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(54) CONSTRUCTION OF A FRAME FOR A SCREEN DEVICE

(57) Screen device (1) with a protective casing (3) and two lateral guides (4) extending downward on either side of the protective casing, wherein the protective casing is provided with a screen roller and a screen which is rollable onto and unrollable from this screen roller and is attached on one of its sides to the screen roller, and wherein the lateral guides are provided to guide the screen when the screen is rolled up and unrolled, wherein the protective casing and the lateral guides are each formed with a frame having a longitudinal direction, and wherein at least one frame is constructed with first elements (6) and second elements (7) which each extend over substantially the whole length of the frame and which are coupled to each other at least partially slidably in the longitudinal direction, wherein the first elements are manufactured from a first material and wherein the second elements are manufactured from a second material having a higher expansion coefficient than the first material.

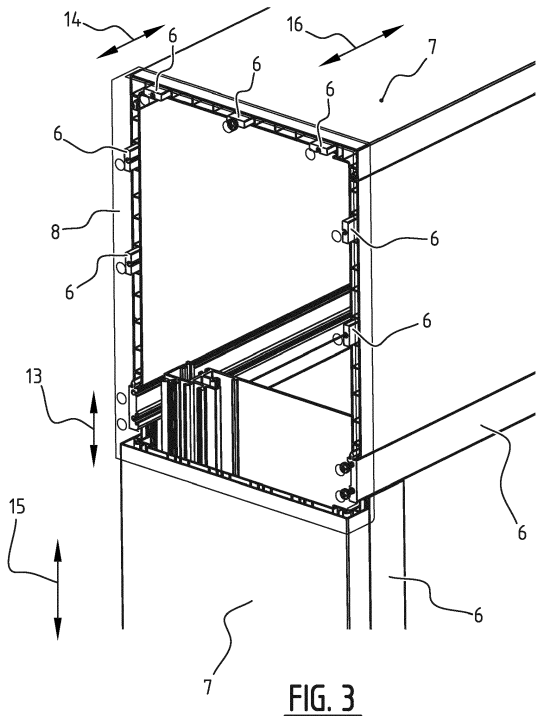

FIG. 3

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Description

[0001] The invention relates to a screen device with a protective casing and two lateral guides extending downward on either side of the protective casing, wherein the protective casing is provided with a screen roller and a screen which is rollable onto and unreliable from this screen roller and is attached on one of its sides to the screen roller, and wherein the lateral guides are provided to guide the lateral side of the screen when the screen is rolled up and unrolled.

[0002] Different types of screen device are known. The most common types are roll-down shutters and sun screens. In the case of roll-down shutters the screen is constructed from a succession of slats. In the case of sun screens the screen is formed by a cloth. Screen devices can be installed for different reasons, including to limit incident sunlight, to limit people looking in, to increase burglar-proofing, to improve energy efficiency, and so on.

[0003] Such screen devices are typically installed on the outer side of a building. This means that the screen is provided to extend along the outer side of a window or door. It is hereby not precluded that a portion of the screen device is at least partially integrated or built into the building. A protective casing can thus be provided above the window with an opening toward the inside of the building, while the screen is nevertheless provided to extend on the outer side of the window. In the present description such a screen device is likewise deemed a screen device which is arranged on the outer side of the building.

[0004] Different types of screen device are further known, ranging from screen devices wherein substantially the whole protective casing and guides are concealed from view, as known from for instance EP 2725181, to types which are wholly surface-mounted on an outside wall, making the whole protective casing and the lateral guides visible. Also known are types falling somewhere therebetween, wherein the protective casing and/or the lateral guides are partially built in and are thus also partially visible.

[0005] It is an object of the invention to provide a screen device having an improved quality and/or functionality of the screen device and/or to manufacture the screen device more cheaply without detracting from quality and/or functionality.

[0006] The invention provides for this purpose a screen device wherein the protective casing and the lateral guides are each formed with a frame having a longitudinal direction, and wherein at least one frame is constructed with first elements and second elements which each extend over substantially the whole length of the frame and which are coupled to each other at least partially slidably in the longitudinal direction, wherein the first elements are manufactured from a first material and wherein the second elements are manufactured from a second material having a higher expansion coefficient than the first material.

[0007] The invention is based at least partially on the insight that the expansion coefficient of materials with which the protective casing and/or guides are manufactured have a significant effect on the lifespan and on the operation of the screen device. This insight follows from the observation that the protective casing and/or guides are often exposed to great temperature changes across the seasons. When sunlight is directly incident on a protective casing, guide or portion thereof in summer, the temperature thereof can locally easily rise to 60 degrees and more. During winter periods this temperature can drop to -20°C and lower. A further phenomenon which occurs, for instance when a screen device is partially or wholly built in, is that temperature differences between for instance the front and rear side of the screen device can be large, which results in internal stresses. These temperature differences can for instance become extreme when a part of the screen device is exposed to direct sunlight, while another part of the screen device lies against an interior wall.

[0008] Modern homes are often provided with large areas of glass, whereby market demand for screen devices with large dimensions increases. It will be apparent to the skilled person here that proper operation of large screen devices, exposed to the above described temperature differences, will not be guaranteed without any problem. The invention is based on the insight that expansion of the materials must be taken into account in the case of screen devices with large dimensions, for instance with a protective casing and/or guides longer than 3 metres.

[0009] In practice the screen device is typically secured to the building at several positions. Roll-down shutters are typically secured to the outer wall cladding, while screens are typically secured to the window. Windows can be manufactured from steel, aluminium, plastic or wood. Each of these material has its own expansion coefficient. When a screen device is connected to the window or to the outer wall at multiple positions, the difference in expansion coefficient between the different materials will generate stresses when the whole is exposed to temperature differences.

[0010] Constructing a frame of a screen device from various different materials makes it possible to construct a cheaper frame. By connecting the different materials to each other for sliding in the longitudinal direction temperature differences will not cause accumulation of internal stresses, but the different elements will be able to slide relative to each other in the longitudinal direction. Warping or deforming of elements of the frame as a result of stresses can hereby be prevented. This improves the operation and functionality of the screen device. The skilled person will namely appreciate that when elements of a frame expand and thereby deform, this deformation will often be directed inward into the frame. In extreme conditions this may obstruct proper operation of the screen device. Expansion of materials as a result of temperature differences will be manifest mainly in the longi-

tudinal direction of the frame. By connecting the different elements to each other for sliding in the longitudinal direction temperature differences and associated differences in expansion can be compensated by the sliding of the elements relative to each other. No notable internal stresses will hereby be built up and, consequently, no deformation will occur. This latter guarantees that the quality and functionality of the screen device remains optimal.

[0011] The at least one frame preferably comprises an end piece wherein at least one of the first and second elements are connected slidably to the end piece. Connecting at least one of the first and second elements slidably to the end piece enables first and second elements on the one hand to slide relative to each other and on the other to slide relative to the end piece, so that the first and second elements can move relative to each other and relative to the end piece in tension-free manner. This allows the first elements and second elements to become longer and shorter as a result of the temperature differences, without being impeded therein.

[0012] The first elements are preferably fixedly connected to the end piece and the second elements are slidable in the longitudinal direction relative to the end piece. The first elements are manufactured from a material with a lower expansion coefficient than the second elements. The first elements will therefore expand less in the case of temperature differences than the second elements. The first elements will therefore be more dimensionally stable than the second elements. It will therefore be advantageous to connect the first elements fixedly to the end piece, because they expand and shrink less intensely. The second elements can then be connected slidably to the end piece so that the difference in expansion and shrinkage of the second elements relative to the first elements can be compensated by the sliding of the second elements in the end piece and by the sliding of the second elements relative to the first elements.

