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(54) **METHOD FOR OPERATING A SCREENING ARRANGEMENT, CONTROL UNIT, AND SCREENING ARRANGEMENT**

(57) In a screening arrangement (10) for a roof window (1), operation of the bottom element (14) to obtain a desired screening position takes place by moving the position indicator (16) to an adjusted position in a desired direction. If the distance is relatively long, the bottom element (14) will be moved in the same direction and to the adjusted position of the position indicator (16). Here, the bottom element (14) is brought into positive engagement with the position indicator (16) and remains in that position. Conversely, if the user moves the position indicator (16) only slightly, this will result in the bottom element (14) being moved towards the position indicator (16), engaging the position indicator (16) in positive engagement, and then, together with the position indicator (16), being moved to the predetermined longitudinal reference position which could be a lowermost longitudinal end position.

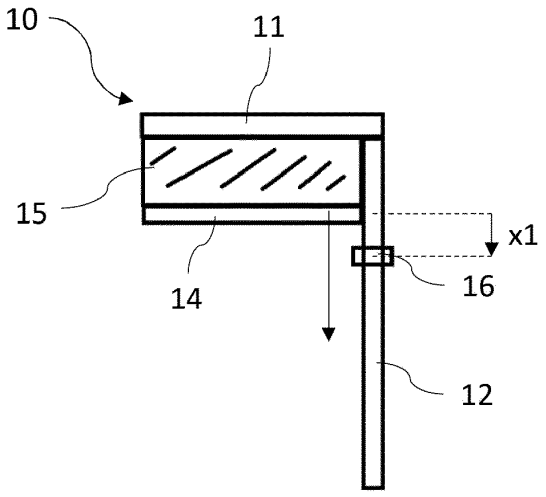

FIG. 19A

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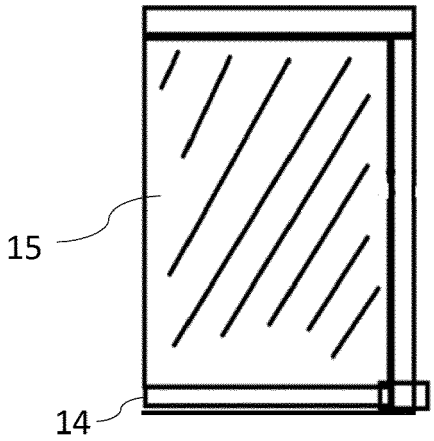

FIG. 19B

Description

Technical Field

[0001] The present invention relates to a method for operating a screening arrangement for screening a window, preferably a roof window, the screening arrangement comprising a screening body having two side edges and a top and bottom portion, two side rails, each defining a longitudinal direction, a width direction, and a depth direction, a bottom element connected to the bottom portion of the screening body, electric drive means operably connecting the bottom element and the side rails, a control system configured to activate the electric drive means to move the bottom element, and a position indicator slidably positionable by physical movement independent of the bottom element in the longitudinal direction. The invention furthermore relates to a control unit configured to perform the method, and to a screening arrangement including such a control unit.

Background Art

[0002] Screening arrangements and operating methods of the kind mentioned in the above are known in the art. Applicant's European patent No. 2886784 shows and describes an example of a screening device in which the side rail comprises a magnetic strip and the position indicator is provided with a permanent magnet. While the screening device of this document overcomes disadvantages of earlier arrangements making use of magnets, the magnetic connection between the position indicator and the bottom element which causes the position indicator to follow the longitudinal position of the bottom element as a slave has drawbacks too.

Summary of Invention

[0003] With this background, it is therefore an object of the invention to provide an operating method for a screening arrangement by which these drawbacks are mitigated.

[0004] This and further objects are met by a method of the kind mentioned in the introduction, comprising the steps of

determining, by a sensor arrangement, the physical movement of the position indicator of the screening arrangement;

in response to determining the physical movement of the position indicator, determining if a distance of the movement of the position indicator exceeds a predetermined distance threshold;

in response to determining that the movement of the position indicator exceeds the predetermined distance threshold, operating the electric drive means of the screening arrangement to adjust the longitudinal position of the bottom element of the screening arrangement so that the bottom element of the screening arrangement is arranged at a longitudinal position indicated by the position indicator; and

in response to determining that the movement of the position indicator is less than or equal to the predetermined distance threshold, operating the electric drive means to adjust the longitudinal position of the bottom element of the screening arrangement so that bottom element end of the screening arrangement is arranged at a predetermined longitudinal reference position.

[0005] In case it is desired to move the position of the bottom element of the screening arrangement, typically to obtain a different screening position, the user manually adjusts the position of the position indicator by applying a force on the position indicator. Depending on the distance that the position indicator has been moved, the control system will activate the electric drive means and the bottom element will first be moved to the adjusted position of the position indicator, and then either stay in that position or move to the reference position. The reference position is typically a bottom position corresponding to a fully screened position, or a top position corresponding to a non-screening position. In that way, the position indicator itself has a controlling function relative to the bottom element of the screening arrangement.

[0006] Since the position indicator is slidably movable along, i.e., in parallel with one of the side rails, the physical movement of the position indicator by manual adjustment indicates an arbitrary longitudinal position. The position indicator may be slidable on one of the side rails of the screening arrangement, or on a separate profile element.

[0007] Operating the electric drive means may comprise applying a voltage and/or current, such as a direct current, to the electric drive means to cause the electric drive means to activate. In some embodiments, the electric drive means may be a rotating electric motor. As will be appreciated by the skilled person, the direction of rotation may be switched by switching the direction of the voltage/current applied to the electric drive.

[0008] The sensor arrangement may be a sensor arrangement configured to determine a physical movement of a position indicator.

[0009] In one embodiment, the method further comprises:

in response to determining a physical movement of the position indicator, determining a direction of movement of the position indicator, the direction of movement being a first direction or a second direction; and

operating the electric drive means of the screening arrangement to move the bottom element of the screening arrangement in the direction of movement of the position indicator.

[0010] In this way, a fully flexible operation of the screening arrangement is made possible, since movement in more directions than one is made possible. Typically, the second direction is opposite to the first direction, along the longitudinal direction as defined by the side rails.

[0011] In a further development of this embodiment, the electric drive means, in response to determining that the movement of the position indicator is less than or equal to the predetermined distance threshold, is operated to adjust the longitudinal position of the bottom element so that the bottom element of the screening arrangement is arranged at a first predetermined longitudinal reference position in response to determining the direction of movement being the first direction or to be arranged at a second predetermined longitudinal reference position in response to determining the direction of movement being the second direction.

[0012] The distance and the direction of movement of the position indicator may in principle be determined in any suitable way.

[0013] In presently preferred embodiments, the determination of the distance and the direction that the position indicator has been moved is carried out by the sensor arrangement and/or by a second sensor arrangement.

[0014] Additionally or alternatively, determining the distance of the movement of the position indicator may comprise:

> in response to determining the direction of movement of the position indicator, operating the electric drive means of the screening arrangement to move the bottom element of the screening arrangement in the direction of movement of the position indicator;
> determining a time period and/or a number of rotations of the electric drive means until a longitudinal position indicated by the position indicator has been reached by the bottom element; and
> determining the distance of movement based on the time period and/or the number of rotations.

[0015] Determining the time period until the longitudinal position indicated by the position indicator has been reached may comprise determining, via the sensor arrangement, a second sensor arrangement, and/or a third sensor arrangement, if the longitudinal position indicated by the position indicator has been reached. The respective sensor arrangement may be configured to determine if at least a portion of the bottom element and/or free end passes by the position indicator.

[0016] The distance of movement may be determined based on the velocity of movement of the bottom element and/or free end and the time. For instance, the velocity of movement may be specific for the electric drive means when activated and/or may be controlled by the voltage and/or current supplied to the electric drive.

[0017] Alternatively or additionally, a number of rotations of the electric drive, such as where the electric drive means comprises an electric motor, may be determined and a distance may be determined based on the number of rotations of the electric drive. In some embodiments, the distance threshold is and/or corresponds to a threshold number of rotations by the electric drive.

