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(54) **MODULAR SYSTEM FOR THE INSULATION OF A COMPARTMENT FOR ROLLING SHUTTERS AND RELATED METHOD OF INSULATION**

(57) The present invention relates to a modular system for the insulation of a compartment (V) for rolling shutters (A) with at least three interlocking panels (1,2,3,4) that are made of a non-elastic material and that, subsequently to installation, are easily removable without the need for invasive works to access the compartment (V).

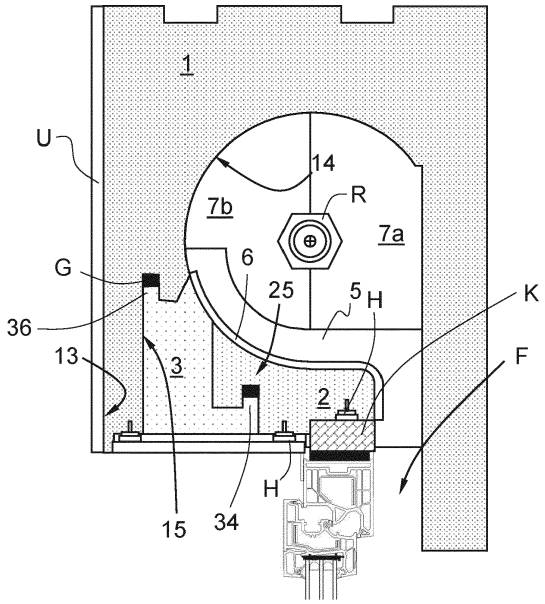

FIG. 10

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Description

Technical Field

[0001] The present invention relates to a modular system for the insulation of a compartment for rolling shutters and related method of insulation.

Background Art

[0002] In the field of building renovation, a particularly important aspect is the energy improvement of existing buildings where special measures are used to insulate the perimeter area of the building more effectively, especially in the areas where there are openings such as doors and windows.

[0003] In the home building sector, most of the solutions for covering windows and doors are still made by means of rolling shutters (shutters, blinds or similar) in which, on top of the window frame, there is a compartment intended to contain the roller connected in a kinematic manner to a tape or a motor that, by placing the roller in rotation, allows the winding and the unwinding of the rolling shutter on the roller itself to cover/uncover the window or door.

[0004] It is well known that most of the heat loss of buildings occurs where there are the openings intended for doors and windows, especially, in the case of solutions to cover the window with shutters, where the containment compartment of the roller is located. In this area, a drastic reduction of the insulating power is due both to air draughts and to the lower thickness of the perimeter wall necessary to contain the rolling shutter with a consequent reduction of the overall insulating power.

[0005] It follows that, although in recent years the development of new technologies in the windows and doors field have allowed a substantial improvement in heat performance, the dispersion of the compartment still remains a particularly crucial drawback.

[0006] Several solutions have been developed to improve the insulation of containment compartments for rolling shutters.

[0007] In the case of renovations with replacement of the window frame, so-called insulated mono-block frames are usually installed. These are solutions that provide for the complete removal of the existing false frames with prefabricated modules, e.g. made of polystyrene, designed for the complete insulation of the window space through an individual frame having several functions: containment of the rolling shutter, support of the window/door frame and possible provision of mosquito nets.

[0008] On the contrary, as illustrated in the known solutions shown in Figures 1-4, in case of renovations without replacement of the window/door frame, the inside of the compartment V is partly filled with several insulating panels P (e.g. made of polystyrene) cut to size and positioned around the volume occupied by the rolling shutter A to increase the overall insulation of the compartment V. Obviously, this solution must also take into account the constructional features of the compartment V intended to house the rolling shutter A in consideration of the fact that the inside of the compartment must always be accessible for any inspection or maintenance operations both in frontal inspection compartments, by means of the so-called box W (Figure 1 and 2), and in inspection from below, by means of the so-called ceiling C (Figure 3 and 4).

[0009] In the particular case of the compartments with the possibility of inspections from below, the ceiling C can be mounted with horizontal sliding closure (Figure 3) on appropriate side guides or with a tilting solution (Figure 4). In both cases, the lower closure panel P for the access to the compartment V, after being cut to size, is foamed and bonded to the lower lintel in order to prevent air draughts from entering.

[0010] This solution, however, is extremely limiting in the case of, after the insulation operations, the access to the compartment is made necessary for inspections or maintenance works. In fact, if, at a later time, an operator needs to work inside the compartment, the lower panel must be unglued and removed with the consequence, more often than not, that the panel is damaged and has to be replaced with a new one that will be bonded and foamed again after the inspection has been completed.

[0011] Due to the aforementioned problems, it became necessary to develop a new modular insulation system that would allow it to be easily implemented in the compartments for rolling shutters, which could facilitate access and inspection, and had high insulating capacity.

[0012] Over the years, several solutions have been proposed to fix, in part, the aforementioned drawbacks.

[0013] DE 20 2014 100 607, for example, proposes a system for the thermal insulation of a box provided with three interlocking panels where the main panel, which winds around the top and front of the roller, is made of elastic material in order to be able to adapt to different dimensions of the compartment. Moreover, in order to be able to inspect the compartment, the main panel is simply inserted inside without bonding or fixing it to the compartment walls so that it can be removed. Notable differences of this solution with respect to the invention proposed herein are identified in the upper elastic panel, therefore not rigid, extending by a length equal to about half the height of the compartment and not fixed to any of the walls of the building.

[0014] DE 20 2008 015 386 proposes a system to thermally insulate a cavity. In the first described embodiment, three interlocking panels made of polystyrene are provided to wind around the roller. The first ring-shaped panel winds the roller on the top and partly on the front, while the second and third panels wind the roller on the front and bottom, respectively. In the second embodiment it is possible to position an intermediate panel between the first and the second panel to adapt to the different heights of the compartments. Notable differences of this solution

with respect to the invention proposed herein are identified in the upper panel having a length equal to about half the height of the compartment and not fixed to any of the walls of the building.

[0015] DE 20 2007 017 443 describes a shutter box comprising three foam insulation bodies arranged around the roller of the shutter. An openable lower cover is provided to allow the access to the compartment. Notable differences of this solution with respect to the invention proposed herein are identified in the upper panel which does not cover the roller at the top, but only at the front, with a vertical extension equal to about half the height of the compartment, not fixed to any of the walls of the building and not interconnected by interlocking to the adjacent panels.

[0016] DE 20 2012 100 407 describes a shutter box provided with three separate insulating mats made of polyethylene, neopor or cellular rubber in which the upper part is foldable at will and is fixed to the upper side and to the internal wall of the compartment. Notable differences of this solution with respect to the invention proposed herein are identified in the non-rigidity of the panels that do not allow self-supporting functions and interconnected to each other without joints.

[0017] The solutions listed above have several drawbacks both with reference to the assembly systems and to the overall insulating power obtainable.

Description of the Invention

[0018] One object of the present invention relates to a system aimed at improving the existing solutions by interconnecting at least three interlocking panels that are made of a non-elastic material and that, subsequently to installation, are easily removable without the need for invasive works to access the compartment.

[0019] The system thus created aims at achieving several advantages. First, the upper insulation panel is configured to:

- be constrained to the upper part of the compartment so that it cannot be removed after being installed,
- be made in a single body piece and have a self-supporting function for any subsequent skimming or plasterboard applications,
- have a height equal to or substantially equal to the height of the compartment,
- wind the roller with a curvilinear facing surface extending by an arc-shaped section comprised between 140° and 180°, preferably equal to about 155°,
- be designed so as to retain the second lower panel so that the latter does not collapse when the lower panel is removed.

[0020] The object set out above is achieved by the present modular system for the insulation of a compartment for rolling shutters having the characteristics of claim 1.

[0021] Another object of the present invention relates to a method of insulation of a compartment for rolling shutters having the characteristics of claim 8.