[0013] The end piece preferably has a chamber in which longitudinal ends of the second elements can extend. The chamber more preferably has at least one wall which at least partially overlaps the second elements in the longitudinal direction. By providing a chamber, and in particular providing at least one wall overlapping the second elements in the longitudinal direction, the frame can be closed, for instance take a substantially wind-tight, splash-proof or watertight form, in technically simple manner while the second elements can still move relative to the first elements and the end piece. This allows closing of the frame and thus preventing water and/or dirt from ending up in the frame, which is undesirable. In this context it will be apparent that when no overlap is provided, and when the temperature drops, the second elements will become shorter so that a gap will be created between the end piece and the second elements, via which gap dirt and/or water could enter the frame. This is avoided by the overlap and by the chamber in which the second elements can move.

[0014] The first elements preferably form a framework which is provided to predetermine at least the length of the frame. The first elements have a lower expansion coefficient than the second elements, such that the first elements expand and shrink less as a result of the temperature changes. The first elements therefore preferably determine the dimensions of the frame. By providing a framework with the first elements the frame is realized in stable manner. The length of the frame is thereby determined by the length of the first elements.

[0015] The first elements are preferably provided to be connected to the building so that the position of the screen device relative to the building is thereby predetermined. Because the first elements have the lowest expansion coefficient, it is advantageous to connect these first elements to the building. The second elements are here preferably not fixedly connected to the building, such that the second elements are able to slide relative to the building and relative to the first elements. This allows warping of the screen device as a result of temperature differences without notable internal stresses being created.

[0016] The second elements are preferably secured relative to the first elements at one position in the longitudinal direction of the frame. Securing the second elements relative to the first elements at one position increases the stability of the frame. It further simplifies operation of the screen device.

[0017] In a first embodiment the at least one frame comprises a second end piece to which the first and second elements are fixedly connected. In this embodiment the second elements are thus secured relative to the first elements at the position of the second end piece. When the first and second elements slide relative to each other due to differences in expansion or shrinkage, this sliding can be compensated at the position of the first end piece.

[0018] In a second embodiment the first and second elements are connected to each other at the position of a central zone. When the first and second elements are connected to each other at the position of a central zone, the difference in length as a result of expansion and shrinkage will be substantially the same at both longitudinal ends. In such an embodiment the end piece is preferably provided at two longitudinal ends. The end piece allows at least one of the elements, and preferably the second elements, to slide in the longitudinal direction. When the elements are centrally connected to each other, the difference in length having to be compensated at a longitudinal end will be smaller than when the first and second elements are connected to each other at the position of a longitudinal end.

[0019] A metal is preferably chosen as first material and a plastic as second material. Plastic is typically cheaper to manufacture and typically has a greater expansion coefficient. By manufacturing the first elements from a metal, a metal framework can be formed which predetermines the dimensions of the frame. Placeable between the first elements of metal are plastic panels

which close the frame, are inexpensive and are slidably connected relative to the metal elements. Alternatively, the whole frame can be formed by plastic panels, wherein metal strengthening elements are arranged in or on the panels.

[0020] The screen device is preferably provided to be built into a building at least partially, and the parts of the at least one frame which are visible in the built-in state are formed by the first elements. A screen device is typically deemed a luxury product which is expected to have a high-end appearance. Manufacturing the visible elements from the first material, this typically being a metal, creates a solid and strong impression. The parts of the frame which are not visible can then be manufactured from a cheaper material. Because of the specific construction and connection of the first elements and second elements, such a construction with two materials can be realized without internal stresses occurring as a result of temperature differences. As already stated above, internal stresses can result in deformation of parts of the frame, which deformation may obstruct the screen device.

[0021] The invention will now be further described with reference to an exemplary embodiment shown in the drawing.

[0022] In the drawing:

figure 1 is an example of a surface-mounted roll-down shutter;
figure 2 is an example of a build-in screen;
figure 3 is an example of a side of a protective casing in which an embodiment of the invention is implemented;
figure 4 is a cross-section of the protective casing according to the embodiment of figure 3;
figure 5 is a cross-section of a protective casing according to an alternative embodiment of the invention;
figure 6 is a section of an end piece; and
figure 7 is a schematic outline of the first and second elements relative to each other.

[0023] The same or similar elements are designated in the drawing with the same reference numerals.

[0024] Figure 1 shows a wall of a building in which two openings 2 are arranged. Openings 2 are primarily closed by means of a window with glass. Mounted in front of the window with glass is a screen device 1 which can be deemed a secondary closure for opening 2. The screen device shown on the left in the figure, screen device 1A, shows a situation in which screen 5 is lowered halfway down. The right-hand screen device 1B shows a screen device which is lowered substantially all the way down. Lowering and raising of screen 5 is typically done by respectively unrolling and rolling up screen 5 from and onto the screen roller in protective casing 3. The screen is here typically retained on its lateral sides by guides 4. These guides 4 are also referred to as screen guides or lateral guides.

[0025] In the embodiment of figure 1 screen device 1 is embodied as a roll-down shutter. A roll-down shutter typically comprises a screen constructed from a plurality of slats which are connected hingedly to each other side by side. Such roll-down shutters are known and are therefore not further described in this description.

[0026] It will be apparent from the further description that the invention can be applied for different kinds and types of roll-down shutters. In the embodiment of figure 1 screen device 1 is of the "surface-mounted" type. This means that substantially all components, including protective casing 3 and guides 4, are mounted on the outer side of the exterior wall. The screen device is thus as it were built "onto" the wall. The skilled person will appreciate that the invention can likewise be applied for other types, for instance roll-down shutters of the "build-in" type or "semi-built-in" type.

[0027] Figure 2 shows a screen device 1 of the "build-in" type. This means that substantially all components of screen device 1, including protective casing 3 and guides 4, are mounted "in" the wall. This has the result that only the underside of protective casing 3 is visible. Other sides of the protective casing are not visible because the protective casing is concealed in the wall, for instance between the exterior wall and the interior wall. Similarly, only the inward-directed side of guides 4 is visible, and the other sides thereof are concealed from view.

[0028] The screen device of figure 2 is a sun screen, wherein the screen (not shown in figure 2) is formed by a cloth or similar object. The cloth is typically, though not necessarily, held under tension in the transverse direction by guides 4. The cloth is retained at the top by the screen roller and provided at the bottom is a bottom slat with a weight for always holding the cloth under a predetermined minimum tension. The lower slat is typically retained by the guides, whereby embodiments wherein the screen itself is not directly retained by the guides will still be deemed a device wherein the lateral guides are provided for guiding the lateral sides of the screen when the screen is rolled up and unrolled in indirect manner. I.e. the screen is then guided via the bottom slat by the guides. Because such screens are known, they are not further discussed in this description.

[0029] Figures 1 and 2 show only a few specific examples of screen devices in which the invention can be applied. The skilled person will appreciate that screen devices can also be partially built in. The protective casing can be provided in or on the wall. The protective casing can further be provided to be opened along the outer side of the building or to be opened along the inner side of the building in order to perform maintenance and repairs. All these types, roll-down shutter or screen, can be constructed with the invention.

[0030] Screen device 1 is typically attached fixedly to the building at multiple positions. The protective casing and guides of figure 1 are secured against the outer finishing layer of the building, for instance against the brick.

In the embodiment of figure 2 the protective casing and the guides are typically screwed fixedly against the window profile. On the basis of the description below it will become apparent that it is irrelevant to the invention to which a part of the building (window profile or finishing layer or other) the screen device is connected. The fact that the screen device is connected to elements of the building causes the effects described in this description to occur, more particularly the effects in respect of expansion and, as a result, the possible occurrence of internal stresses.

[0031] The invention is based mainly on the insight that screen devices are highly susceptible to great temperature differences across the seasons. The screen device is here not necessarily subject to these differences as a whole, and an outer side or a visible side of the screen device will often be subject to greater temperature differences than an inner side or a rear side of the screen device. It is particularly when different materials are connected to each other that these temperature differences can cause internal stresses. The way in which internal stresses can then cause the screen device to function improperly and/or the lifespan of the screen device to be adversely affected has been described at length above.

