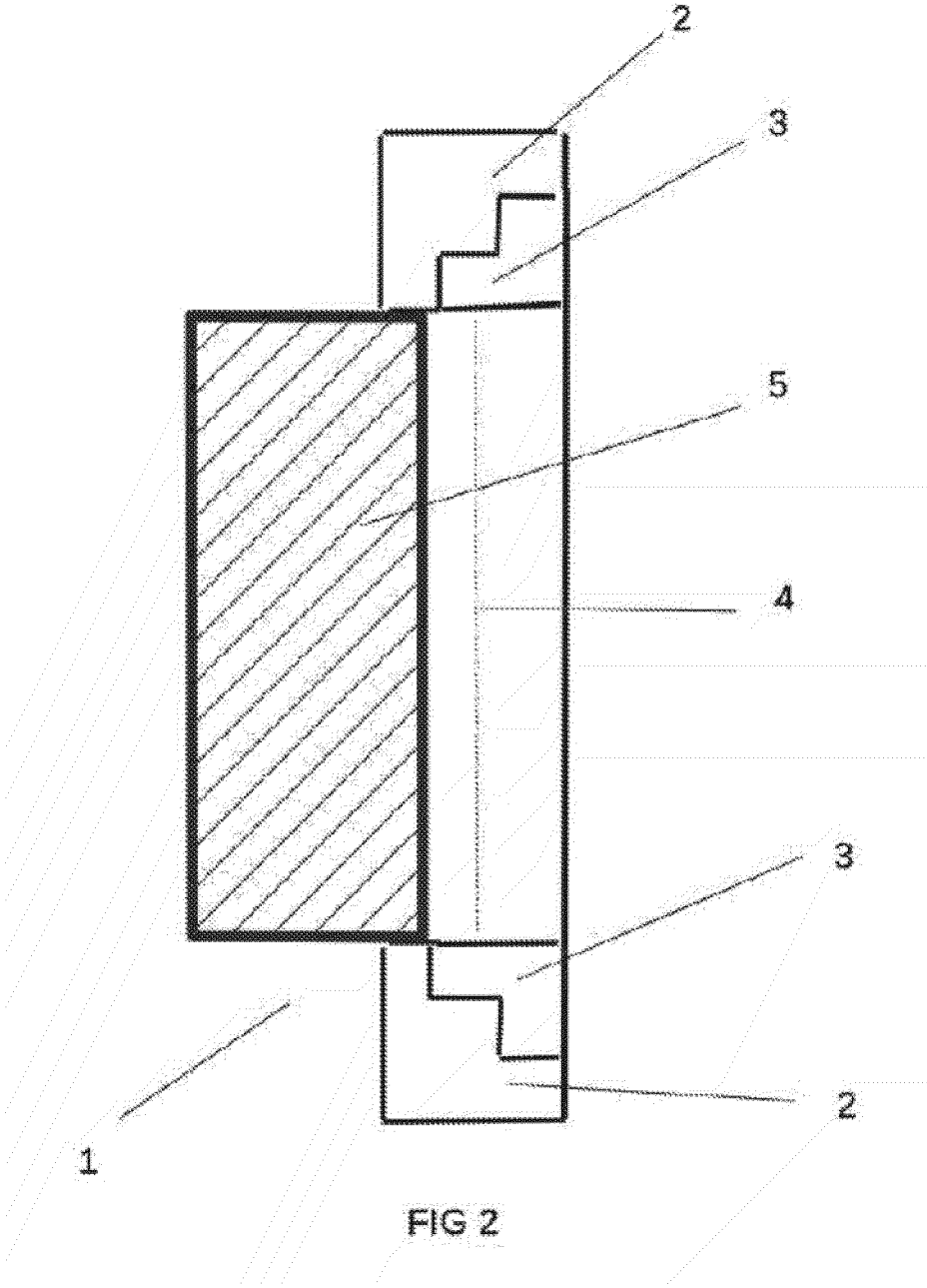
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