[0018] Alternatively or additionally, the distance may be determined based on the number of rotations and information regarding the distance of movement of the bottom element and/or free end per rotation of the electric drive. Such information may be information regarding gearing and/or a material thickness of a screening body of the screening arrangement. Such information may be provided as data representative of the information. Notably, such information may be provided to provide an estimated distance of movement of the bottom element and/or free end per revolution of the electric drive. It is furthermore noted that it will be clear to the skilled person how such information can be used to determine a distance of movement of the bottom element and/or free end per revolution of the electric drive.

[0019] In an embodiment, the sensor arrangement comprises one or more sensors selected from the group comprising: one or more of a current sensor, a rotary encoder, and one or more, such as two, Hall effect sensors.

[0020] In a further development of the above embodiment, the bottom element of the screening arrangement comprises two Hall elements positioned at a distance from each other in the longitudinal direction, and the position indicator comprises a magnet configured to interact with both of the Hall elements when the position indicator is positioned in close proximity of the bottom element. The position indicator may comprise more magnets, and the magnets may be permanent magnets. More than two sensors may be provided. This embodiment provides for reliable operation of the screening arrangement as the Hall effect sensors are configured to provide a signal in response to physically moving the magnet(s) of the position indicator, e.g., within a predetermined distance.

[0021] Alternatively or additionally, the interaction between the Hall elements and the magnet is such that when the position indicator is moved in the longitudinal direction through a distance less than or equal to the predetermined distance threshold, the magnet is brought out of interaction with one or the other of the Hall elements, thereby determining the direction of movement of the position indicator and arranging movement of the bottom element of the screening arrangement to one or the other of the predetermined longitudinal reference positions. This facilitates operation of the screening arrangement even further.

[0022] In one embodiment, the bottom element of the screening arrangement comprises releasable positive engagement means for positive engagement with the position indicator, and operating the electric drive means, in response to determining that the movement of the position indicator exceeds the predetermined distance threshold, comprises operating the electric drive means

so that the engagement means is brought into positive engagement with the position indicator at the longitudinal position indicated by the position indicator. In this way, easy engagement and disengagement between the bottom element and the position indicator is obtained.

[0023] The term "positive engagement" (German: formschlüssig) is to be interpreted as encompassing mechanical coupling of two otherwise separate components such that the design and geometry of the components prevent the coupling from being released unintentionally by forces to which the components are subjected during use, including in particular such mechanical couplings in which mutually complementary shapes of the respective components fit together in the engaged position, and in which intentional movement of at least one of the components out of the engaged position is required, typically involving at least partial movement of part(s) of one or both components in a direction at an angle to the intended movement. In other words, the term positive engagement is to be understood as any form of form-locking coupling in which the shapes or geometrical forms of two components interlock with each other in such a way that they create an engagement preventing disengagement until intentional release is carried out by an active or conscious action by a user.

[0024] As opposed hereto, "non-positive engagement" (German: kraftschlüssig) involves such engagement which only requires a force in the direction of intended movement to obtain release. A non-exhaustive list of examples of non-positive engagement means include frictional connections, magnetic connections, "soft" snap connections, etc. in which the engagement between the components is enabled by means of forces mainly in the tangential direction rather than the normal direction.

[0025] In a further embodiment, the bottom element of the screening arrangement comprises releasable positive engagement means for positive engagement with the position indicator, and wherein operating the electric drive means, in response to determining that the movement of the position indicator is less than or equal to the predetermined distance threshold, comprises operating the electric drive means so that the engagement means is brought into positive engagement with the position indicator, and the bottom element together with the position indicator are moved to the predetermined longitudinal reference position. As the positive engagement takes place between the bottom element and the position indicator, and thus not with for instance the side rail, a reliable engagement is made possible while at the same time allowing the position indicator to be brought along with the movement of the bottom element of the screening arrangement.

[0026] In a second aspect of the invention a control unit is provided. The control unit is communicatively coupled to an electric drive means of a screening arrangement for screening a window, preferably a roof window, wherein the control unit is configured to operate the electric drive means to adjust a longitudinal position of a bottom element of the screening arrangement, and wherein the control unit is furthermore communicatively coupled to a sensor arrangement configured to determine a movement of a position indicator of the screening arrangement, characterised in that

the control unit is configured to perform the method according to the first aspect of the invention.

[0027] In a third aspect of the invention, a screening arrangement is provided.

[0028] Further aspects may include a computer programme product comprising instructions which, when the programme is executed by a control unit, cause the control unit to carry out the method according to the first aspect of the invention.

[0029] In some embodiments, the computer programme product comprises a non-transitory computer-readable medium having stored thereon the instructions.

[0030] The method may be considered to be a computer-implemented method. Other presently preferred embodiments and further advantages will be apparent from the subsequent detailed description and drawings.

[0031] A feature described in relation to one of the aspects may also be incorporated in the other aspects, and the advantage of the feature is applicable to all aspects in which it is incorporated.

Brief Description of Drawings

[0032] In the following description embodiments of the invention will be described with reference to the drawings, in which

FIG. 1 is a plan view of a screening arrangement in an embodiment of the invention, mounted in a frame of a window;

FIG. 2 is a partial view, on a larger scale, of the upper right-hand corner of the screening arrangement and window of FIG. 1;

FIG. 3 is a partial perspective view of a position indicator mounted on a side rail of the screening arrangement in the embodiment of FIGS. 1 and 2;

FIGS. 4 and 5 are end views of a position indicator and a side rail of a screening arrangement in an embodiment of the invention, shown in a condition of use and during mounting of the position indicator, respectively;

FIG. 6 is a partial perspective view of a bottom element of the screening arrangement in an embodiment of the invention;

FIG. 7 is a view substantially corresponding to FIG. 6, but with some parts removed;

FIG. 8 is an end view of the bottom element of FIGS. 6 and 7;

FIG. 9 is an exploded view of parts of the bottom element of FIGS. 6 to 8;

FIG. 10 is an exploded perspective view of a position indicator of the screening arrangement in an embodiment of the invention;

FIGS. 11 to 16 are perspective views from different angles of the position indicator of FIG. 10;
FIGS. 17A and 17B are partial perspective views, showing the engagement and disengagement, respectively, of a position indicator and the bottom element of the screening arrangement in an embodiment of the invention;
FIGS. 18A to 18C show details of the bottom element and the position indicator in an embodiment of the invention, in three different positions;
FIGS. 19A to 19D are schematic views indicating different positions of the position indicator along the side rail of the screening arrangement in an embodiment of the invention;
FIGS. 20A and 20B are schematic views of an alternative embodiment of the screening arrangement;
FIGS. 21A and 21B are schematic views of a further alternative embodiment of the screening arrangement;
FIGS. 22 to 24 are schematic views showing details of parts of the position indicator and the bottom element of the screening arrangement in three alternative embodiments of the invention;
FIGS. 25A-25B and 26A-26B are views corresponding to FIG. 5 of various further embodiments of the screening arrangement;
FIG. 27 is a flowchart indicating steps in a method for operating a screening arrangement; and
FIG. 28 is a schematic overview of a screening arrangement in an embodiment of the invention.

Description of Embodiments

[0033] In the following detailed description, preferred embodiments of the present invention will be described. However, it is to be understood that features of the different embodiments are exchangeable between the embodiments and may be combined in different ways, unless anything else is specifically indicated. It may also be noted that, for the sake of clarity, the dimensions of certain components illustrated in the drawings may differ from the corresponding dimensions in real-life implementations.

[0034] It is noted that terms such as "up", "down", "left-hand", "right-hand", "exterior", "interior", "outer", "inner" are relative and refers to the viewpoint in question.

[0035] Referring initially to FIGS. 1 to 3, an embodiment of a screening arrangement generally designated 10 is shown, mounted in a frame 2 representing a window. In the shown configuration, the frame 2 constitutes a pane-carrying sash of a roof window 1 and may be pivotable about a centre axis, or top-hung, relative to a stationary frame (not shown) of the roof window 1. The frame 2 may likewise be a stationary frame, which in a mounted position of the window lines an aperture in a building. It is noted that the term "frame" is to be understood as incorporating any substantially rectangular structure positioned in any opening in a building, whether in a wall or the roof, and surrounding an opening 3 to be screened. The screening arrangement 10 may thus be utilised in connection with e.g. windows having a frame only, windows having a sash and a frame, or in doors. In the present context, the screening arrangement 10 will be described as an interior screening arrangement mounted on the interior side of a roof window, i.e., the side facing an inside room of a building.