[0032] In the present description a screen device 1 is deemed an assembly of three frames, being one frame forming protective casing 3 and two frames in each case forming a guide 4. Further operating elements, including the screen roller with the screen, can be placed in each of the frames. The invention as will be further described can be applied to the guides, applied to the protective casing and applied to the combination of guides and protective casing. Each frame has a longitudinal direction. It will be apparent here that the longitudinal direction of the frame forming protective casing 3 will typically extend horizontally, while the longitudinal direction of the frame forming the guides will typically extend in upright direction. Because the longitudinal direction corresponds to the direction in which the frame has the largest dimension, expansion, and particularly differences in expansion between materials, have the greatest effect in the longitudinal direction of the frame.

[0033] According to the invention, each frame is constructed from a combination of one or more first elements and one or more second elements. First elements are manufactured from a first material and second elements are manufactured from a second material which differs from the first material and which has an expansion coefficient greater than the expansion coefficient of the first material. The second material will hereby expand and shrink more than the first material under the influence of the same temperature changes. The first elements and second elements are connected slidably to each other in the longitudinal direction of the frame. This means that an element is able to slide relative to another element in the longitudinal direction. The result hereof is that when an element expands more than another element, the one element can also slide in the longitudinal direction relative to the other element, so that no undesired stresses are created as a result of the connection of the first and second element. This is because, owing to the sliding, each element can expand and shrink in substantially tension-free manner, taking into account possible friction. In practice first elements will typically be formed from a metal, for instance aluminium or steel. The second elements can be formed from a plastic. This construction allows large parts of the frame to be manufactured from a plastic, which is significantly cheaper than a metal. The plastic typically has a greater expansion coefficient than metal.

[0034] By placing the first and second elements for sliding relative to each other in the longitudinal direction, differences in length between the first and second elements as a result of temperature changes have to be taken into account. These differences in length are compensated at the position of end pieces 8. More particularly, at least one of the first and second elements will also be placed for sliding relative to end piece 8 in the longitudinal direction. In other words, at least one of the first and second elements will not be fixedly connected to one of the end pieces 8. It is assumed here that each frame 2 has a longitudinal ends, where an end piece is in each case placed in order to provide the frame with a finish at its longitudinal ends.

[0035] Figure 3 shows an embodiment in which the principles of the embodiment are used to minimize internal stresses while the use of various different materials with different expansion coefficients is possible. Figure 3 shows a preferred embodiment of the invention wherein a side of protective casing 3 also forms a part of screen guide 4. The side of protective casing 3 forms the end piece 8 for the elements forming the frame of the protective casing. The side of the protective casing also forms the end piece 8 for the elements forming the frame of guide 4. The side wall of the protective casing thereby fulfils a plurality of functions, including closing the side of the protective casing, forming an end piece for the frame forming the protective casing and forming the end piece for the frame forming the guides. The side of the protective casing can further function as mounting wall for mounting of the screen roller and the parts related thereto.

[0036] Figure 3 shows an embodiment of a build-in screen with a wide guide. The term wide guide is known in the field and indicates that guide 4 is wider than strictly necessary for guiding the screen. In the case of a wide guide the width or depth of the guide is adjusted to the dimensions of protective casing 3 in order to facilitate the building in and concealing of the screen device as a whole, for instance in a cavity of a wall. Because the screen device of figure 3 is provided to be built in substantially wholly, only the underside of protective casing 3 and the inner side of guides 4 will be visible to a user.

[0037] In the screen device of figure 3 protective casing 3 is therefore provided at the position of its underside with a first element 6 which forms a visible frame part. Provided at the position of the upper side of the protective

casing are further first elements 6 which are embodied as strengthening core. First elements 6 together form a framework for the frame which forms protective casing 3. First elements 6 are preferably fixedly connected to end piece 8. The first elements are manufactured from a metal, for instance aluminium. The first elements which form a visible frame part can be finished with a lacquer or other finish which lends the screen device a visual impression of high quality.

[0038] The frame which forms the protective casing further comprises second elements 7, formed as plastic panels in the embodiment of figure 3. The second elements 7 are connected to the first elements 6 in a manner such that second elements 7 can slide in the longitudinal direction of the frame of the protective casing, which longitudinal direction is designated with arrow 16. Second elements 7 are also connected to end piece 8 for sliding in this longitudinal direction 16. More particularly, the longitudinal ends of second elements 7 are placed in a chamber of end piece 8, wherein the longitudinal ends of second elements 7 can move in the chamber of end piece 8 in the longitudinal direction 16. This is further elucidated with reference to figure 6. The plastic of second elements 7 has an expansion coefficient which is typically considerably greater than the expansion coefficient of the metal of first elements 6.

[0039] For an optimal construction of the frame the first elements 6 and second elements 7 are manufactured with a length which is chosen such that the first elements and second elements 6 and 7 are the same length at a predetermined maximum operating temperature of the screen device. It is thus for instance possible to opt for first elements 6 and second elements 7 to have the same length at a temperature of 70°C. This will have the result that at an average ambient temperature, for instance 20°C, second elements 7 are considerably shorter than first elements 6. In order to compensate this difference in length of second elements 7 relative to first elements 6 a sliding zone is provided in end pieces 8. In the embodiment of figure 3 a sliding zone for the frame of the protective casing is designated with reference numeral 14 and a sliding zone for the frame of the guide is designated with reference numeral 13.

[0040] When first elements 6 are fixedly connected to end pieces 8, second elements 7 will move in the sliding zone as a result of temperature variations. Because first elements 6 have the smallest expansion coefficient it will be advantageous to connect these first elements 6 fixedly to end pieces 8. This is because the outer dimensions of the screen device will then be determined mainly by the length of first elements 6. The length of first elements 6 changes less than the length of the second elements, so that the screen device becomes more dimensionally stable.

[0041] The skilled person will appreciate that the above described principles can also be reversed, and that second elements 7 can be fixedly connected to end pieces 8. First elements 6 are then manufactured to be shorter than second elements 7. It is for instance possible here to predetermine a minimum operating temperature at which first elements and second elements have the same length, and the first elements 6 can here be provided for sliding in sliding zones 14 and 13. In such an embodiment a screen device is less dimensionally stable than in the above described embodiment.

[0042] The skilled person will appreciate that materials other than aluminium and plastic can be used to form first and/or second elements. Particularly for a protective casing as shown in figure 3, the invention allows the second elements to be manufactured from cheaper materials and/or with cheaper production techniques, so that the protective casing becomes more inexpensive. The invention further allows the second elements to be manufactured from a material with a higher insulating value, thus improving the energy efficiency of the screen device. The second elements 7 can here for instance be manufactured from a plastic having a considerably higher resistance to heat transfer than metal. This reduces the potential negative effect of the screen device on the energy efficiency of the building as a whole. The invention further allows second elements 7 to be manufactured from a material having better sound damping properties than metal. The sound characteristics of the building can hereby be improved.

[0043] The explanation above is focused mainly on the frame of protective casing 3. In figure 3 the frame of the guide is also manufactured from at least a first element 6 and at least a first element 7 which are connected to each other for sliding in the longitudinal direction 15 of the frame of guide 4. The same principles as described above in respect of protective casing 3 apply to guide 4.

[0044] Figure 4 shows a cross-section of the protective casing of the embodiment of figure 3. Figure 4 shows a plurality of first elements 6 and a plurality of second elements 7. As already described above, the embodiment of figures 3 and 4 is provided with two types of first element: a first element forming a visible frame part, designated with 6A, and a second type forming a strengthening core, designated with 6B. The first elements forming a visible frame part 6A are provided at the bottom of the protective casing because, in the embodiment of figures 3 and 4, the protective casing is embodied to be built in so that only these lower parts are visible. Figure 4 further shows that a protective cover 9 can be connected to the first element 6A in known manner in order to cover the protective casing on an underside.

[0045] Figure 4 shows a plurality of first elements formed as strengthening core 6B. These first elements 6B are placed in cavities of second elements 7. These first elements 6B can slide in the cavities of second elements 7 so that second elements 7 can expand and shrink more than first elements 6B in the case of temperature changes. The sliding connection between the first elements as strengthening core 6B and second elements 7 is realized by a compatibility of shape. Because first element 6B fits in a cavity or space or chamber of second

element 7, first elements 6B are connected to second elements 7.