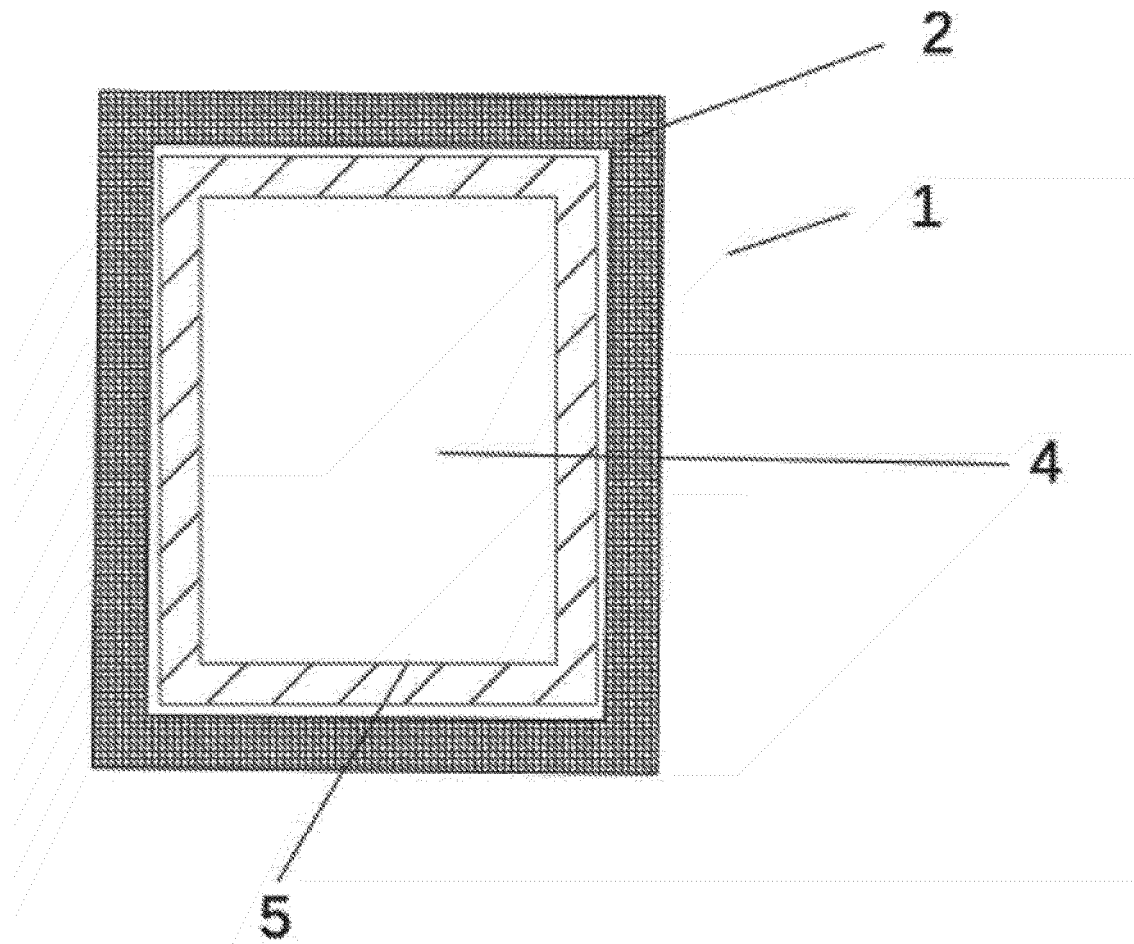