[0036] The frame 2 has a top member 2.1, two mutually parallel side members 2.2, 2.3, and a bottom member 2.4, surrounding the opening 3 to be screened, covered by a suitable panel element such as insulating glazing in the form of a pane 4.

[0037] The screening arrangement 10 comprises a screening device including a screening body 15 (indicated in FIGS. 19A to 19C) having two side edges and a top and bottom portion.

[0038] Two side rails 12, 13 are provided in the screening device, each defining a longitudinal direction L, a width direction W and a depth direction D as shown in FIG. 3.

[0039] In the embodiment shown, the screening device of the screening arrangement 10 further comprises a top casing 11 located at the top member 2.1 of the frame; however, the invention is applicable also to screening devices in which no top casing is present. The top portion of the screening body 15 is typically fastened to a winding, folding, or rotating structure such as a spring-biased roller bar in a roller blind accommodated in the top casing 11, which also accommodates the top portion of the screening body 15 and connected to an upper end of the side rails.

[0040] A bottom element 14 of the screening device of the screening arrangement 10 is connected to the bottom portion of the screening body 15 and being configured to be longitudinally positionable in said longitudinal direction L to provide a screening position by means of electric drive means operably connecting the bottom element 14 and the side rails 12, 13 as will be described in some detail below.

[0041] It is noted that the terms top portion and bottom portion of the screening body 15 denote the position the respective portions assume in the mounted condition of the screening arrangement 10. Other mounting positions are conceivable. Furthermore, while the top portion here remains within the top casing 11 in use, and the bottom portion constitutes a free end of the screening body 15, other exemplary configurations of the screening arrangement include two free ends of the screening body, most often attached to respective movable bars, and no top casing is present.

[0042] The screening body 15 is typically made from cloth or fabric, which may be flexible to allow rolling up, but may also be pleated. However, other screening devices having other kinds of screening bodies are conceivable for use in the screening arrangement of the invention. Hence, it is noted that as used herein the term "screening body" is intended to encompass all feasible

types of screening bodies, examples being roller blinds, lamella blinds, curtains, awnings, roller shutters, and shades.

[0043] The screening arrangement comprises a position indicator 16 slidably positionable along one or the other of the side rails 12, 13 for manually indicating a desired longitudinal position of the bottom element 14. In the following, the position indicator 16 will be described as being positioned on the right-hand side rail 12. The longitudinal position of said position indicator 16 is manually adjustable by physical movement of the position indicator to an arbitrary longitudinal position along the side rail 12.

[0044] The position indicator 16 is configured to engage the bottom element 14 by releasable positive engagement means when the bottom element 14 is brought into contact with the position indicator 16 to assume an engaged condition, in such a way that:

i) the positive engagement means is arranged to be released when the longitudinal position of the position indicator 16 is manually adjusted by applying a force on the position indicator substantially in said longitudinal direction L, and

ii) the positive engagement means is arranged to keep the position indicator 16 in the engaged condition with the bottom element 14 to follow the movement of the bottom element 14 in said longitudinal direction L when the bottom element 14 is moved in the longitudinal direction L by activation of the electric drive means.

[0045] In the embodiment shown, the position indicator 16 is slidably connected to the slide rail 12 itself but may be associated to one or the other of the side rails 12, 13 on a more general level, for instance movable on a separate profile at or near the side rail.

[0046] The term manual movement encompasses any physical movement exerted by a user on the position indicator, typically carried out by a hand of the user.

[0047] By longitudinal position is meant a position in the longitudinal direction L.

[0048] Within the context of the present application the term engagement amounts to physical engagement, i.e., the position indicator and the bottom element are in contact with each other.

[0049] The term positive engagement is to be understood as any form of form-locking engagement preventing disengagement until intentional release is carried out. That is, in the engaged condition, the shapes of the components involved interlock in a coupling that may only be released intentionally, typically by moving one or both components, or parts thereof, in a direction at an angle to the intended direction of movement.

[0050] Referring now also to FIGS. 4 to 28, embodiments of the screening arrangement 10 will be described in more detail.

[0051] Turning first to FIGS. 4 to 6 and 17A and 17B, the releasable positive engagement means to allow the position indicator 16 to be brought into engagement with the bottom element 14 in this embodiment comprises at least one male part provided on the position indicator 16 and interacting with a female part provided on the bottom element 14.

[0052] Alternatively, the male part may be provided on the bottom element and the female part on the position indicator, or one of the bottom element or the position indicator may constitute the male part and/or female part themselves.

[0053] In this embodiment, however, a male part 191 is provided on the position indicator 16 and a female part 141 on the bottom element 14. Furthermore, the male part 191 and the female part 141 here have complementary, substantially rectangular shapes.

[0054] To facilitate engagement and disengagement of the bottom element 14 and the position indicator 16 in this embodiment, one of the male part and the female part is provided with a spring bias. Here, the spring bias is provided by a spring 192 on the position indicator 16. It is also conceivable to form the position indicator, or parts thereof, of a resilient material. The bias typically performs biasing of the respective at least one of said male and female parts towards the engaged condition. Where a spring bias is provided in the embodiments presently described, the spring bias may as indicated bias the respective one of the male and female part in the depth direction D.

[0055] The male part 191 is configured to be automatically brought into engagement with the female part 141 by movement of the bottom element 14 in the longitudinal direction L such that the male part 191 moves relative to the female part in the depth direction D during the engagement. In the embodiment shown, the female part comprises a notch 141, here provided on an end piece 142 of the bottom element 14.

[0056] As shown most clearly in FIG. 4, in the embodiment shown, the position indicator 16 has such an extension in the width direction D that it protrudes beyond an inner edge of the side rail 12. While the bottom element 14 is not shown in this figure, it is clear that the position indicator 16 overlaps the bottom element 14 partly in the width direction W such that the position indicator 16 comprises an outer portion overlapping the side rail 12 and an inner portion protruding beyond an inner edge of the side rail 12. The configuration of the components of the screening arrangement 10 is such that when moving the bottom element 14 from the position shown in FIG. 2, on activation of the electric drive means, the bottom element 14 is moved in the direction of the position indicator 16 and is able to pass below the position indicator 16, i.e., on the side of the position indicator 16 facing the pane 3 as seen in the depth direction D, and enter into engagement with the position indicator 16 as described in the above.

[0057] It is also noted that it is advantageous that the bottom element 14 has a rounded, elliptical, half-elliptical,

circular, or semi-circular shape on the face facing the position indicator 16, when seen in cross-section in the length direction L, cf. in this regard in particular FIGS. 17A and 17B.

[0058] In case it is desired to release the engagement between the position indicator 16 and the bottom element 14, the user adjusts the longitudinal position of the position indicator 16 manually, by applying a force on the position indicator 16 substantially in the longitudinal direction L. While applying this force, the male part 191 is brought out of engagement from the female part 141 in that the male part 191 of the position indicator 16 is tilted about an axis parallel to the width direction W, i.e., according to arrow T in FIG. 17B.

[0059] It is also conceivable to render the engagement of the bottom element 14 and the position indicator 16 releasable by means of the material of the position indicator 16 being flexible and/or resilient in such a way that manually adjusting the position of said position indicator 6 releases said engagement.

[0060] Turning now to FIGS. 20A-20B, 21A-21B, and 22 to 24, alternative embodiments will be described. For the sake of simplicity, only the reference numerals 16.1, 16.2, 16.3 etc. will be used for alternative embodiments of the position indicator and details of the releasable positive engagement means, while other elements have the same reference numerals as in the embodiments described in the above. Only differences relative to the embodiments described in the above will be referred to.