[0046] Figure 4 also shows other sliding connections 10 whereby different elements 6, 7 are connected to each other. Sliding connections 10A are here provided to connect a first element 6 to a second element 7. Sliding connections 10B are shown in figure 4 to connect a second element to a further second element. It will be apparent here that, in practice, the further sliding connections 10B need not necessarily take the form of sliding connection, since the expansion coefficient of a second element relative to another second element is typically the same, whereby these second elements typically will not slide relative to each other. Sliding connections 10B are rather shown schematically as one of the options for realizing a connection. Alternatively, connections 10B can also be embodied as fixed connection.

[0047] Figure 5 shows a cross-section of a protective casing 3 according to an alternative embodiment. In figure 5 the corner elements of the frame of the protective casing are formed by first elements 6, while the surfaces extending between the corners are formed by second elements 7. Because first elements 6 and second elements 7 alternate in figure 5, all sliding connections 10 are embodied as a sliding connection between a first element 6 and a second element 7. Figure 5 shows different types of sliding connection 10A which are based mainly on compatibility of shape. The clearance and the manner of connecting of first element 6 and second element 7 depend here on the chosen type of connection 10. Figure 5 illustrates a connection in which a coupling element 11 is provided. To the right of the sliding connection with coupling element 11 a sliding connection 10A is shown as hook connection.

[0048] Figure 5 shows screen roller 17 with screen 18, which illustrates that the screen is connected to screen roller 17 on one side. The other end of the screen is typically connected to a bottom slat 19 which pulls screen 18 down with its weight. Screen 18 can thus be held neatly stretched between screen roller 17 and bottom slat 19. In the transverse direction the screen is typically retained by the lateral guides 4. There are however embodiments wherein screen 18 is not retained by guides 4. The invention can also be applied for such screen devices.

[0049] The screen device is preferably provided to be connected to the building directly or indirectly. For each frame, only one of the first and second elements is preferably connected fixedly to the building. The first element 6 or the second element 7 is preferably opted for here, taking into account the expansion coefficient of the material against which the screen device is mounted. The first element and the second element have different expansion coefficients. The stresses in the protective casing can be minimized by choosing the element with the expansion coefficient which differs least from the expansion coefficient of the material against which the screen device is mounted. First element 6 will typically be chosen for mounting the screen device against the building thereby, since the first elements have the lowest expansion coefficient.

[0050] In the embodiment of figure 5 the front side of the protective casing is designated with reference numeral 12. In a surface-mounted screen device it would be possible to opt to provide front side 12 as first element 6. The whole front side thereby takes the form of first element 6, typically a metal, whereby the visual impression of the whole visible side of the protective casing is one of high quality. The upper side and the rear side of the protective casing can then take the form of second element 7, with the above described advantages. This illustrates that the frame forming the protective casing can be assembled freely depending on the situation, the intended use and the customer's wishes.

[0051] Figure 6 shows several embodiments for slidably connecting one of the first element and the second element to an end piece 8. On the basis of these principles of figure 6 the skilled person can manufacture the end piece, for instance as shown in figure 3. The principles of figure 6 can be applied to end pieces for the frame forming protective casing 3 and to end pieces of the frame forming guide 4.

[0052] Figure 6A shows a first embodiment in which a first element is placed as strengthening core 6B slidably in a second element 7. First element 6B is fixedly connected to end element 8. The fixed connection is illustrated with reference numeral 20. Figure 6 shows the fixed connection as a connection with a screw or bolt. Other fixed connections, such as glueing, stapling, riveting or welding, are however also possible.

[0053] Figure 6 shows that end piece 8 has two overlapping walls 23 between which a chamber 21 forms. Overlapping walls 23 extend in the longitudinal direction 15/16 of the frame with the object of overlapping longitudinal ends of second element 7 in this longitudinal direction 15/16. Second element 7 can slide relative to end piece 8, which is illustrated with arrow 24. Chamber 21, formed by the two overlapping walls 23, has an opening 22, via which opening 22 first element 6 and second element 7 can extend into chamber 21.

[0054] Figure 6B shows an alternative embodiment wherein end piece 8 has only one overlapping wall 23. In the embodiment of figure 6B a chamber 21 is not formed, but an overlap is realized between overlapping wall 23 and second element 7. Second element 7 can slide relative to end piece 8, as illustrated with arrow 24. In the embodiment of figure 6B first element 6 is formed as strengthening core 6B which is fixedly connected 20 to end piece 8.

[0055] Figure 6C shows a further embodiment similar to the embodiment of figure 6A, but wherein the first element forms a visible frame part 6A. First element 6A is placed adjacently of second element 7. First element 6A is fixedly connected 20 to end piece 8. In the embodiment of figure 6C end piece 8 comprises two overlapping walls 23 which form a chamber 21 inside which second element 7 can slide 24.

[0056] In each of the embodiments of figures 6A, B and C overlapping wall 23 is formed with a length, in the longitudinal direction 15/16 of the frame, which is chosen such that the overlapping wall has a predetermined minimum overlap with the second element within a predetermined temperature range. Overlapping wall 23 can thus be chosen with a length for having for instance a minimum overlap of 5 cm between -20°C and +70°C. The above stated numbers are only intended as an example to illustrate the operating principles which will be apparent to the skilled person on the basis of the description of the figures. The skilled person will appreciate that the overlap and the length of overlapping wall 23 according to the above described definition depends on the overall length of the frame 15/16 because the overall length of the frame 15/16 partly determines the change in length between first element 6 and second element 7.

[0057] Figure 7 shows multiple embodiments which illustrate how first element 6 and second element 7 can be attached relative to each other in their longitudinal direction. This mutual attachment has an effect on end piece 8, as will become apparent hereinbelow. These principles can be applied to the frame of the protective casing, to the frame of the guide, and can even be applied in combination with each other inside a frame. The skilled person will appreciate that first element 6 and second element 7 can be connected at one position as seen in the longitudinal direction, without this reducing the slidability of the elements relative to each other for the purpose of compensating differences in expansion. It is only at this one position that the elements will not slide relative to each other.

[0058] Figure 7A shows a first embodiment wherein the first element 6 is fixedly connected to respective end pieces 8 at the position of its two longitudinal ends. This is illustrated in figure 7A with screw 20. First element 6 is then connected via a fixed connection 20 to second element 7 in a central zone. In order to avoid internal stresses first element 6 is connected at only one position, as seen along its longitudinal direction, to second element 7. In the embodiment of figure 7A second element 7 will slide 24 relative to end pieces 8 roughly equally at both longitudinal ends. In a configuration according to figure 7A the length of overlapping wall 23 can be minimal because the sliding distance 24 is divided substantially equally over the two end pieces 8. A drawback of the configuration of figure 7A could be that the fixed connection 20 in a central zone between first element 6 and second element 7 is difficult to realize.

[0059] Figure 7B shows a further embodiment wherein first element 6 and second element 7 are not fixedly connected to each other. Second element 7 lies fully clear or is freely slidable relative to first element 6. This is designated with arrows 24, which are situated on the left, in the centre and on the right along the longitudinal direction. First element 6 is fixedly connected to end pieces 8 in the same way as in the embodiment in figure 7A. Overlapping wall 23 will have to be considerably longer than in the embodiment of figure 7A because the second element is able to position itself to the extreme left or the extreme right. The skilled person will appreciate that such an embodiment is easier to realize because no connection need be provided between first element 6 and second element 7. The skilled person will also appreciate that the operation is less controllable due to the absence of this connection.