FIG 3

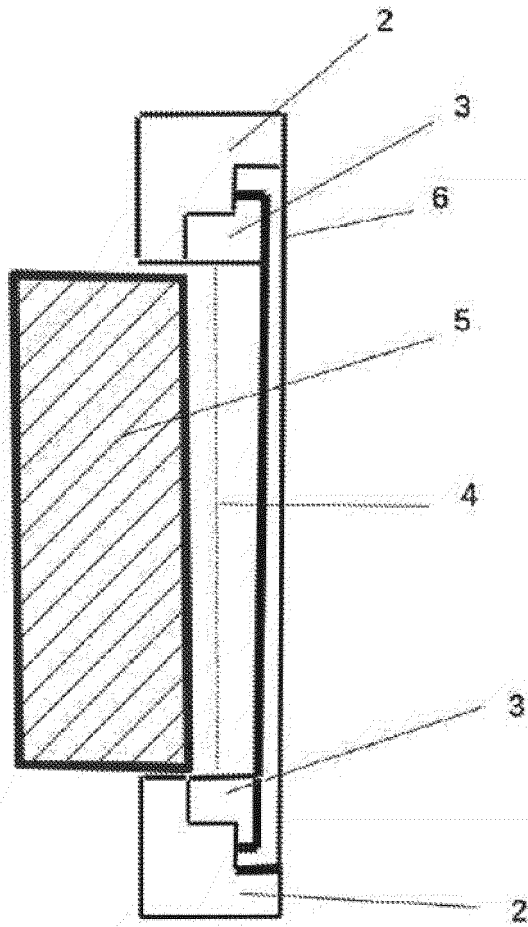


FIG 4

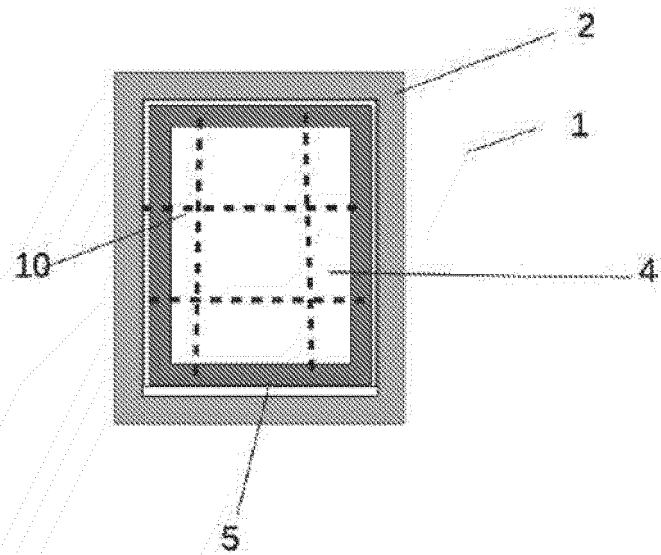
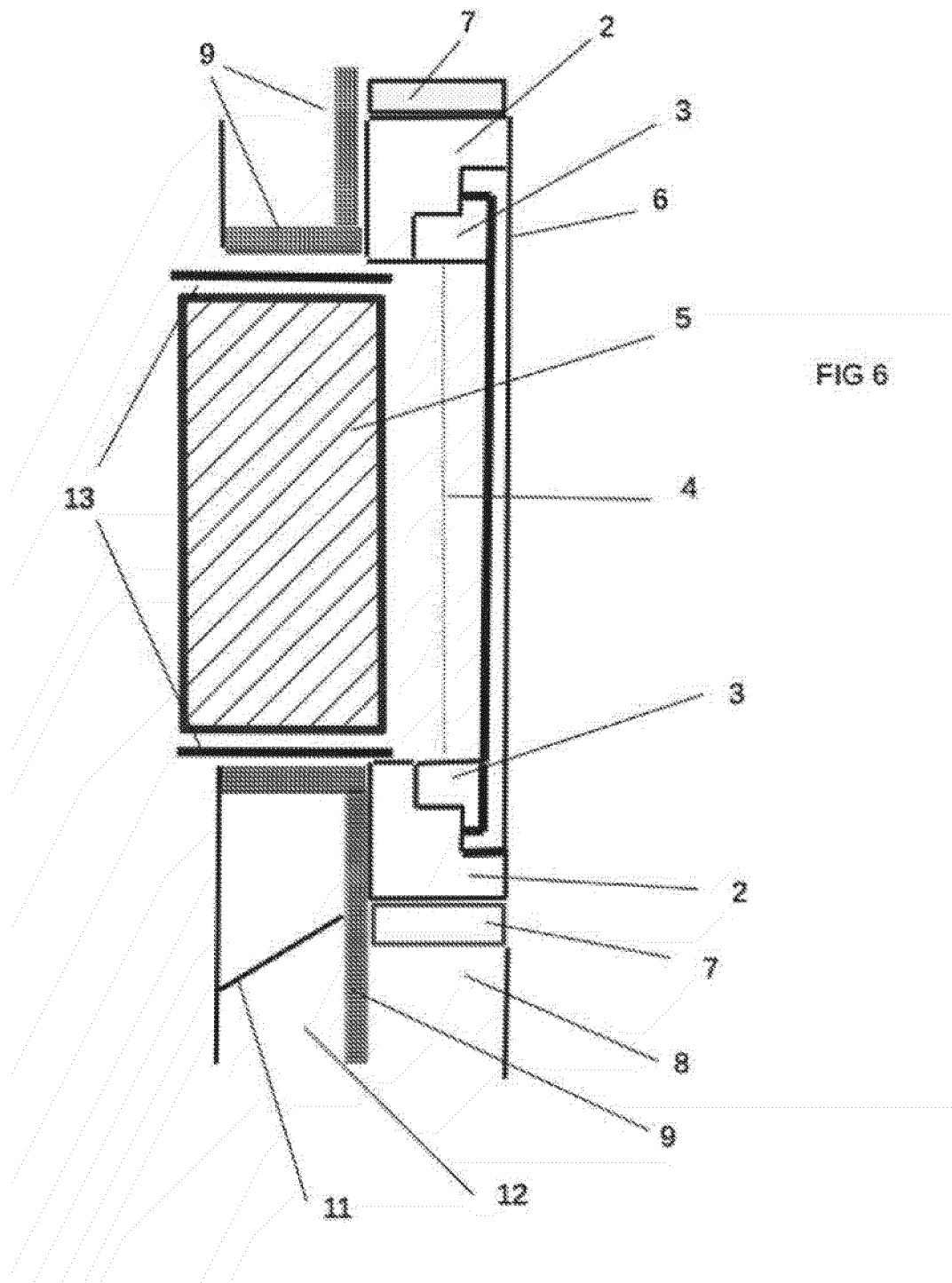
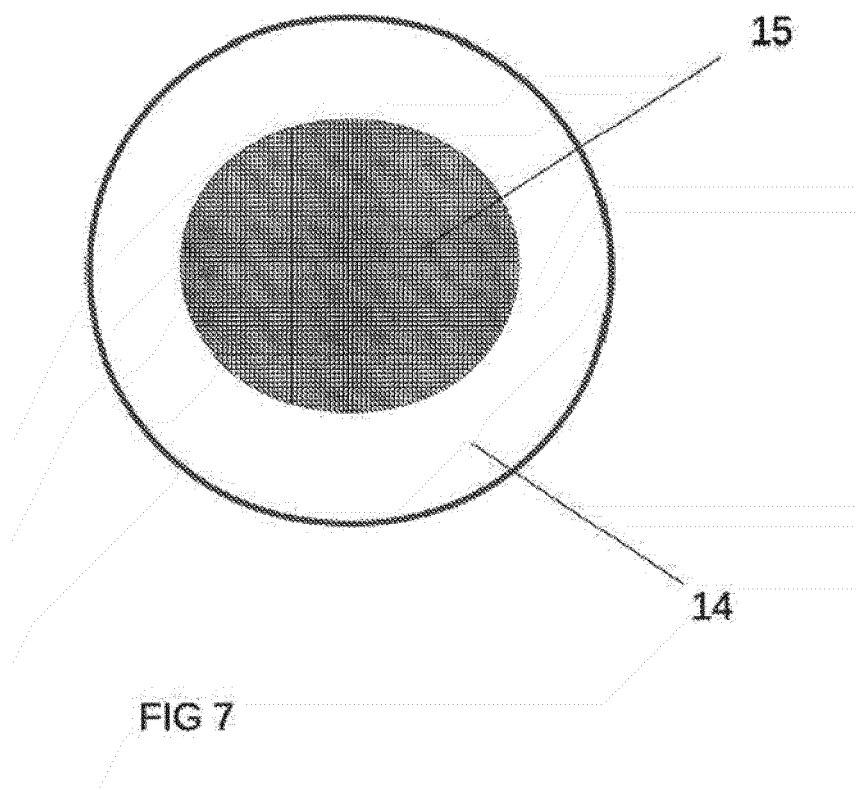


FIG 5





INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2021/070936

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

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Paseo de la Castellana, 75 - 28071 Madrid (España)

Facsimile No.: 91 349 53 04

Authorized officer

R. Peñaranda Sanzo

Telephone No. 91 3493051

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2021/070936

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2021/070936

CLASSIFICATION OF SUBJECT MATTER

E06B1/06 (2006.01)

E06B1/02 (2006.01)

E06B9/01 (2006.01)

REFERENCES CITED IN THE DESCRIPTION

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