[0061] In the embodiment of FIGS. 20A-20B, the at least one male part of the position indicator 16.1 comprises a retractable pawl 16.11 configured to be moved in the width direction W to engage with the female part formed as a recess 16.12 in the bottom element 14. The movement in the width direction W is incurred by a permanent magnet 16.13 interacting with a metallic element (not shown). The dimensions and geometry of the retractable pawl 16.11 and the recess 16.12 are chosen such that the engagement between the position indicator 16.1 and the bottom element 14 is sufficient to enable the position indicator 16.1 to follow the movement, but at the same time allow the user to override the magnetic force such that the retractable pawl 16.11 is brought out of engagement with the recess 16.12.

[0062] In the embodiment of FIGS. 21A-21B, the male part of the position indicator 16.2 comprises two protrusions 16.21, 16.22 configured to engage with the bottom element 14. The protrusions 16.21, 16.22 are provided at a respective side of the position indicator 16.2 and complement the shape of the bottom element 14. Improved operability is provided by inclined portions of the protrusions 16.21, 16.22 and a spring-bias 16.23 in the width direction W. Also in this embodiment, the dimensions and geometry are chosen such that the engagement between the position indicator 16.2 and the bottom element 14 is sufficient to enable the position indicator 16.2 to follow the movement, but at the same time allow the user to release the engagement.

[0063] Referring now to FIG. 22, this figure shows an enlarged and simplified version FIG. 17A showing the embodiment of the screening arrangement described in the above, namely where the male part 191 and the female part 141 have complementary, substantially rectangular shapes. As already described, the engagement occurs as the bias from the spring 192 moves the position indicator 16 in the depth direction D. In order to release the engagement, the position indicator 16 is tilted as indicated by arrow T. During the tilting, the bottom of the male part 191 forms an inclined surface, and further physical movement exerted by the user in the longitudinal direction L will bring the male part 191 out of engagement from the female part 141.

[0064] In the alternative embodiment shown in FIG. 23, the female part comprises two inclined portions 16.31, 16.32. Alternatively, the male part could be provided with two inclined portions, or both the male part and the female part could be provided with one inclined portion each, as long as it is possible to form at least one inclined surface in order to allow easy release of the position indicator 16.3 from the bottom element 14. It is noted that unless intentional tilting is carried out, the shape of the male part of the position indicator 16.3 will not be able to slide along any of the inclined portions 16.31, 16.32 of the female part in the bottom element 14.

[0065] Finally, in the alternative embodiment shown in FIG. 24, the male part and the female part have complementary curved shapes. As shown, the female part is formed as a bowl 16.41 and the male part as a substantially spherical ball 16.42. The dimensions and geometry are such that a user may push or drag the position indicator 16.4 free of the bottom element 14, but a bias from a spring 16.43 may also facilitate the engagement and the release.

[0066] Further alternatives include not-shown embodiments in which a male part is formed as a spring of a material such as steel rotationally journalled in the position indicator and biased towards a relaxed condition corresponding to a non-engaging position. The male part is configured to engage a female part formed as in the embodiment of Fig. 23 by action of a magnetic force, for instance provided by a permanent magnet in the bottom element, such that the male part during engagement rotates about an axis parallel to the longitudinal direction L into the female part by the force of the magnet to assume the engaged condition. The user disengages the engagement by dislocating the position indicator substantially in the longitudinal direction L, whereby the male part slides along one of the inclined portions of the female part whereby the magnet force is overcome, and the male part is rotated back to its relaxed condition in the opposite rotational direction. The same principle applies in embodiments where the male part is provided on the bottom element and the female part is provided on the position indicator.

[0067] Referring now in particular to FIGS. 10 to 16, the configuration of the position indicator 16 in one em-

bodiment will be described in detail. Elements having the same or analogous function as in the above carry the same reference numerals throughout.

[0068] The position indicator 16 in this embodiment comprises a cover 17 and a connection unit 18, 19. The cover 17 is accessible and visible at all times and is also the component handled by the user, both when mounting the position indicator 16 on the side rail 12 and during operation, while the connection unit remains mainly covered and thus hidden below the cover 17.

[0069] The connection unit comprises a first connection part 18 providing connection of the position indicator 16 to the side rail 12, and a second connection part 19 providing the releasable positive engagement with the bottom element 14.

[0070] The cover 17 has a substantially rectangular base portion 170. Seen from the side, the base portion 170 is slightly curved, i.e. with a substantial radius of curvature. Depending skirt portions are provided at the edges of the base portion, namely a first skirt portion 172 extending around the entire periphery of the base portion, and a second skirt portion 173 which extends over only a part of the circumference and which is offset to the interior relative to the first skirt portion 172.

[0071] During assembly of the position indicator 16, the first and second connection parts 18, 19 forming the connection unit are assembled first. Subsequently, the cover 17 is connected to the connection unit, in the embodiment shown releasably by snap engagement means provided in that a first set of counter-hooks 1741 provided on an interior side 171 of the base portion 171 is hooked around a first set of snap hooks 1841 on the first connection part 18 (cf. FIG. 12), following which a second set of counter-hooks 1742 is hooked around a second set of snap hooks 1842 such that the position indicator 16 is now in an assembled state constituting a supply condition and is ready for mounting on one or the other of the side rails 12, 13. The snap engagement between the cover 17 and the connection unit is advantageously relatively firm, as it is not intended for the user to dismount the cover 17. Furthermore, it is noted that the cover 17 is configured to be moveable relative to the connection unit.

[0072] In general, all components of the position indicator 16 are symmetric such that there is no difference between up and down as seen in the longitudinal direction L, i.e. the position indicator is equally applicable on the right-hand and left-hand side rail 12, 13. Suitable materials and manufacturing process comprise moulding and 3D printing of plastic materials for the cover 17 and connection unit components. Any springs present are typically made of metal. Representative dimensions of the position indicator 16 relative to the components of the screening device are shown in FIGS. 1 to 3. Referring also to the directions L, W, D in a mounted condition of the position indicator 16, the position indicator 16 has a length (the dimension in the width direction W in the mounted condition) of about 50 mm, a width (the dimension in the longitudinal direction L in the mounted condition) of about 20 mm, and a total height (the dimension in the depth direction D in the mounted condition) of about 15 mm, of which about 10 mm protrudes from a front of the side rail 12. In comparison, the bottom element 14 has a height (the dimension in the longitudinal direction L in the mounted condition) of about 50 mm, and the side rails 12, 13 each a width of about 30 mm. These dimensions are given as examples only, and variations are foreseen. The overall dimensions of the screening device of the screening arrangement 10 depend on the size of the window in question, i.e., including the length of the side rails in the longitudinal direction L, the length of the bottom element 14, and of the top casing 11, if present, in the width direction W, and of the length of the screening body 15 between its top and bottom portions.

[0073] During installation of the screening arrangement 10, the top casing 11 (if present), the screening body 15 and the bottom element 14 are typically mounted in a first step. Next, the side rails 12 and 13 are connected to the top casing 11 and to the side members 2.2, 2.3 of the frame 2. In the embodiment shown, the side rails 12 and 13 are connected to the side members 2.2, 2.3 of frame 2 such that they are positioned within an opening defined by inwards facing surfaces of the frame members.

[0074] In order to bring the position indicator 16 from the supply condition to a condition of use, the position indicator 16 is connected to the side rail in question, here side rail 12, from the front, i.e., from the interior of the room in the embodiment shown.

[0075] To that end, the connection unit of the position indicator 16 comprises snap engagement means configured to engage with engagement means of the side rail 12 as will be described in the following.

[0076] In the embodiments shown, the snap engagement means of the position indicator 16 is arranged to allow the position indicator 16 to engage with the engagement means of the side rail 12 by movement substantially in the depth direction D. During this movement, it is advantageous that the position indicator 16 is substantially free of rotation, or only subjected to rotation about an axis parallel to the longitudinal direction L. This allows mounting of the position indicator 16 also when there is limited available space between the side rails 12, 13 and the frame members 2.2, 2.3.