[0060] Figure 7C shows a further embodiment wherein first element 6 and second element 7 are connected to each other in an indirect manner via the end piece 8 which is shown on the left-hand side of figure 7C. The one end piece 8, shown on the left in the figure, is fixedly connected 20 to the first element and is fixedly connected 20 to the second element. This end piece 8, shown on the left-hand side of the figure, need not be provided with an overlapping wall 23 because both first element 6 and second element 7 are attached fixedly against end piece 8. The further end piece 8, shown on the right-hand side of figure 7C, is fixedly connected to the first element, but not to the second element 7. Second element 7 will hereby be able to slide 24 on the right-hand side relative to end piece 8. The whole variation in length of the second element relative to the first element will therefore be compensated by the end piece 8 shown on the right-hand side of figure 7C. Overlapping wall 23 of this end piece 8 will therefore have to be large, and in particular larger than the overlapping wall 23 of the embodiment of figure 7A. The skilled person will appreciate that when the embodiment of figure 7C is applied, only one end piece 8 need be provided which is provided with overlapping walls 23 so as to compensate variations in length.

[0061] The above described principles allow a frame to be constructed from various different materials in different ways. Even when the frame is manufactured with greater lengths, for instance lengths greater than 2.5 metres, more preferably greater than 3 metres, no notable internal stresses will occur in the frame despite different materials having different expansion coefficients.

[0062] The skilled person will appreciate on the basis of the above description that the invention can be embodied in different ways and on the basis of different principles. The invention is not limited to the above described embodiments. The above described embodiments and the figures are purely illustrative and serve only to increase understanding of the invention. The invention will not therefore be limited to the embodiments described herein, but is defined in the claims.

Claims

1. Screen device with a protective casing and two lateral guides extending downward on either side of the protective casing, wherein the protective casing is provided with a screen roller and a screen which is rollable onto and unrollable from this screen roller and is attached on one of its sides to the screen

roller, and wherein the lateral guides are provided to guide the lateral sides of the screen when the screen is rolled up and unrolled, wherein the protective casing and the lateral guides are each formed with a frame having a longitudinal direction, and wherein at least one frame is constructed with first elements and second elements which each extend over substantially the whole length of the frame and which are coupled to each other at least partially slidably in the longitudinal direction, wherein the first elements are manufactured from a first material and wherein the second elements are manufactured from a second material having a higher expansion coefficient than the first material.

2. Screen device according to claim 1, wherein the at least one frame comprises an end piece wherein at least one of the first and second elements are connected slidably to the end piece.

3. Screen device according to claim 2, wherein the first elements are fixedly connected to the end piece and wherein the second elements are slidable in the longitudinal direction relative to the end piece.

4. Screen device according to claim 3, wherein the end piece has a chamber in which longitudinal ends of the second elements can extend.

5. Screen device according to claim 4, wherein the chamber has at least one wall which at least partially overlaps the second elements in the longitudinal direction.

6. Screen device according to any one of the foregoing claims, wherein the first elements form a framework which is provided to predetermine at least the length of the frame.

7. Screen device according to claim 6, wherein the first elements are provided to be connected to the building so that the position of the screen device relative to the building is thereby predetermined.

8. Screen device according to any one of the foregoing claims, wherein the second elements are secured relative to the first elements at one position in the longitudinal direction of the frame.

9. Screen device according to claim 8, wherein the at least one frame comprises a second end piece to which the first and second elements are fixedly connected.

10. Screen device according to claim 8, wherein the first and second elements are connected to each other at the position of a central zone.

11. Screen device according to claim 10 and according to any one of the claims 2-5, wherein the end piece is provided at two longitudinal ends of the at least one frame.

12. Screen device according to any one of the foregoing claims, wherein a metal is chosen as first material and wherein a plastic is chosen as second material.

13. Screen device according to any one of the foregoing claims, wherein the screen device is provided to be built into a building at least partially, and wherein parts of the at least one frame which are visible in the built-in state are formed by first elements.