[0022] Still another object of the present invention relates to a kit for the on-site installation of a system for the insulation of a compartment for rolling shutters having the characteristics of claim 14.

Brief Description of the Drawings

[0023] Further characteristics and advantages of the system, the method and the kit according to the present invention will result from the description below of its preferred examples of embodiment, given by way of an indicative, yet nonlimiting example, with reference to the attached figures, wherein:

- Figures 1 and 2 show cross-sectional images of a compartment for the housing of a roller for shutters of the box type with frontal inspection according to the prior art,
- Figure 3 shows a cross-sectional image of a compartment for the housing of a roller for shutters provided with a lower ceiling for inspection from below according to the prior art,
- Figure 4 shows a cross-sectional image of a compartment for the housing of a roller for shutters provided with a tilting lower ceiling for inspection from below according to the prior art,
- Figure 5 shows a cross-sectional image of a modular system for the insulation of a compartment for rolling shutters by means of interlocking panels enclosed by a sliding lower ceiling and mosquito net option according to one of the embodiments of the present invention,
- Figure 6 shows the system of Figure 5 without a mosquito net according to one of the embodiments of the present invention,
- Figure 7 shows a cross-sectional image of a modular system for the insulation of a compartment for rolling shutters with interlocking panels having a cap-shaped lower ceiling according to one of the embodiments of the present invention,
- Figure 8 shows the system of Figure 7 with a mosquito net option according to one of the embodiments of the present invention,
- Figure 9 shows the system of Figure 7 without a mosquito net and self-expanding gaskets according to one of the embodiments of the present invention,
- Figure 10 shows a cross-sectional image of the modular system according to the invention according to a further embodiment.

Embodiments of the Invention

[0024] With reference to the attached figures, a system for the insulation of a compartment V according to the present invention is globally represented.

[0025] The compartment V occupies a generally predefined volume intended to contain a rolling shutter A that can be rolled up on a revolving roller R extended longitudinally along its own axial direction. The compartment V is generally built on site and obtained at the upper part of the architectural space of the perimeter wall M of a building.

[0026] As will be seen later in the present description, the compartment V is also intended to contain a plurality of panels 1, 2, 3 and 4 advantageously interconnected with each other by interlocking and shaped to size so that they extend around the roller R.

[0027] First of all, it should be specified that there are different masonry techniques for the construction of the compartment V depending on the type of architecture of a building.

[0028] According to an embodiment shown in the examples of Figures 5-9, the compartment V can be obtained at the perimeter wall M and delimited as follows:

- at the rear, by the inside of the perimeter wall M of the building,
- above, by the upper lintel Q,
- at the front, by a layer of plasterboard U or other covering,
- below, by the ceiling C and by the lower lintel K.

[0029] Conveniently, between the perimeter wall M and the lower lintel K a passage slot F for the rolling shutter A is identified.

[0030] In detail, the depth 11 of the compartment V is defined between the perimeter wall M and the plasterboard U while the height 12 is defined between the upper lintel Q and the lower lintel K.

[0031] Conveniently, the compartment V is intended to be at least partly filled by the insulating panels 1, 2, 3 and 4 arranged around the roller R. In detail, the panels 1, 2, 3 and 4 are shaped externally to follow, when joined together, the internal perimeter profile of the compartment V. Furthermore, each panel 1, 2, 3 and 4 is shaped inwardly to leave adequate volume for the rolling shutter A when rolled up on the roller R. For this purpose, the radial distance between the roller R and the panels 1, 2, 3 and 4 is preferably comprised between 100 mm and 140 mm, in particular about 123.5 mm.

[0032] Preferably, the panels 1, 2, 3 and 4 are made of non-elastic insulating material. In the remainder of the present description and in the subsequent claims, the term "non-elastic" means a mostly rigid material that does not tend to deform under the action of external forces. One example of an insulating material used for the panels of the present invention is polystyrene.

[0033] According to an embodiment, only the first panel 1 is made of non-elastic insulating material. A first panel 1 made of elastic, thus non-rigid material (such as, e.g., panels made of rock wool, glass wool, etc.), would be ill-suited for use in the present invention since, as will be seen below, the first panel 1 must perform a self-supporting function.

[0034] Conveniently, the insulating panels 1, 2, 3 and 4 extend parallel to the axial direction of the roller R by a length substantially equal to the width of the compartment V and are, preferably, four in number: a first upper panel 1 and three lower panels 2, 3 and 4.

[0035] The first upper panel 1 has a substantially horizontally reflected "L" shape in which there are mainly a horizontal upper surface 11, a rear surface 12 and a front surface 13 both of which are extended substantially vertically, and a connecting surface 14 facing towards the roller R between the rear surface 12 and the front surface 13.

[0036] In use, the front surface 13 of the first panel 1 extends downwardly by a length substantially equal to the height 12 of the compartment V.

[0037] According to some embodiments, the first panel 1 is intended to at least partly wind the upper volume portion around the roller R.

[0038] According to the embodiment shown in Figures 5-8, the front surface 13 of the first panel 1 has a greater height than the height of the rear surface 12.

[0039] Different solutions cannot however be ruled out, such as the one illustrated e.g. in Figure 9, in which the rear surface 12 of the first panel 1 has an extension with a greater height than the height of the front surface 13 that extends as far as the slot F, beyond the lower lintel K.

[0040] Advantageously, such a solution is able to achieve an extremely high insulating power thus meeting the requirements of the strictest European energy standards (e.g. "CasaClima" standard).

[0041] With reference to the example in Figure 9, taking as a reference a Cartesian system whose center of the axes X and Y corresponds to the axial direction of extension of the roller R, the connecting surface 14 of the first panel 1 extends around the axial direction of extension of the roller R altogether from the first I to the third III quadrant in a counterclockwise direction.

[0042] As can be seen in the various embodiments illustrated in the attached figures, the connecting surface 14 of the first panel 1 faces towards the roller R and may have, depending on the various installation solutions, a curvilinear pattern (Figures 7-9) or polygonal pattern (Figures 5 and 6).

[0043] If the connecting surface 14 has a polygonal pattern, the latter may be delimited by a plurality of straight segments 14a, 14b, 14c and 14d preferably in an even number of four (Figures 5 and 6). Similar solutions cannot however be ruled out with several segments intended to ensure that the connecting surface 14 follows an overall circumferential extension around the roller R and/or the rolling shutter A.

[0044] Conversely, if the connecting surface 14 has a curvilinear pattern (Figures 7, 8 and 9), the latter extends around the axial direction of extension of the roller R to form a cylindrical portion. In particular, the connecting surface 14 extends by an arc-shaped section of predetermined length preferably comprised between 140° and

180°, preferably equal to about 155°.

[0045] The first panel 1 also has a lower surface 15 connecting the connecting surface 14 to the front surface 13. Said lower surface 15 may have a substantially regular broken pattern (visible, e.g., in Figures 5 and 6) consisting of three segments perpendicular to each other or a complex broken pattern (Figures 7, 8 and 9) in which the lower surface 15 is made up of several segments joined together according to different orientations. In the latter case, the first panel 1 may have a recess 16 arranged at the bottom surface 15 and intended to receive, as explained in detail below, by non-linear shape coupling, an engagement portion 46 of the fourth panel 4.

[0046] Preferably, the upper surface 14 of the first panel 1 has a substantially straight pattern to follow the pattern and abut against the internal surface of the upper lintel Q.

[0047] Conveniently, the front surface 13 is perpendicular to the upper surface 14. Advantageously, the front surface 13 is flat with a continuous pattern. In this context, if during a redevelopment of the compartment, the interior portion of the house suffers damage or consolidation or cosmetic renovation work is required, the first panel 1 can perform a self-supporting function so that it can be used as a support for direct application of a plaster skim coat or fixing of plasterboard.