[0077] Throughout the embodiments shown, the snap engagement means of the position indicator 16 comprises male engagement means provided at a distance from each other, while the engagement means of the side rail 12 comprises female engagement means provided along opposite longitudinal side edges of the side rail 12. It is however conceivable also to provide female engagement means on the position indicator and male engagement means on the side rail, as long as the snap engagement is able to be performed and at the same time allow the position indicator to slide along the side rail 12.

[0078] In the embodiment shown, in which the position indicator 16 comprises the connection unit which in turn

comprises the first connection part 18 and the second connection part 19, the snap engagement means is provided on the first connection part 18. The snap engagement means described comprises male engagement means provided on the first connection part 18 to engage the female engagement means of the side rail 12, here configured as shown in FIG. 5.

[0079] The side rail 12, in the version shown in FIG. 5, comprises a first flange 121 constituting a front of the side rail 12, a second flange 122 at a distance from the first flange 121 in the depth direction D, and a leg 123 extending substantially at right angles to the first and second flanges 121, 122 and by which the side rail 12 is connected to the side member 2.2 of the frame 2. On its underside, the second flange 124 is provided with a rack 124 forming part of transmission means facilitating the longitudinal positioning L of the bottom element 14, to be described below. The female engagement means is here provided as an edge section 121a at an inner side edge 1211 and a groove section 121b at an outer side edge 1212 of the first flange 121.

[0080] The first connection part 18 comprises a base 181 with a fixed part in the form of a first hook 1811, and a hinged grip 182 with a second hook 1821 provided at a distance from the first hook 1811. The hooks 1811, 1821 are configured to engage opposite respective edge section 121a and groove section 121b along longitudinal sides of the side rail 12 in the engaged condition as shown most clearly in FIG. 4.

[0081] The hinged grip 182 is hingedly connected to the base 181 so as to be at least partially rotatable about an axis parallel to the longitudinal direction L during mounting of the position indicator 16. Here, a hinge connection 1822 connected to the base portion 181 allows rotation as indicated in FIG. 12. A spring 1823 provides bias to the hinged grip 182, that is, a torque in the clockwise direction about the hinge connection 1822, such that the hook 1821 is held in abutment with the groove section 121b at the outer side edge 1212 of the side rail 12. An abutment 186 is provided to keep the hinged grip 182 in check, the abutment 186 interacting with a top section 1824 of the hinged grip 182.

[0082] In alternative embodiments, as shown in FIGS. 25A-25B and 26A-26B, one or more engagement portions could be provided by forming suitable resilient flex parts 16.51, 16.52 of the connection unit of the position indicator 16.5 of a resilient material, or hinged parts 16.61, 162 at both sides of the position indicator 16.6. The hinged parts could for instance also be positioned centrally in the connection unit, or at other locations in the position indicator 16. Combinations of the engagement portions is also foreseen.

[0083] Also shown in FIGS. 25A-25B and 26A-26B are embodiments of the female engagement means of the side rail 12. As in the embodiment shown in FIG. 5, the female engagement means of FIGS. 26A-26B comprises one edge section 121a and one groove section 121b, here provided at the inner and outer side edges 1211, 1212 of the side rail 12, respectively. As an alternative, FIG. 25A shows the female engagement means as edge sections 121c, 121d at each longitudinal edge of the side rail 12, and FIG. 25B shows a groove section 121e, 121f at each side edge. Combinations are conceivable.

[0084] In case it is desired to remove the position indicator 16 from the side rail 12, for instance to move the position indicator from one side rail 12 to the other, the engagement of the second hook 1821 is released by activating the partial rotatability of the hinged grip 182 in the counter-clockwise direction against the bias of the spring 1823 as seen in FIG. 11, whereby the second hook 1821 disengages the groove section 121b at the outer side edge 1212 of the side rail 12 and thus releases the engagement and departs from the condition of use. Following release, the hinged grip 182 reverts to its starting position by means of the bias of the spring 1823.

[0085] Once mounted on the side rail 12, the position indicator 16 is able to perform a sliding movement on the side rail 12. The engagement between the first connection part 18 and the side rail 12 is sufficiently tight to allow the position indicator 16 to remain stationary at the intended position without sliding downwards as a result of gravity, vibrations etc. but is still able to be physically moved by a user without scratching or otherwise affecting the side rail 12 itself.

[0086] Turning now to the second connection part 19 connected to the first connection part 18 and providing connection of the position indicator 16 with the bottom element 14 in an engaged condition:

The second connection part 19 comprises a base portion 190, which in the embodiment shown is located in the section of the position indicator 16 which protrudes beyond the inner side edge 1211 of the side rail 12 in the mounted condition. Hence, if the bottom element 14 is in a position at or near the position indicator 16, the base portion 190 of the second connection part 19 will overlap the bottom element 14 partly. By at, near, proximate or closely proximate, it is meant that the bottom element 14 is disposed or oriented so as to engage the position indicator 16. Typical ranges for any distance between engagement parts of the respective engagement means are 0 to 10 mm, in particular 1 to 5 mm.

[0087] The male part of the positive engagement means comprises a rib 191 provided on a base portion 190 of the second connection part 19 and protruding in the depth direction D. It is thus the rib 191 which is configured to engage with the female engagement means in the form of the notch 141 of the bottom element 14 in the engaged condition in the way described in the above.

[0088] In this regard, it is noted that during engagement of the female part in the form of notch 141 of the bottom element 14 and the male part in the form of the rib 191, when the bottom element 14 is brought into contact with the position indicator 16 to assume an engaged condition, the first connection part 18 is configured without parts protruding in the width direction W so as to allow passage of the position indicator 16 during movement in

the longitudinal direction L in the condition of use of the screening arrangement 10.

[0089] The second connecting part 19 has a generally longitudinal configuration, as seen in the width direction W in the mounted condition on the side rail 12, somewhat resembling a vehicle chassis structure. Adjacent the base portion 190, the second connection part 19 comprises a transition portion 193 adjoined by a plate portion 194, and a shaft portion 196.

[0090] The second connection part 19 is hingedly connected at a hinge portion 195 to the first connection part 18 so as to be rotatable about an axis parallel to the longitudinal direction L. To ease assembly, the hinge portion 195 and counterpart set of hinge pins 185 on the first connection part 18 are formed such that the hinge portion 195 is able to be inserted over the hinge pin 185 from one angle but when the second connection part 19 is rotated towards its position of use, the hinge portion 195 is retained from release. The hinge portion 195 comprises a set of fork-shaped parts, each with a semi-circular bearing surface to contact a complementary shaped semi-circular bearing surface of each hinge pin 185. Once assembled, the first connection part 18 forms a fixed connection with the second connection part 19 at the hinge pin 185 and hinge portion 195.

[0091] However, the second connection part 19 is nevertheless able to perform a limited rotating movement due to the flexibility and resilience of the shaft portion 196 allowing torsion of the shaft portion 196. Thus, the second connection part 19 is configured to perform a tilting movement about an axis parallel to the width direction W, in the mounted condition, by interaction of a set of flanges 1711, 1712 on the interior side 171 of the base portion 170 of the cover 17 with the plate portion 194 on the second connection part 19. The flanges 1711, 1712 are guided in respective tracks 1831, 1832 of the first connection part 18.

[0092] Thus, applying a pressure on the cover 17 in the length direction L will allow the position indicator 16 to tilt along arrow T (cf. for instance FIG. 17B) and subsequently move the position indicator 16 in order to adjust the position thereof.

[0093] Finally, the second connection part 19 is provided with a set of magnet grip portions 197 which together with the base portion 190 accommodate a magnet 198 forming part of a sensor arrangement as will be described below.

[0094] Referring to FIGS. 18A-18C, 19A-19C and 27-28, further details of conceivable methods of operation will be described in more detail.

[0095] As shown in the general overview of the operational units of the screening arrangement 10 in FIG. 28, the screening device components are shown to the left, i.e., side rails 12, 13, bottom element 14, and screening body 15. The position indicator 16 so to say forms a link between the screening device components and a control system shown to the right in FIG. 28. The control system comprises a control unit 20. The control unit 20 is communicatively coupled to the electric drive means 22 and to a sensor arrangement 21 configured to determine a movement of a position indicator 16 of the screening arrangement 10.