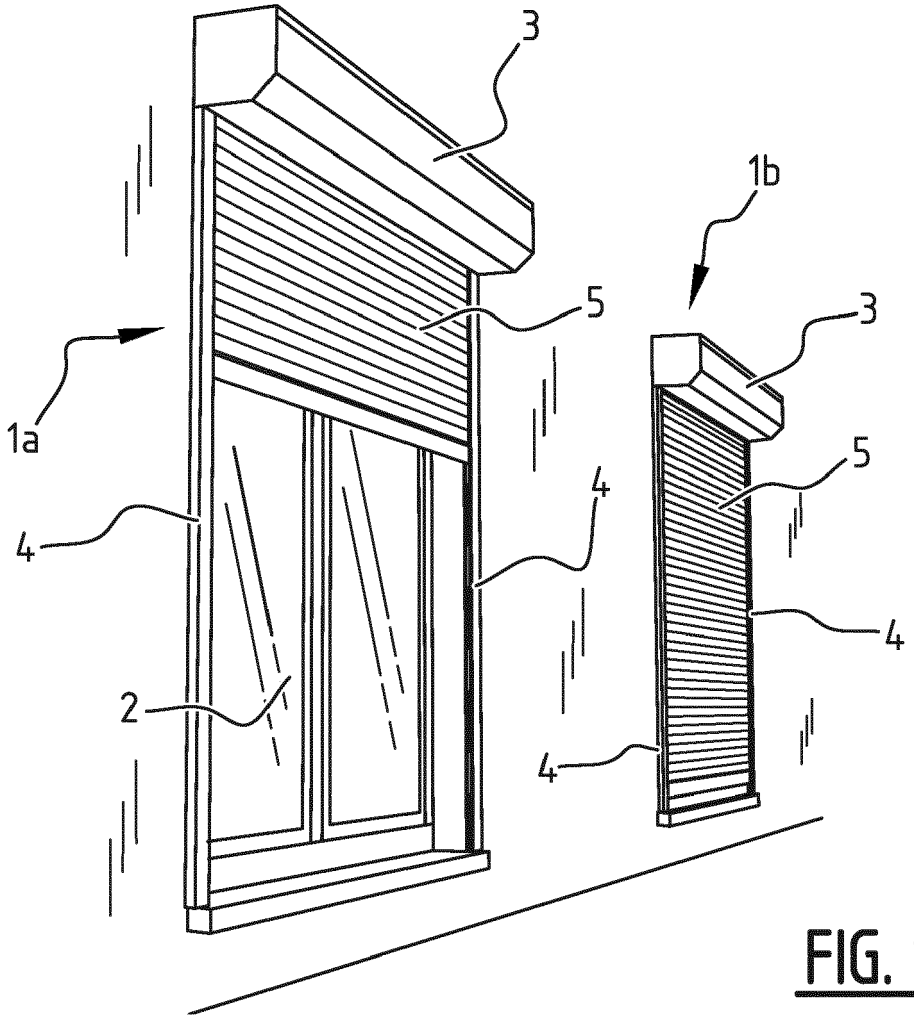

FIG. 1

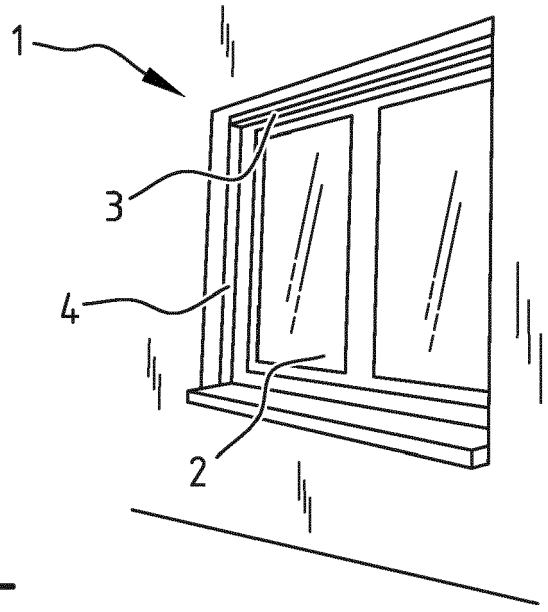

FIG. 2

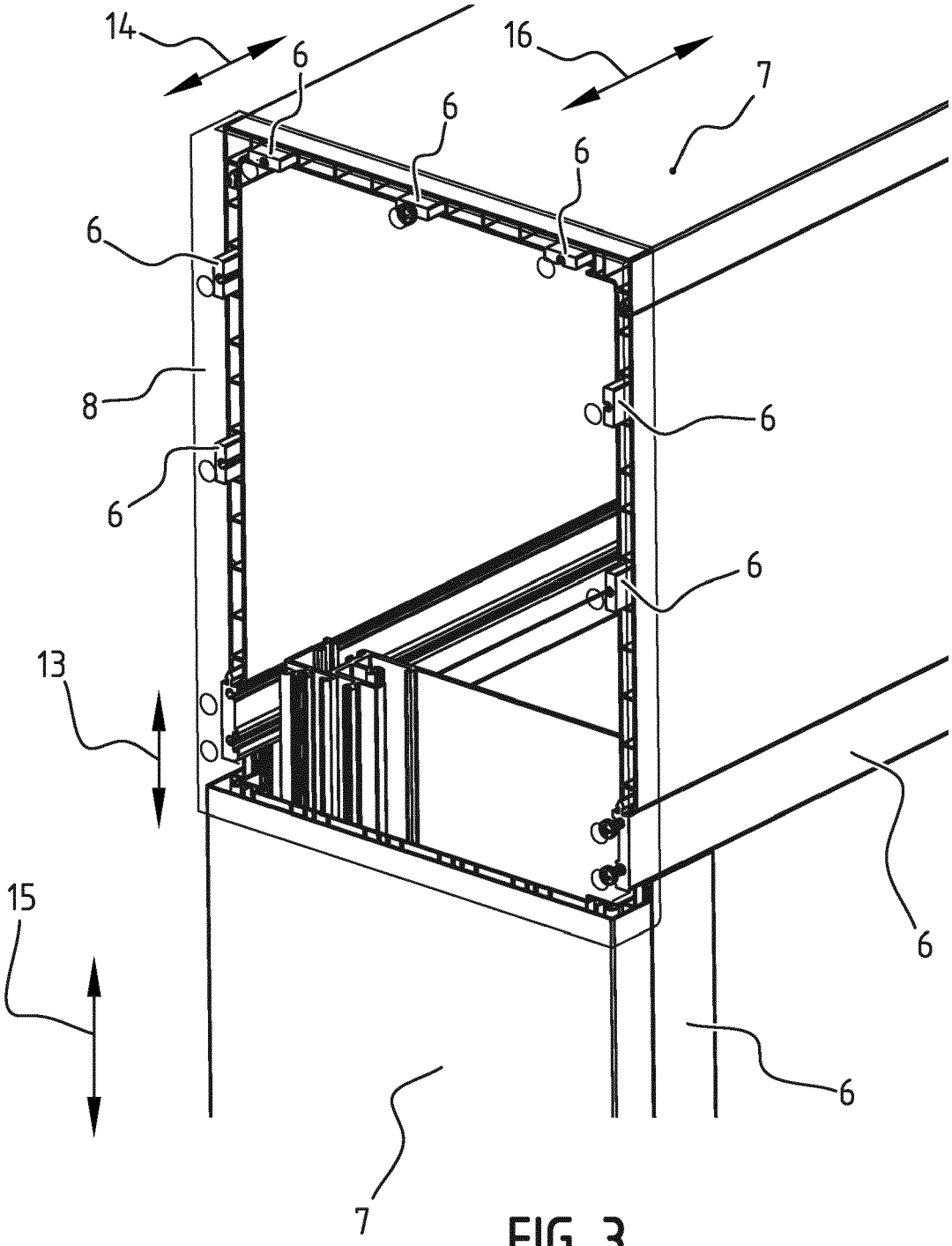

FIG. 3

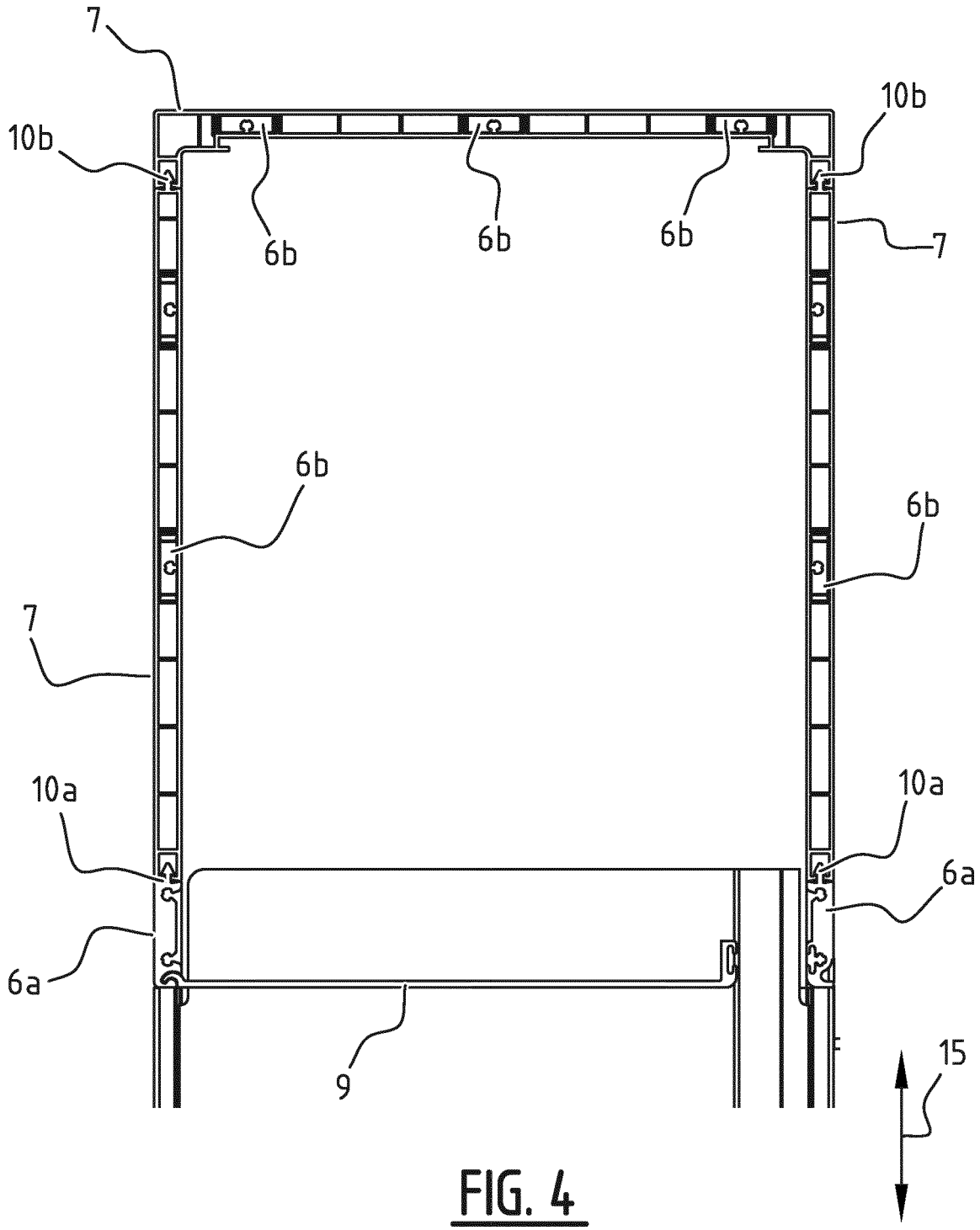

FIG. 4

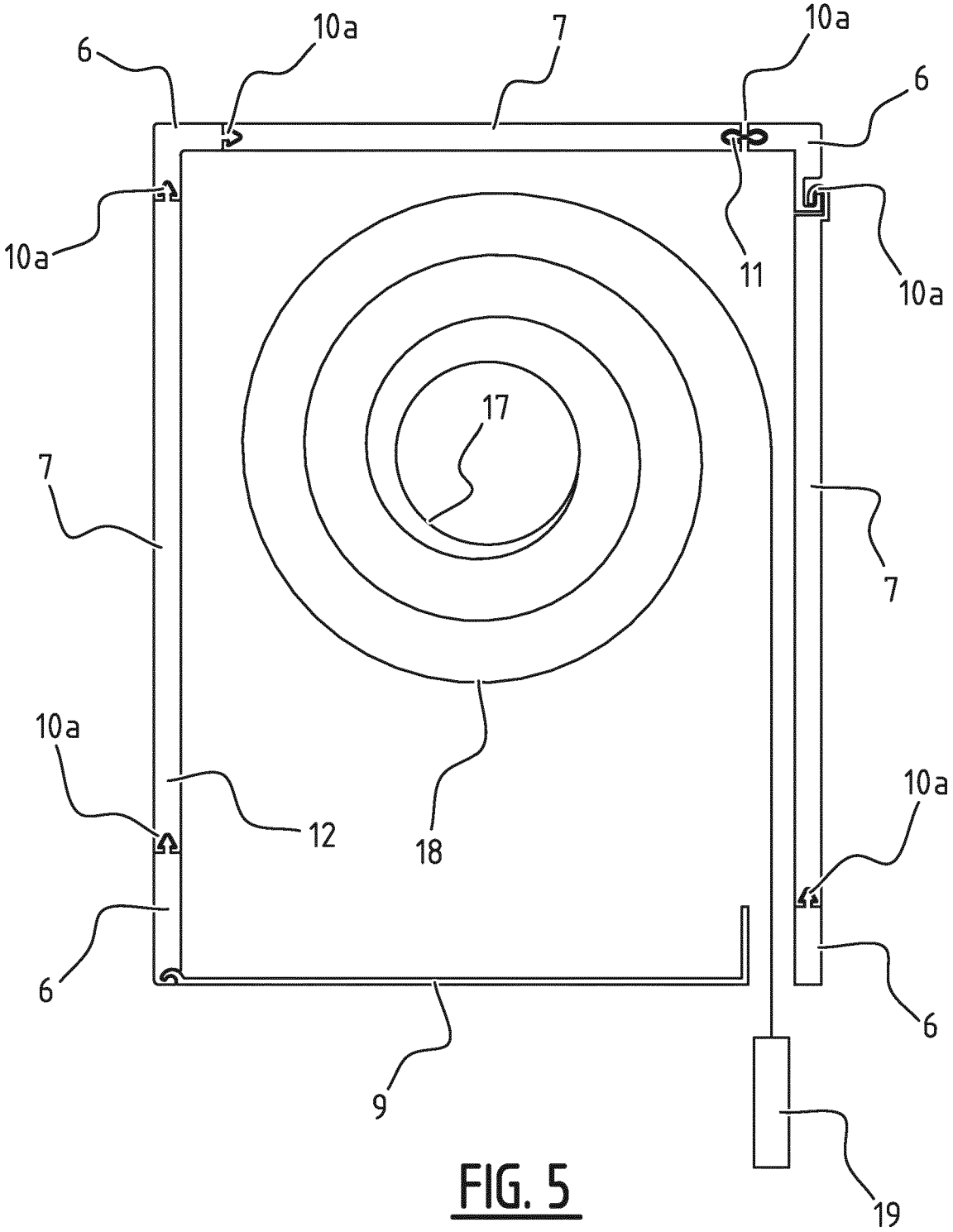

FIG. 5

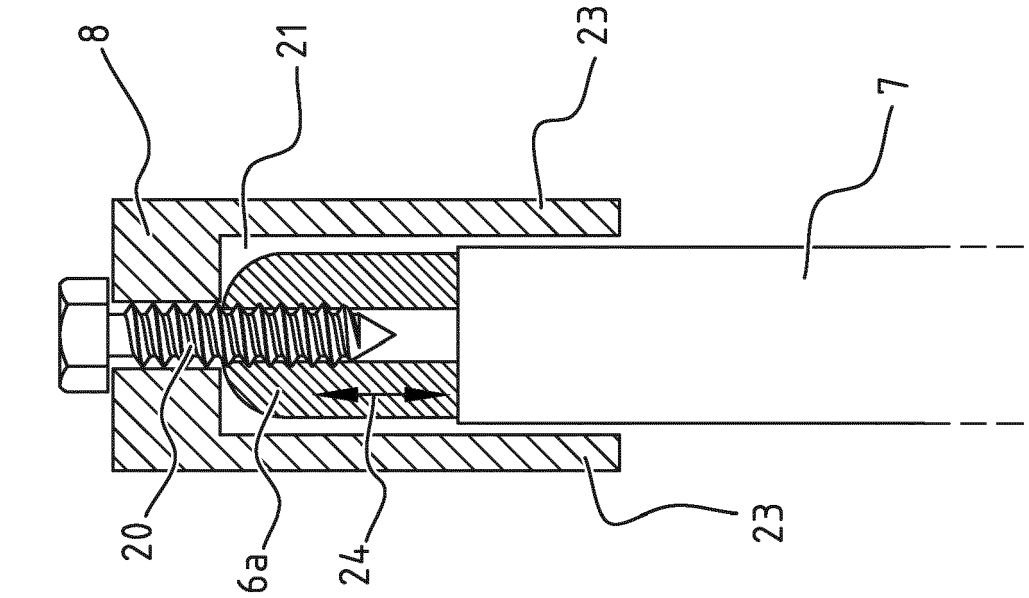

FIG. 6C

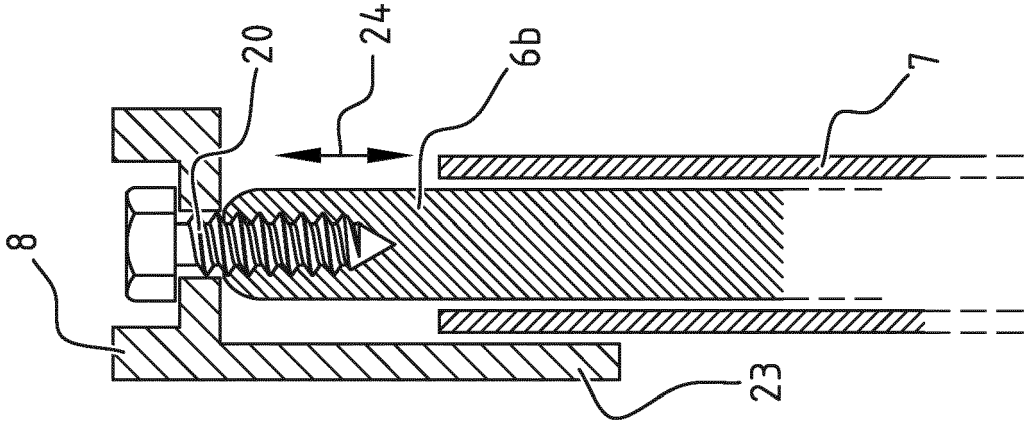

FIG. 6B

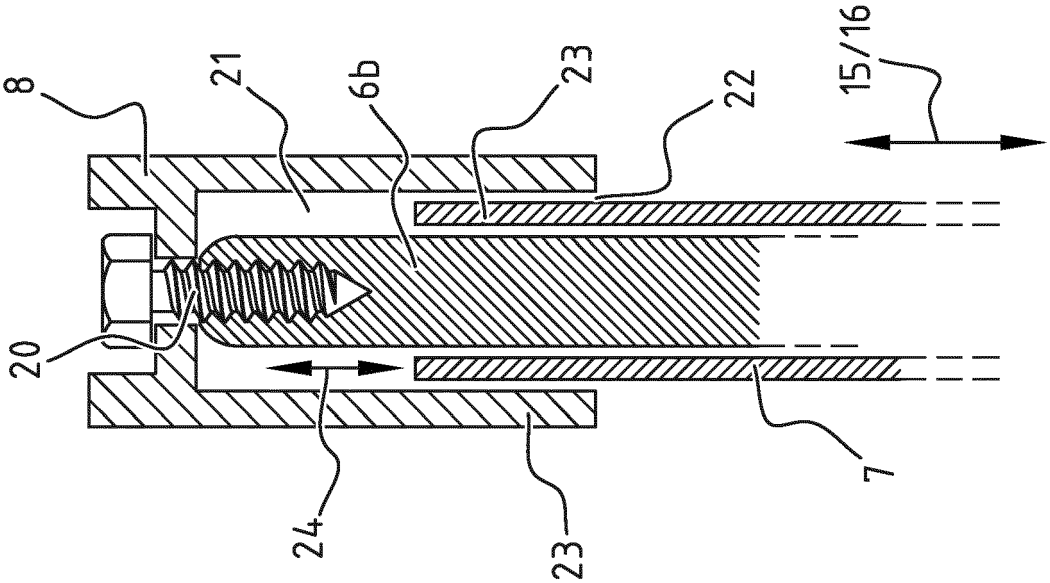

FIG. 6A

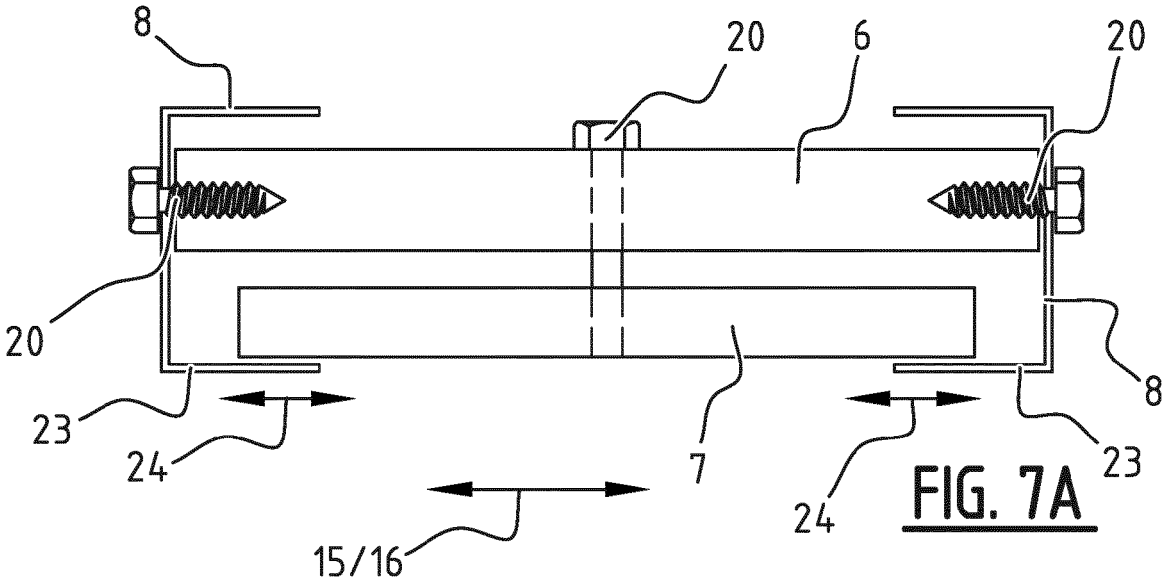

FIG. 7A