[0048] With reference to the three lower panels 2, 3 and 4, some of the different possible embodiments are shown below.

[0049] As anticipated above, the volume portion underneath the roller R in the compartment V is intended to be partly filled by means of a second 2, a third 3 and a fourth insulating panel 4 which are mounted by interlocking with each other in order to make a self-supporting modular system that does not require the panels to be bonded together. In this way, any internal inspections of the compartment V can be carried out without the need for invasive ungluing works and, as specified below, extremely quickly.

[0050] As shown in the example of Figure 5, the second lower panel 2 is intended to be installed on top of the lower lintel K between the slot F and the third panel 3. Conveniently, the second panel 2 has a substantially vertically reflected "C" shape in which are mainly identified a horizontal upper surface 21 and a horizontal lower surface 22, a substantially vertically-extended rear surface 23, and a front connection surface 24 between the upper surface 21 and the lower surface 22.

[0051] Advantageously, the front connection surface 24 of the second lower panel 2, in use facing the inside of the building, has a longitudinal groove 25 intended to receive, by shape coupling, an engagement portion 34 of the third lower panel 3.

[0052] Conveniently, the upper surface 21 of the second panel 2 faces towards the roller R and preferably has a straight pattern.

[0053] As shown in the examples of Figures 6, 7, 8 and 9, the second panel 2 may be shaped according to different formats depending on the particular wall structure of the building, or depending on the presence or absence of the mosquito net Z in which one or more extensions can be provided to form overall outlines, e.g., in the shape of a vertically reflected "F" (Figures 8 and 9), in the form of a horizontally reflected "S" (Figure 7), etc.

[0054] With reference to the example illustrated in Figure 6, the third lower panel 3 is intended to be installed between the second panel 2 and the fourth panel 4 and has, in its simplest embodiment, a substantially "L" shape rotated by 180° in which are mainly identified a horizontal upper surface 31 and a horizontal lower surface 32, a rear surface 33 having a substantially vertical extension from which the engagement portion 34 overhangs, and a front surface 35 comprising one or more engagement/overhanging portions 36. Conveniently, the overhanging portion 36 is intended to mate superiorly with a corresponding engagement portion 45 of the fourth panel 4.

[0055] According to further versions, alternative embodiments of the third panel 3 cannot be ruled out in which there may be, e.g., two or more overhanging portions 36 oriented downwards and separated from each other by a groove 37 (Figure 7) intended to receive by shape coupling the engagement portion 45 of the fourth panel 4.

[0056] Preferably, the upper surface 31 of the third panel 3 extends from the second quadrant II to the third quadrant III and may have a straight pattern (Figures 5 and 6) or a curvilinear pattern (Figures 7, 8 and 9).

[0057] If the upper surface 31 of the third panel 3 has a curvilinear pattern, it preferably extends around the axial direction of extension of the roller R by an arc-shaped section of predetermined length comprised between 30° and 55°, preferably equal to about 43°.

[0058] The fourth lower panel 4 is intended to be fitted between the first panel 1 and the third panel 3 and has, in its simplest version (Figure 5), a substantially "T" shape rotated by 180° in which are mainly identified a horizontal upper surface 41 and a horizontal lower surface 42 connected by respective rear surface 43 and front surface 44.

[0059] The upper surface 41 of the fourth panel 4 preferably extends by a predefined length in the third quadrant III and can also have a straight pattern (Figures 5 and 6) or a curvilinear pattern (Figures 7, 8 and 9).

[0060] In the event of the upper surface 41 of the fourth panel 4 having a curvilinear pattern, it extends around the axial direction of the roller R by an arc-shaped section of predetermined length preferably comprised between 20° and 50°. Conveniently, the rear surface 43 and front surface 44 of the fourth panel 4 may have a substantially regular complex broken pattern (visible, e.g., in Figures 5 and 6) consisting of segments perpendicular to each other or a complex broken pattern (Figures 7, 8 and 9) in which the surfaces 43 and 44 are composed of multiple segments joined together according to different orientations. In the latter case, the fourth panel 4 may have two or more engagement portions 45, 46 (Figures 7, 8 and

9) respectively obtained at the rear surface 43 and front surface 44 and intended to fit by shape coupling into the groove 37 of the third panel 3 and into the recess 16 of the first panel 1, respectively.

[0061] According to some embodiments, gaskets G (e.g., self-expanding) may be provided between the panels 1, 2, 3, and 4 to increase the insulating power between the panels. In particular, the gaskets may be fitted at the interlocking points of the panels 1, 2, 3 and 4, e.g. between the longitudinal groove 25 and the engagement portion 34, between the groove 37 and the engagement portion 45, and between the recess 16 and the engagement portion 46.

[0062] According to some embodiments, one or more magnetic elements (not shown) may be provided between the panels 1, 2, 3 and 4 to increase mutual adhesion between the panels. Preferably, the gaskets G themselves may also have magnetic portions or be magnetic themselves to make a dual insulating and adhesion function.

[0063] With reference to the different embodiments of the invention, the compartment V can be closed by a lower cover C (so-called ceiling) that can be inserted by sliding (Figures 5 and 6) on appropriate guides obtained laterally to the compartment V or close the latter by means of a "cap" system in which the cover C is joined to one or both the lower panels 3, 4 (Figures 7, 8 and 9). In the latter case, the joining of the cover C to the panels 3, 4 may be carried out by providing suitable joining elements H secured to the upper surface of the cover C and to the panels 3, 4. In a preferred embodiment, the joining may be carried out by means of a dowel/screw anchorage or different anchorages of the snap-on type.

[0064] With reference to the example shown in the magnified view of Figure 8, each joining element H preferably comprises a magnetic portion H1 fixable to the panel by means of, e.g., a dowel H3 and a metal head H2 secured to the cover C (or vice versa). Advantageously, by means of this configuration, the opening of the cover C will be simplified without having to carry out invasive operations of bonding/ungluing to access the inside of the compartment V. It will be possible, e.g., to remove the cover C by means of a suction cup system to separate the magnetic portion H1 from the metal head H2.

[0065] As shown in the example of Figure 5, the upper surfaces 21, 31, 41 of the second 2, third 3, and fourth panels 4 are substantially aligned in the same horizontal plane.

[0066] As shown in the example of Figure 6, the upper surfaces 21 and 31 of the second panel 2 and third panel 3 are substantially aligned in the same horizontal plane, while the surface 41 of the fourth panel is inclined with respect to said horizontal plane.

[0067] As shown in the examples of Figures 7, 8, and 9, the surfaces 14, 21, 31, 41 of the panels 1, 2, 3, and 4 facing towards the roller R are substantially aligned on a portion of the same circumferential surface arranged around the roller R between the first quadrant I and the fourth quadrant IV in a counterclockwise direction which extends by an arc-shaped section of a predetermined length preferably comprised between 180° and 300°, preferably equal to about 240°. According to the embodiment shown in Figure 10, the modular system of the invention may provide for the insulation of the compartment V with a smaller number of panels, in particular with a number of three panels: a first upper panel 1 and two lower panels 2 and 3 (rather than three lower panels such as in the embodiments described above).

[0068] In this version, the fourth panel 4 is omitted and the lower coverage of the compartment V is carried out only by the second lower panel 2 and the third lower panel 3. In detail, the third panel 3 is arranged by interlocking between the first panel 1 and the second panel 2. The shapes of the third panel 3 and of the second panel 2 are quite similar to the previously described embodiments where the difference of the second panel 2 in this version consists in an overall more extended shaping between the second quadrant II and the third quadrant III to make a continuity of the lower coverage of the compartment V between the lower lintel K and the third panel 3. Additionally, the longitudinal groove 25 of the second panel 2 is turned, in use, downwards and intended to receive by shape coupling the engagement portion 45 of the third panel 3.

[0069] One of the methods of insulating a compartment for roller shutters according to the present invention is described below.