[0096] In the embodiment shown, the sensor arrangement 21 is integrated in the screening arrangement 10, in the embodiment shown in the bottom element 14.

[0097] Correspondingly, the control unit 20 may also integrated in the screening arrangement 10, here also in the bottom element 14, but could alternatively be positioned in the top casing 11.

[0098] The control system for activating the drive means comprises, in a manner known *per se,* a circuit or processor configured to activate said electric drive means to move the bottom element 14. A such control system may comprise a control unit and a non-transitory memory for storing instructions thereon and in operable connection with the control unit. A control unit may be any control unit known and/or may comprise one or more of a central processing unit (CPU), a microcontroller unit (MCU), a field-programmable gate array (FPGA), an application specific integrated circuit (ASIC), and a digital signal processor (DSP). The memory may comprise instructions which, when carried out by the control unit, causes the control unit to operate (including activating) the drive means. The memory may comprise one or more of a random-access memory (RAM), a read-only memory (ROM), a Flash-memory, or the like. The control system may be configured to activate/operate the drive means to adjust the position of at least the bottom element 14. The electric drive means may be an electric motor drive, such as a DC motor, an AC motor, or a stepper motor, configured to drive in two opposite directions. The control system may be configured to operate the electric motor drive to run in either one of the two opposite directions or to brake.

[0099] Power supply for the electric drive means and the control system may include one or more solar panels facing an exterior side of the screening arrangement 10, but the drive means may also be connected to the mains electric supply of the building in which the roof window 1 with the screening arrangement 10 is installed.

[0100] Referring now to FIGS. 7 to 9, one example of a set-up of the electric drive means 22 and the sensor arrangement 21 of FIG. 28 is shown.

[0101] To carry out the movement of bottom element 14 to the desired position, first and second transmission means are provided. The first transmission means comprises a cogwheel 144 mounted on a rotatable shaft in connection with a motor (not shown), and the second transmission means comprises a rack 124, indicated schematically in FIGS. 4 and 5, extending in the longitudinal direction of each of the side rails 12, 13. Such electric drive means provides for a particularly well-functioning and durable transmission system and is known from Applicant's European patents Nos. 2738342, 2738343, 2738344, and in further developed versions in European patents Nos. 3258055 and 3492686.

[0102] Further details shown in FIGS. 7 to 9 include a side piece 111 of the top casing 11. A counterpart side piece is present at the opposite longitudinal end of the top casing 11. When mounting the top casing 11 to the frame 2 of the window, the side pieces are slidingly mounted over mounting brackets (not shown) provided on the frame side members 2.2 and 2.3. A set of electric terminals 112 is provided to supply the control system and the electric drive means of the screening arrangement 10 via contacts provided in at least one of the mounting brackets, the contacts being in turn connected to the mains electric supply of the building. Such an arrangement is disclosed in Applicant's European patents Nos. 2002079 and 3203008. It is noted that in case the screening arrangement is solar operated, the configuration of the side pieces 111 may be different.

[0103] Finally, it is noted that the bottom element 14 is shown as a profile having a front 140 facing the interior, bordered at each longitudinal end by the end piece 142 and a counterpart end piece at the other longitudinal end of the bottom element 14. A holding piece 143 located on the back side of the end piece 142 serves as a platform for orientation of other elements and accommodates the holding plate 145. Two Hall elements 146a, 146b are positioned on a holding plate 145 located at the end of the bottom element 14. The Hall elements 146a, 146b are communicatively coupled to circuitry generally designated 147 which is in turn in connection with the control system. During operation, the Hall elements 146a, 146b interact with the magnet 198 of the position indicator 16 to determine the movement of the position indicator 16 as will be described in further detail below.

[0104] On a general level, operation of the screening arrangement takes place by the following steps:

performing a physical movement of the position indicator 16 by manually sliding the position indicator 16 along the side rail 12 to a longitudinal position,

determining a direction and a distance of the physical movement of the position indicator 16 by means of the sensor arrangement 21,

activating the electric drive means 22 in response to determining the physical movement of the position indicator 16,

operating the electric drive means 22 to move the bottom element 14 in the direction of movement of the position indicator 16 to the longitudinal position of the position indicator 16, and

bringing the bottom element 14 into contact with the position indicator 16 and engaging the positive engagement means to assume an engaged condition.

[0105] Seen from a processing point of view, the control system first comes into operation in step 50 when the direction and distance of the physical movement of the position indicator 16 is determined by the sensor arrangement 21 indicated in the flowchart of FIG. 27.

[0106] Secondly, in step 51, the electric drive means 22 is activated and is moved in the direction of movement of the position indicator 16 until the bottom element 14 has been brought into contact with the position indicator 16 and the positive engagement means has been engaged such that the bottom element 14 and the position indicator 16 are now in the engaged condition.

[0107] Depending on the desired functionality of the screening arrangement, the movement of the position indicator 16 into an adjusted position may be used for indicating whether the bottom element 14 is to be moved to the adjusted position of the position indicator, or to a fully screened position, or to a fully un-screened position. This is represented by step 52 which is a decision step. Subsequent steps 53 and 54 are dependent on the outcome of the decision made as will be described below.

[0108] In order to determine the movement of the position indicator 16 in terms of direction and distance, one example embodying the sensor arrangement 21 will now be described with particular reference to FIGS. 18A-18C. In these figures, the bottom element 14 is represented by the two Hall elements 146a, 146b positioned on the holding plate 145 located at the end of the bottom element 14, and by the circuitry 147 communicatively coupled to the Hall elements 146a, 146b and in connection with the control system. Reference is briefly made to FIG. 9 showing the position of the components relative to other parts of the bottom element 14. It is noted that the interaction between the Hall elements 146a, 146b of the bottom element 14 and the magnet 198 of the position indicator 16 is purely for sensing purposes and has no retaining effect of the position indicator 16 relative to the bottom element 14. Correspondingly, the position indicator 16 is represented by magnet 198. The position of the magnet 198 in the position indicator 16 is for instance shown in FIG. 10.

[0109] In FIG. 18A, the bottom element 14 and the position indicator 16 are shown in the position they have relative to each other in the engaged condition. Since the position indicator 16 is positioned in close proximity of the bottom element 14, the magnet 198 of the position indicator 16 interacts with both of the Hall elements 146a, 146b in this position. As described in the above, the position indicator 16 may now be moved in the longitudinal direction L along the side rail 12 as indicated by the arrow in FIG. 18A. This movement occurs during use of the screening arrangement, by a user moving the position indicator 16 physically, typically by hand.

[0110] Turning now to FIG. 18B, the position indicator 16 has been moved through a distance x1, downwards when seen in the position the screening arrangement 10 assumes in the frame 2 of the roof window 1 shown throughout.

[0111] Now, the sensor arrangement 21 has detected that the position indicator 16 has been moved and this information is reported to the control unit 20 of the control system. The settings of the control system include a predetermined distance threshold such that in response to determining the physical movement of the position indi-

cator 16, it is determined if the distance of the movement of the position indicator 16 exceeds the predetermined distance threshold. Dependent on whether the actual distance, x1 in FIG. 18B, exceeds the predetermined distance threshold, or is less than or equal to the predetermined distance threshold, the electric drive means 22 will be operated in accordance with one of the situations represented by steps 53 and 54 of FIG. 27, following the outcome of decision step 52:

[0112] In a first situation, in response to determining that the movement of the position indicator 16 exceeds the predetermined distance threshold, operating the electric drive means 22 of the screening arrangement 10 to adjust the longitudinal position of the bottom element 14 of the screening arrangement 10 so that the bottom element 14 of the screening arrangement 10 is arranged at a longitudinal position indicated by the position indicator.

[0113] In a second situation, in response to determining that the movement of the position indicator 16 is less than or equal to the predetermined distance threshold, operating the electric drive means 22 to adjust the longitudinal position of the bottom element 14 of the screening arrangement 10 so that the bottom element 14 of the screening arrangement is arranged at a predetermined longitudinal reference position.