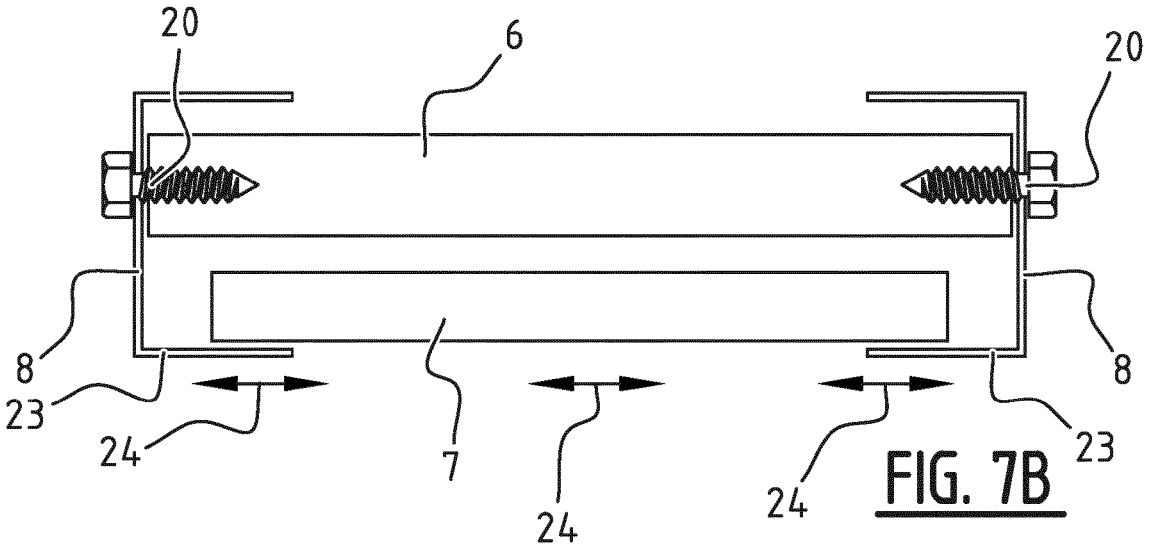

FIG. 7B

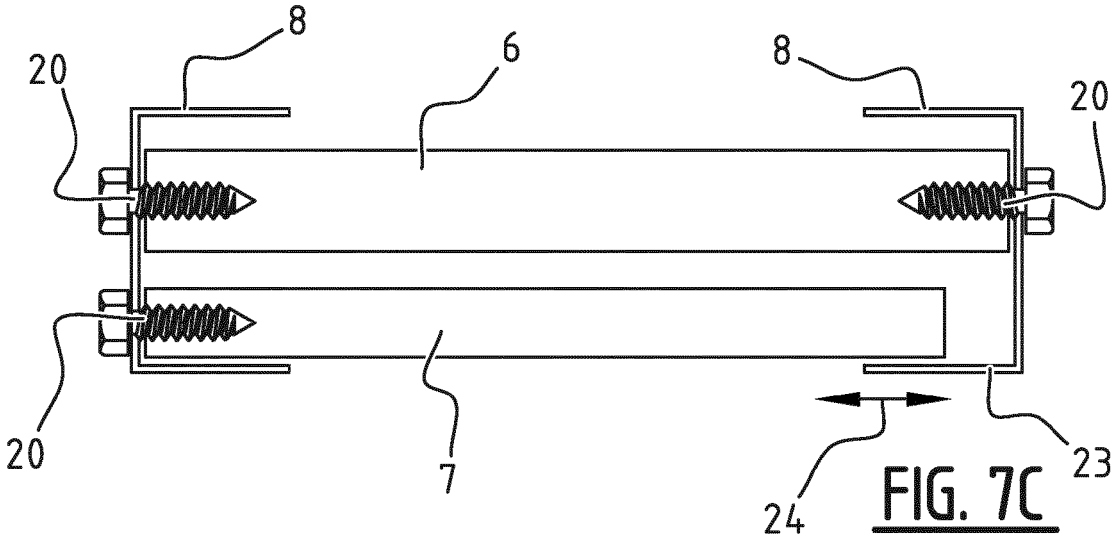

FIG. 7C

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EUROPEAN SEARCH REPORT

Application Number
EP 18 19 3650

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	DE 20 2013 002887 U1 (D & M ROLLADENTECHNIK GMBH [DE]) 27 June 2014 (2014-06-27) * abstract; figures 1,2 * * paragraphs [0029], [0005], [0017], [0011] *	1,6,7,12 2-5 8-11	INV. E06B9/17 E06B9/42 E06B9/58
Y	EP 1 640 553 A2 (ZURFLUH FELLER [FR]) 29 March 2006 (2006-03-29) * paragraph [0011]; figures 1,2 *	2-5	
A	DE 44 07 885 A1 (BESLER ARMIN [DE]) 14 September 1995 (1995-09-14) * the whole document *	1-13	
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E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 February 2019	Cornu, Olivier

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01-02-2019

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