[0070] An initial phase involves having three or four panels 1, 2, 3 and 4 shaped to size, and for example contained in a ready-to-use kit previously prepared at the factory, according to the dimensions of the compartment V to be insulated. Another phase involves the insertion of the first panel 1 inside the compartment V to be fixed above the roller R, e.g, by gluing it to the wall M and to the upper lintel Q with polyurethane foam.

[0071] Another phase involves the insertion of the second panel 2 inside the compartment V to be positioned on the lower lintel K. In one embodiment, for example, the second panel is fixed to the lintel K by means of polyurethane foam bonding or by means of a magnetic joining element H.

[0072] In the case of insulation with three lower panels (Figures 5-9), a further phase involves interlocking the third panel 3 to the second panel 2 by shape coupling of the engagement portion 34 in the longitudinal groove 25.

[0073] In this way, the adhesion and fixing of the two panels 2 and 3 to each other is guaranteed without the need for adhesives and thanks to the special non-linear coupling given by the predefined shape of the panels themselves. Subsequently, the fourth panel 4 is intended to be interlocked between the third panel 3 and the first panel 1 by means of non-linear shape coupling. Also in this case, the adhesion and fixing of the fourth panel 4 to the panels 1 and 3 is guaranteed without the need for adhesives and thanks to the special predefined shaping of the panels themselves.

[0074] In the case of insulation with two lower panels (Figure 10), the third panel 3 is interlocked to the second panel 2 and to the first panel 1 by mutual shape coupling. As can be observed, the overhanging portions 34 and 36 fit into their respective housings 25, 16 provided in the second panel 2 and in the first panel 1. In this way, the adhesion and fixing of the two panels 2 and 3 to each other is guaranteed without the need for adhesives and thanks to the special non-linear coupling given by the predefined shaping of the panels themselves.

[0075] Still another phase may involve the insertion of side panels 7a, 7b to completely close the side of the compartment V. The side panels 7a, 7b (e.g. in the shape of half moons) are intended to be fixed to the internal side walls of the compartment and can be provided with respective through holes for the passage of the roller R. In one version, as shown in Figure 10, it is also possible to have an additional panel 5 with reduced thickness (e.g. a few centimeters) that can be placed next to each side of the compartment V and shaped like an inverted "C" to be positioned between the lower panels 2, 3 and/or 4 and the roller R. In this version, it is also possible to have a self-expanding gasket 6 that can be inserted on top of panels 2 and 4 to obtain such an insulation as to avoid air passages on the sides of the compartment V.

[0076] After all the panels have been inserted, the compartment V is closed by the ceiling C according to the above mentioned techniques, and at the external surface 13 of the first panel 1 an application of a final covering layer U, such as plasterboard, or the application of other architectural elements may be provided. According to one embodiment not shown, the compartment V may be obtained inside the perimeter wall M of the building and delimited as follows:

- at the front and rear by the internal sides of the perimeter wall M of the building,
- above by the upper lintel Q, and
- below by the ceiling C and by the lower lintel K.

[0077] In this context, the phase of applying the final coverage layer U will not be necessary since the external surface 13 of the first panel 1 will also be bonded inside the perimeter wall M.

[0078] If it is necessary to access the inside of the compartment V for inspection, the various panels can be disassembled in only three steps:

- removal of the ceiling C,
- removal of the third panel 3 (Figure 10) and/or of the fourth panel 4 (Figures 5-9),
- removal of the second panel 2.

[0079] It is therefore clear how, with very few operations, it is possible to access the compartment V without any invasive operation of ungluing and/or masonry work. Advantageously, thanks to the particular shaping of the panels, after the panels have been removed, an easy access to the compartment V is ensured with an access opening from below even up to 200 mm deep, thus allowing operating easily for any maintenance operations even by non-specialized personnel.

[0080] As it could be appreciated from what has been described, the modular system for the insulation according to the present invention makes it possible to meet the requirements and overcome the drawbacks referred to in the introductory section of the present description with reference to the prior art.

[0081] Obviously, the embodiments and versions described and illustrated hereinabove are to be considered as purely illustrative, and a skilled person in the art, in order to satisfy contingent and specific needs, may make numerous modifications and variations to the system according to the above-described invention, comprising, e.g., the combination of said embodiments and versions, all of which, however, are contained within the scope of protection of the invention as defined by the following claims. For example, it may be possible to insulate the compartment with a greater number of shaped panels interlocked with each other to form a self-supporting puzzle to avoid mutual bonding and speed up the assembly and disassembly operations.

Claims

1. Modular system for the insulation of a compartment (V) for rolling shutters (A) obtained at the perimeter wall (M) of a building, said compartment (V) being closable below by a removable cover (C), comprising:

   a revolving roller (R) positioned between an upper lintel (Q) and a lower lintel (K) and extended along a longitudinal direction (Z-Z) to allow the winding and unwinding of a rolling shutter (A) around the roller (R), said rolling shutter (A) being movable in a passage slot (F) located between the perimeter wall (M) and the lower lintel (K),
   a first upper panel (1) made of non-elastic insulating material and structurally shaped so as to at least partly wind the upper and front volume portion around the roller (R),
   a second lower panel (2) intended to be installed at least partly on top of the lower lintel (K) of the compartment (V) between the slot (F) and the first panel (1), and
   a third lower panel (3, 4) intended to be installed at least partly on top of the cover (C) and between said first (1) and said second panel (2),
   wherein each panel (1, 2, 3, 4) is interconnected by interlocking to an adjacent panel,
   characterized by the fact that said first panel (1) is constrained to the upper lintel (Q) and to the perimeter wall (M) without possibility of re-

moval from the compartment (V).

2. Modular system according to the preceding claim, wherein said first panel (1) has an upper surface (14) with a substantially straight pattern to follow the pattern and abut against the internal surface of the upper lintel (Q).

3. Modular system according to any of the preceding claims, wherein the front surface (13) of the first panel (1) extends downwardly by a length substantially equal to the height (12) of the compartment (V).

4. Modular system according to claim 2 or 3, wherein the front surface (13) of the first panel (1) is flat and perpendicular to the upper surface (14).

5. Modular system according to any of the preceding claims 2 to 4, wherein the first panel (1) comprises a connecting surface (14) between said front surface (13) and said upper surface (14) which faces towards the roller (R) and extends by an arc-shaped section of predetermined length preferably comprised between 140° and 180°.

6. Modular system according to any of the preceding claims, comprising one or more magnetic elements (G) arranged between said panels (1, 2, 3 and 4) to increase the mutual adhesion of said panels (1, 2, 3, 4).

7. Modular system according to any of the preceding claims, wherein the surfaces (14, 21, 31, 41) of the panels (1, 2, 3, 4) facing towards the roller (R) are substantially aligned on a portion of a same circumferential surface arranged around the roller (R) between the first quadrant (I) and the fourth quadrant (IV) in a counterclockwise direction and which extends by an arc-shaped section of a predetermined length preferably comprised between 180° and 300°, preferably equal to about 240°.

8. Method for the insulation of a compartment (V) for rolling shutters (V) obtained at the perimeter wall (M) of a building, comprising the phases of:

- having at least three insulating panels (1, 2, 3, 4) made of non-elastic materials,
- shaping a first panel (1) so that the connecting surface (14) facing towards the roller (R) extends by an arc-shaped section of a predetermined length preferably comprised between 140° and 180°,
- inserting the first panel (1) inside the compartment (V) above and at the front of the roller (R),
- constraining the first panel (1) to the upper lintel (Q) and to the perimeter wall (M),
- inserting a second panel (2) inside the compartment (V) and position it at least partly above the lower lintel (K),
- inserting inside the compartment (V) a third panel (3) and interlock it between the first panel (1) and the second panel (2),
- closing the compartment (V) by means of a cover (C).