[0114] In other words, if the user moves the position indicator 16 through a relatively long distance in a specific direction to an adjusted position, this will result in the bottom element 14 being moved in the same direction and to the adjusted position of the position indicator 16, entering into positive engagement with the position indicator 16, and remaining in that position. Conversely, if the user moves the position indicator 16 only slightly, this will result in the bottom element 14 being moved towards the position indicator 16, engaging the position indicator 16 in positive engagement, and then, together with the position indicator 16, being moved to the predetermined longitudinal reference position.

[0115] While in principle, first and second directions could be selected arbitrarily in the screening arrangement 10, the directions are typically chosen to be upwards and downwards, respectively. Correspondingly, first and second predetermined longitudinal reference positions respectively constitute an uppermost longitudinal end position, corresponding to an un-screened window, and a lowermost longitudinal end position, corresponding to a fully screened window. Thus, in case distance x1 in the example of FIG. 18B is below or equals the predetermined distance threshold, then the bottom element 14 will be moved to the fully screened position. This is represented by FIGS. 19A and 19B.

[0116] In the embodiment shown, with the sensor arrangement 21 including two Hall elements 146a, 146b positioned with a longitudinal spacing, this is carried out in that the magnetic field of the magnet 198, in the position shown in FIG. 18B, has been brought out of interaction with the upper Hall element 146a while still interacting with the lower Hall element 146b. This is made possible by a suitable selection of the characteristics of the Hall elements 146a, 146b, and of the magnet 198, in combination with the spacing between the two Hall elements 146a, 146b. While the operational ranges of a Hall element sensor generally are around 0-80 mm, the person skilled in the art will choose suitable parameters to allow application in a screening arrangement as described.

[0117] Turning now to the situation shown in FIG. 18C, the position indicator 16 has been moved through a distance x2, which is longer than distance x1, and according to the exemplary settings exceeds the predetermined distance threshold.

[0118] Here, the magnetic field is no longer able to reach any of the Hall elements 146a, 146b such that the magnet 198 is brought out of interaction with both of the Hall elements 146a, 146b.

[0119] As a consequence, the electric drive means 22 is operated so that the engagement means is brought into positive engagement with the position indicator 16 at the longitudinal position indicated by the position indicator and the bottom element 14 then remains in this position. This is represented by FIGS. 19C and 19D.

[0120] Specific embodiments of the invention have now been described. However, several alternatives are possible, as would be apparent for someone skilled in the art.

[0121] Such and other obvious modifications must be considered to be within the scope of the present invention, as it is defined by the appended claims.

List of reference numerals

[0122]

1 roof window
2 frame

2.1 top member
2.2 side member
2.3 side member
2.4 bottom member

3 window opening
4 pane
10 screening arrangement
11 top casing

111 side piece
112 electric terminals

12 side rail

121 first flange
1211 inner side edge
1212 outer side edge
121a female engagement means / edge section at inner side edge

121b female engagement means / groove section at outer side edge
121c female engagement means (alternative embodiment)
121d female engagement means (alternative embodiment)
121e female engagement means (alternative embodiment)
121f female engagement means (alternative embodiment)
122 second flange
123 leg
124 rack

13 side rail
14 bottom element

140 front of bottom element
141 notch
142 end piece
143 holding piece
144 cogwheel
145 holding plate
146a Hall element
146b Hall element
147 circuitry

15 screening body
16 position indicator

16.1 position indicator alternative embodiment)

16.11 retractable pawl
16.12 recess in bottom element
16.13 magnet in bottom element

16.2 position indicator (alternative embodiment)

16.21 protrusion
16.22 protrusion
16.3 position indicator (alternative embodiment)

16.31 inclined portion
16.32 inclined portion

16.4 position indicator alternative embodiment)

16.41 bowl

16.42 ball

16.43 spring

16.5 position indicator (alternative embodiment)

16.51 resilient flex part
16.52 resilient flex part

16.6 position indicator (alternative embodiment)

16.61 hinged part
16.62 hinged part

17 cover

170 base portion
171 interior side of base portion
1711 flange
1712 flange
172 first skirt portion
173 second skirt portion
1741 first set of counter-hooks (for receiving snap-hooks 1841)
1742 second set of counter-hooks (for receiving snap-hooks 1842)
175 recess to guide spring 192

18 first connection part of connection unit

181 base portion
1811 fixed part / hook
182 hinged part / hinged grip
1821 hook
1822 hinge connection
1823 spring
1824 top section
1831 track (for receiving flange 1711)
1832 track (for receiving flange 1712)
1841 first set of snap hooks
1842 second set of snap hooks
185 hinge pin for hinge portion 195
186 abutment (for hinged grip 182)

19 second connection part of connection unit
190 base portion
191 rib
192 spring
193 transition portion
194 plate portion
195 hinge portion
196 shaft portion
197 magnet grip portions
198 magnet
20 control unit
21 sensor arrangement
22 electric drive means
50 step
51 step
52 step
53 step
54 step

L longitudinal direction
W width direction
D depth direction
T arrow (denoting tilting)

x1 first distance
x2 second distance

Claims

1. A method for operating a screening arrangement (10) for screening a window, preferably a roof window, the screening arrangement comprising a screening body (15) having two side edges and a top and bottom portion, two side rails (12, 13), each defining a longitudinal direction (L), a width direction (W), and a depth direction (D), a bottom element (14) connected to the bottom portion of the screening body (15) and positionable in the longitudinal direction (L), electric drive means (22) operably connecting the bottom element (14) and the side rails (12, 13), a control system configured to activate the electric drive means (22) to move the bottom element (14), and a position indicator (16) slidably positionable by physical movement independently of the bottom element (14) in the longitudinal direction (L), said operating method comprising:

   determining, by a sensor arrangement (21), the physical movement of the position indicator (16) of the screening arrangement (10);
   in response to determining the physical movement of the position indicator (16), determining if a distance (x1, x2) of the movement of the position indicator (16) exceeds a predetermined distance threshold;
   in response to determining that the movement of the position indicator (16) exceeds the predetermined distance threshold, operating the electric drive means (22) of the screening arrangement (10) to adjust the longitudinal position of the bottom element (14) of the screening arrangement (10) so that the bottom element (14) of the screening arrangement (10) is arranged at a longitudinal position indicated by the position indicator; and
   in response to determining that the movement of the position indicator (16) is less than or equal to the predetermined distance threshold, operating the electric drive means (22) to adjust the longitudinal position of the bottom element (14) of the screening arrangement (10) so that the bottom element (14) of the screening arrangement is arranged at a predetermined longitudinal reference position.

2. The method according to claim 1, wherein the method further comprises:

   in response to determining the physical movement of the position indicator, determining a direction of movement of the position indicator (16), the direction of movement being a first direction or a second direction; and
   operating the electric drive means (22) of the screening arrangement (10) to move the bottom element (14) of the screening arrangement (10) in the direction of movement of the position indicator (16).

3. The method according to claim 2, wherein the electric drive means (22), in response to determining that the movement of the position indicator (16) is less than or equal to the predetermined distance threshold, is operated to adjust the longitudinal position of the bottom element (14) so that the bottom element of the screening arrangement is arranged at a first predetermined longitudinal reference position in response to determining the direction of movement being the first direction or to be arranged at a second predetermined longitudinal reference position in response to determining the direction of movement being the second direction, the first predetermined longitudinal reference position being preferably an uppermost longitudinal end position, and the second predetermined longitudinal reference position a lowermost longitudinal end position.

4. The method according to any one of the preceding claims, wherein the sensor arrangement (21) comprises one or more sensors selected from the group comprising: one or more of a current sensor, a rotary encoder, and one or more, such as two, Hall effect sensors.

5. The method according to claim 4, wherein the bottom element (14) of the screening arrangement (10) comprises two Hall elements (146a, 146b) positioned at a distance from each other in the longitudinal direction (L), and wherein the position indicator (16) comprises a magnet (198) configured to interact with both of the Hall elements (146a, 146b) when the position indicator (16) is positioned in close proximity of the bottom element (14).