9. Method according to the preceding claim, wherein said phase of shaping provides that said first panel (1) has an upper surface (14) obtained with a substantially straight pattern so that it abuts against the internal surface of the upper lintel (Q).

10. Method according to the preceding claim, wherein said phase of shaping provides that the first panel (1) has a front surface (13) made with a length substantially equal to the height (12) of the compartment (V).

11. Method according to the preceding claim, wherein said phase of shaping provides that the front surface (13) of the first panel (1) is shaped with a pattern substantially flat and perpendicular to the upper surface (14).

12. Method according to the preceding claim, wherein said phase of shaping provides to make a connecting surface (14) between said front surface (13) and said upper surface (14) of said panel facing, in use, towards the roller (R) to extend around the latter by an arc-shaped section of a predetermined length preferably comprised between 140° and 180°.

13. Method according to the preceding claim, comprising the phases of:

- removing the cover (C),
- removing the third panel (3) and/or the fourth panel (4),
- removing the second panel (2),
- access the inside the compartment (V).

14. Kit for the on-site installation of a system for the insulation of a compartment (V) for rolling shutters comprising at least three insulating panels (1, 2, 3, 4) according to any of the claims 1 to 7 and shaped to size at the factory to interconnect to each other by interlocking and to follow, when joined together, the internal perimeter profile of the compartment (V) and to extend around the roller (R).

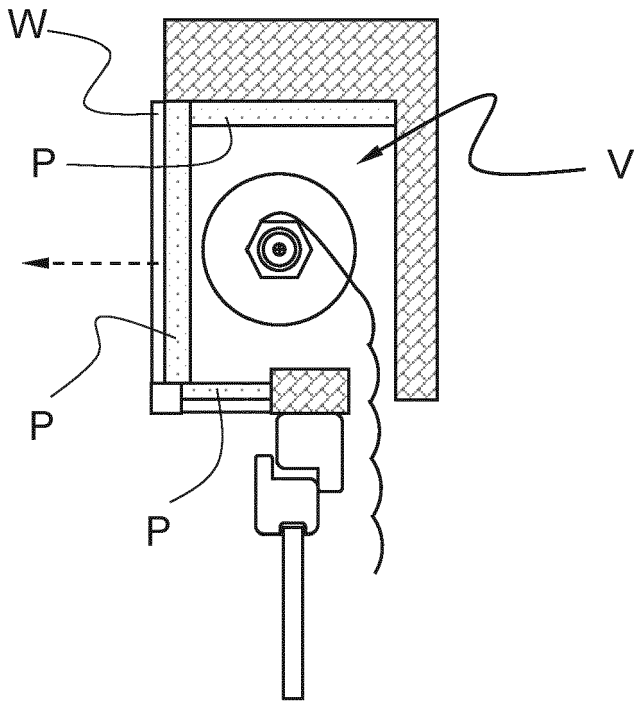

FIG. 1
(PRIOR ART)

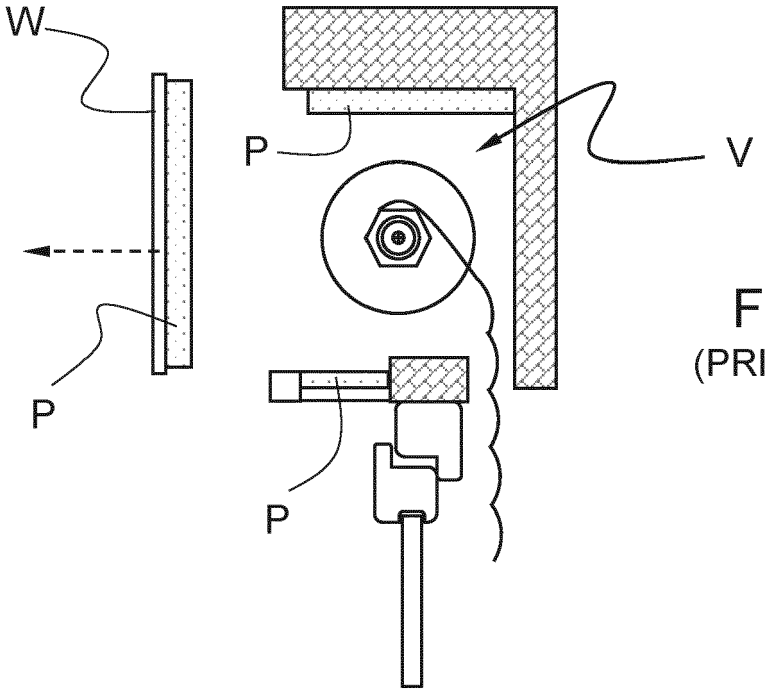

FIG. 2
(PRIOR ART)

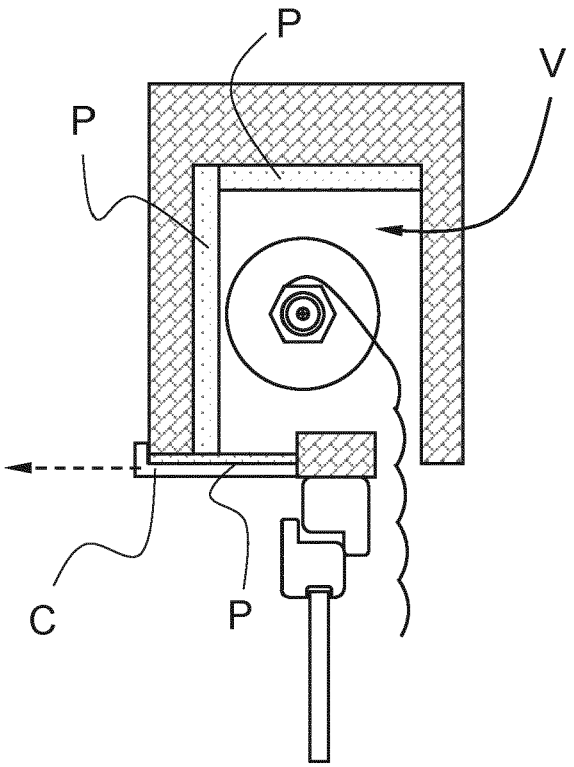

FIG. 3
(PRIOR ART)

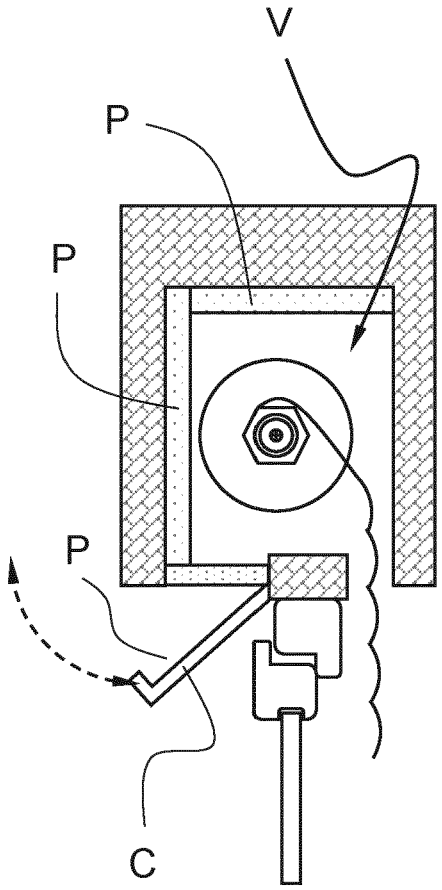

FIG. 4
(PRIOR ART)

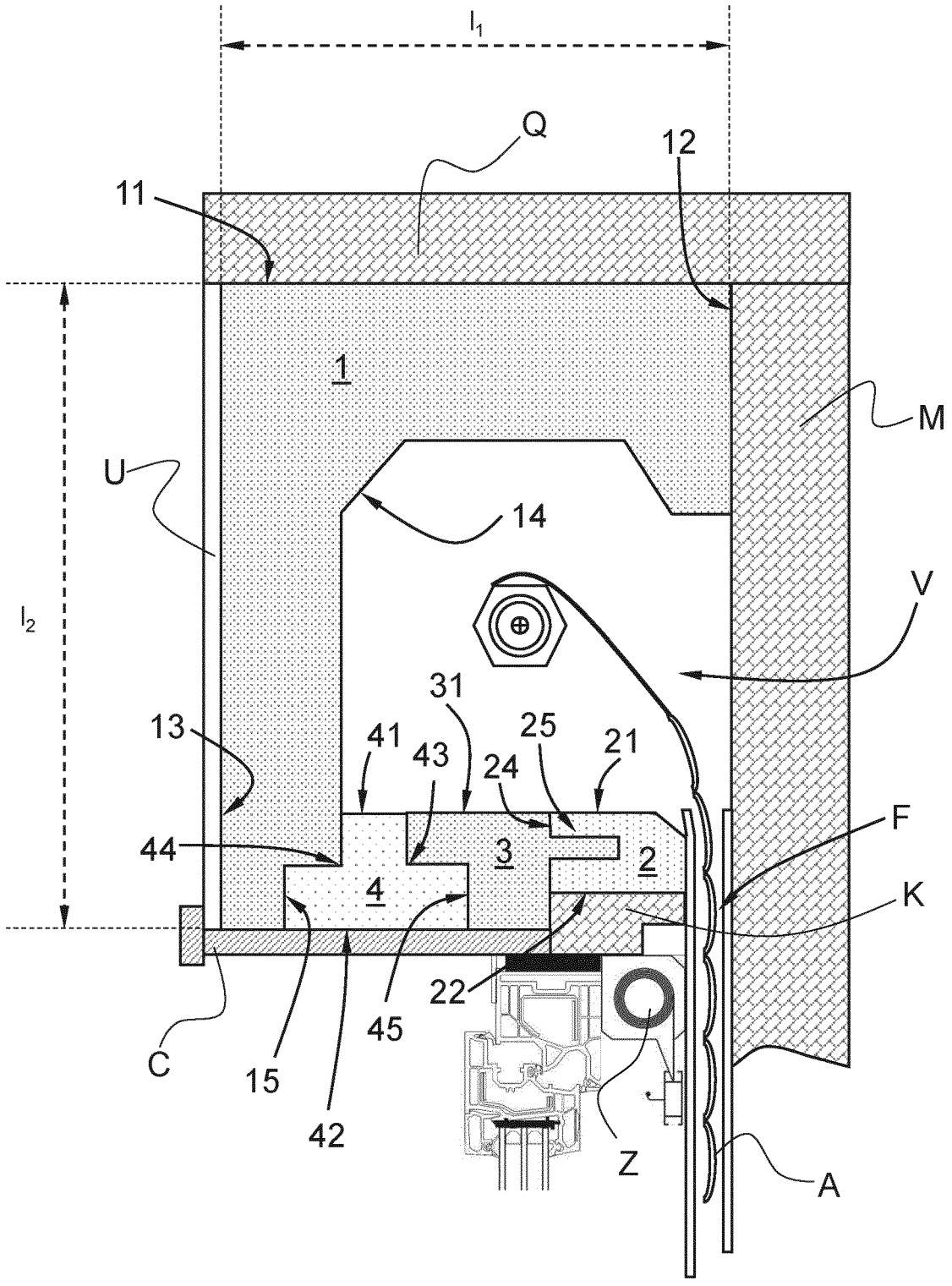

FIG. 5

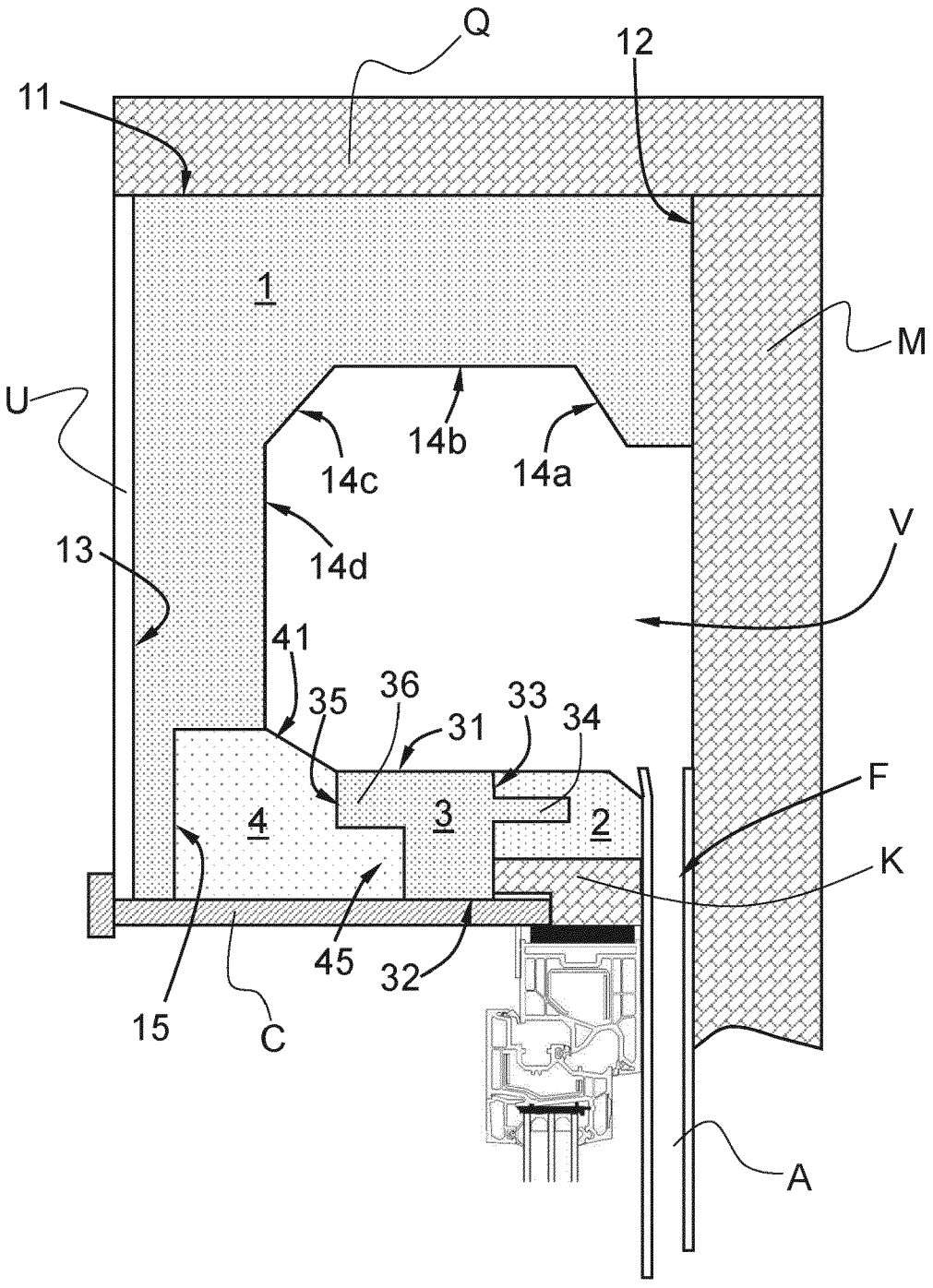

FIG. 6

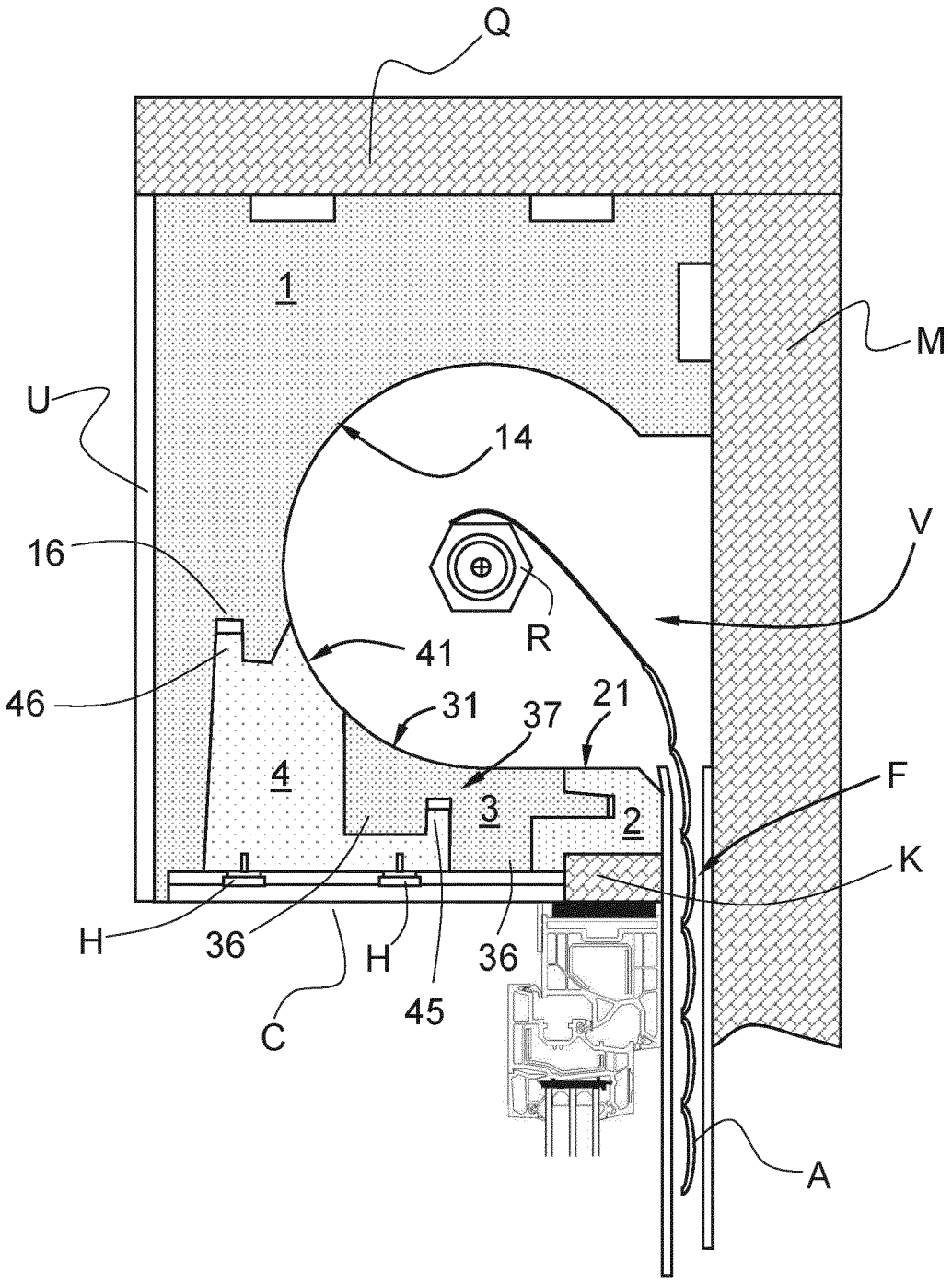

FIG. 7

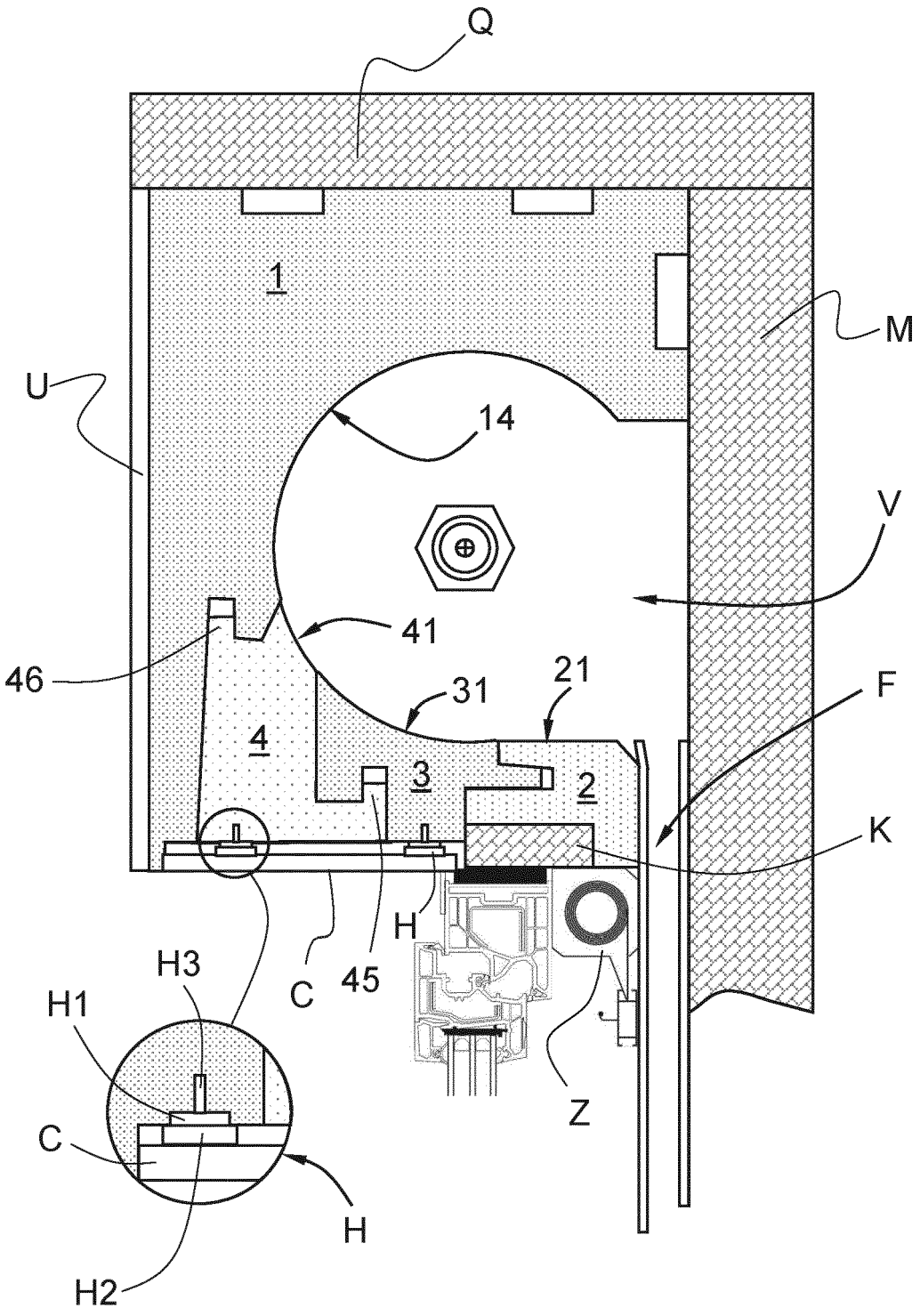

FIG. 8

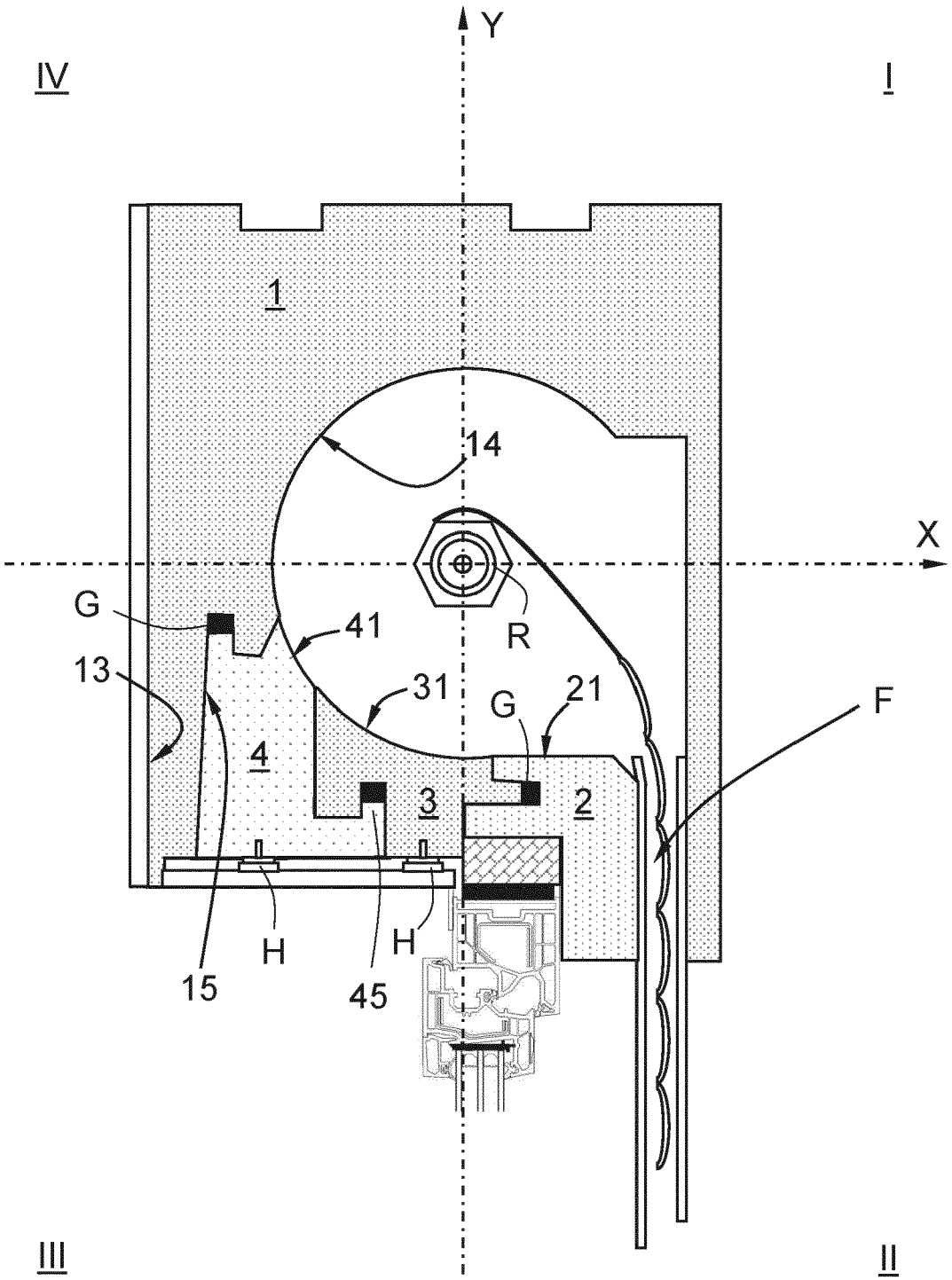

FIG. 9

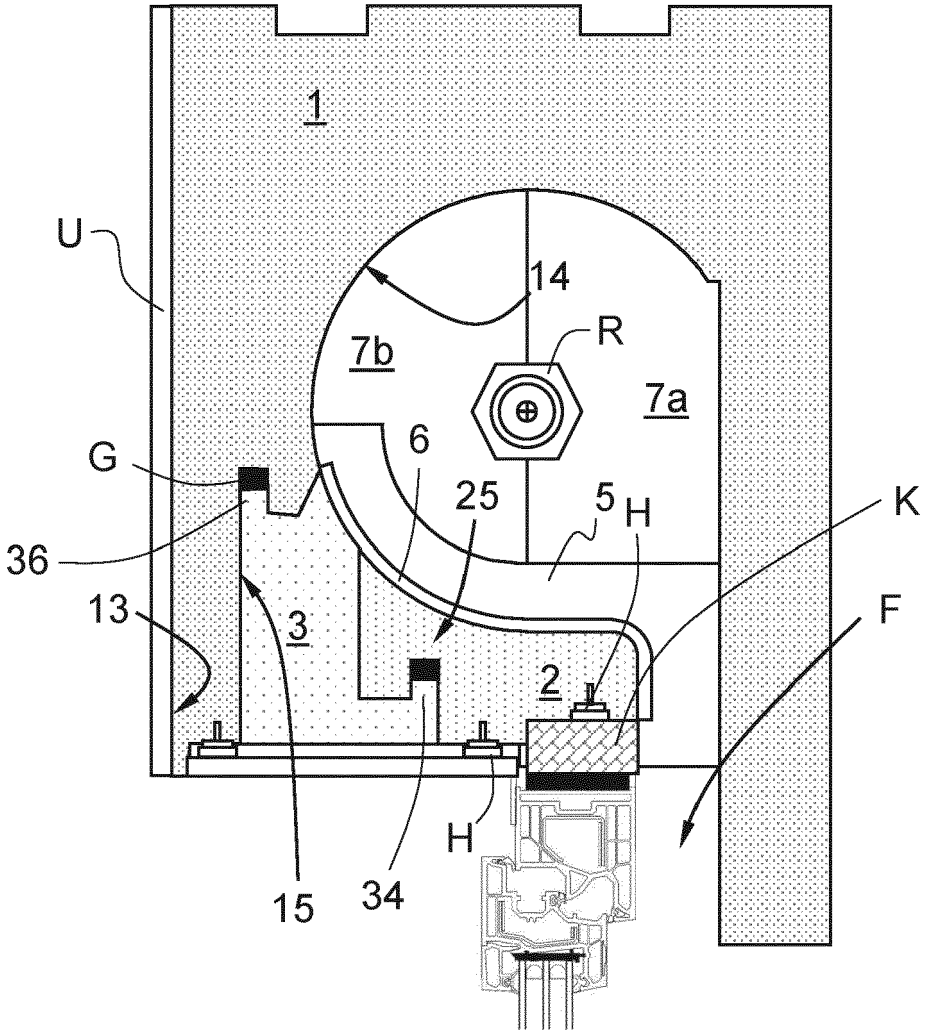

FIG. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 21 16 9554

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	DE 20 2014 100607 U1 (WETZSTEIN KONRAD [DE]; KEMPTER ANTON [DE]) 13 March 2014 (2014-03-13) * paragraph 36 - pages 1-2, paragraph 43; claims 21,22; figure 1 *	1-7	INV. E06B9/17
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Y	* paragraph 29 - pages 1-6, paragraph 47 *	6	
A,D	DE 20 2012 100407 U1 (WETZSTEIN KONRAD [DE]; KEMPTER ANTON [DE]) 7 March 2012 (2012-03-07) * figures 1-6 *	1-14	
A,D	DE 20 2007 017443 U1 (D & M ROLLADENTECHNIK GMBH [DE]) 16 April 2009 (2009-04-16) * figure 1 *	1-14	
Y	DE 195 00 296 A1 (NEEB HEYKO [DE]) 27 July 1995 (1995-07-27) * claim 1; figures 1,2 *	6	TECHNICAL FIELDS SEARCHED (IPC) E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 September 2021	Merz, Wolfgang

CATEGORY OF CITED DOCUMENTS

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30-09-2021

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- DE 202012100407 **[0016]**