6. The method according to claim 5, wherein the interaction between the Hall elements (146a, 146b) and the magnet (198) is such that when the position indicator (16) is moved in the longitudinal direction (L) through a distance less than or equal to the predetermined distance threshold, the magnet (198) is brought out of interaction with one or the other of the Hall elements (146a, 146b), thereby determining the direction of movement of the position indicator (16) and arranging movement of the bottom element (14) of the screening arrangement (10) to one or the other of the predetermined longitudinal reference positions.

7. The method according to claim 5 or 6, wherein the

interaction between the Hall elements (146a, 146b) and the magnet (198) is such that when the position indicator (16) is moved in the longitudinal direction (L) through a distance exceeding the predetermined distance threshold, the magnet (198) is brought out of interaction with both of the Hall elements (146a, 146b), thereby arranging movement the bottom element (14) of the screening arrangement (10) to the longitudinal position of the position indicator (16).

8. The method according to any one of the preceding claims, wherein the bottom element (14) of the screening arrangement (10) comprises releasable positive engagement means for positive engagement with the position indicator (16), and wherein operating the electric drive means (22), in response to determining that the movement of the position indicator (16) exceeds the predetermined distance threshold, comprises operating the electric drive means (22) so that the engagement means is brought into positive engagement with the position indicator (16) at the longitudinal position indicated by the position indicator.

9. The method according to any one of the preceding claims, wherein the bottom element (14) of the screening arrangement (10) comprises releasable positive engagement means for positive engagement with the position indicator (16), and wherein operating the electric drive means (22), in response to determining that the movement of the position indicator (16) is less than or equal to the predetermined distance threshold, comprises operating the electric drive means (22) so that the engagement means is brought into positive engagement with the position indicator (16), and the bottom element (14) together with the position indicator (16) are moved to the predetermined longitudinal reference position.

10. A control unit (20) communicatively coupled to an electric drive means (22) of a screening arrangement (10) for screening a window, preferably a roof window, wherein the control unit (20) is configured to operate the electric drive means (22) to adjust a longitudinal position of a bottom element (14) of the screening arrangement, and wherein the control unit is furthermore communicatively coupled to a sensor arrangement configured to determine a movement of a position indicator of the screening arrangement,
characterised in that
the control unit is configured to perform the method according to any one of claims 1-9.

11. A screening arrangement (10) for a window, preferably a roof window (1), said window comprising a frame (2) with a top member (2.1), a bottom member (2.4) and two mutually parallel side members (2.2, 2.3), said screening arrangement (10) comprising:
a screening body (15) having two side edges and a top and bottom portion,
two side rails (12, 13), each defining a longitudinal direction (L), a width direction (W), and a depth direction (D),
a bottom element (14) connected to the bottom portion of the screening body (15) and being configured to be longitudinally positionable in said longitudinal direction (L) to provide a screening position by means of electric drive means (22) operably connecting the bottom element (14) and the side rails (12, 13),
a position indicator (16) slidably positionable along at least one of the side rails (12) for manually indicating a desired longitudinal position of the bottom element (14), the longitudinal position of said position indicator (16) being manually adjustable by physical movement of the position indicator (16) to an arbitrary longitudinal position along the at least one side rail (12),
a control system configured to activate said electric drive means to move the bottom element (14),
characterised in that
the control system comprises a control unit (20) according to claim 10, the control unit being communicatively coupled to the electric drive means (22) and to a sensor arrangement (21) configured to determine a movement of a position indicator (16) of the screening arrangement (10).

12. The screening arrangement according to claim 11, wherein the sensor arrangement (21) is integrated in the screening arrangement (10), preferably in the bottom element (14).

13. The screening arrangement according to claim 11 or 12, wherein the control unit (20) is integrated in the screening arrangement (10), preferably in the bottom element (14).

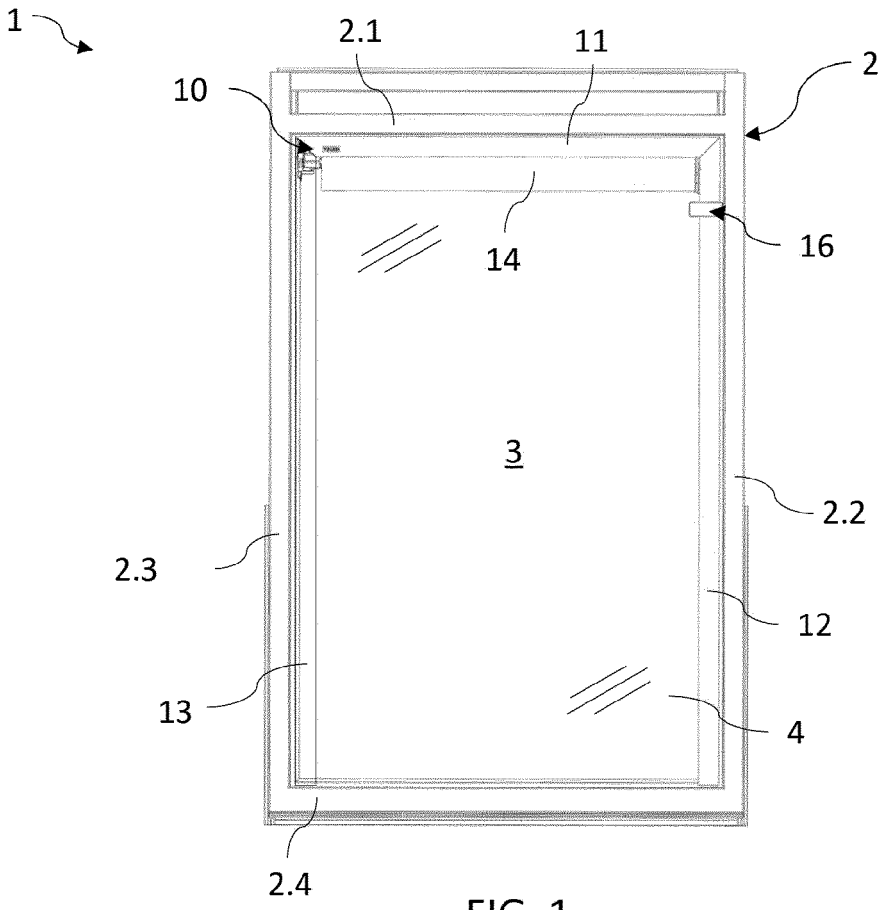

FIG. 1

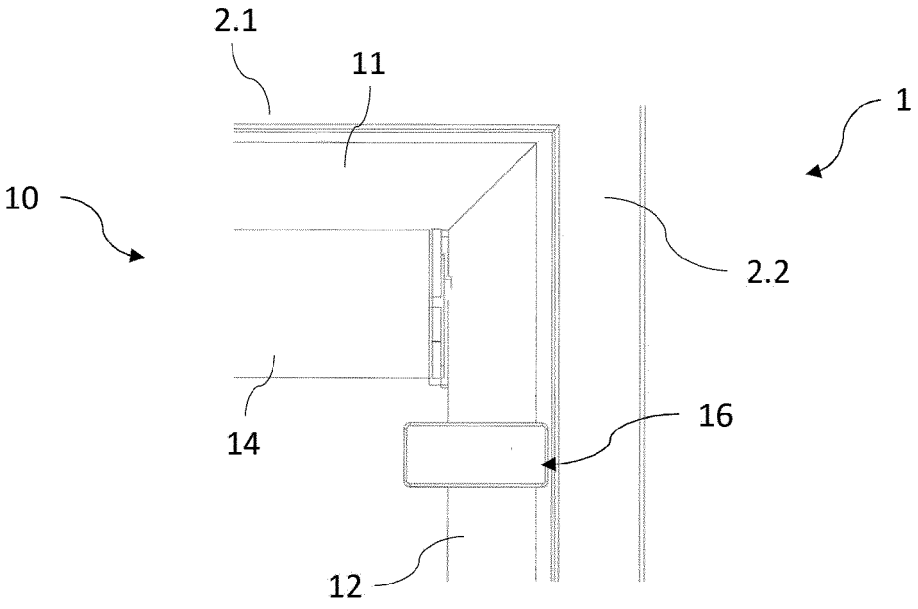

FIG. 2

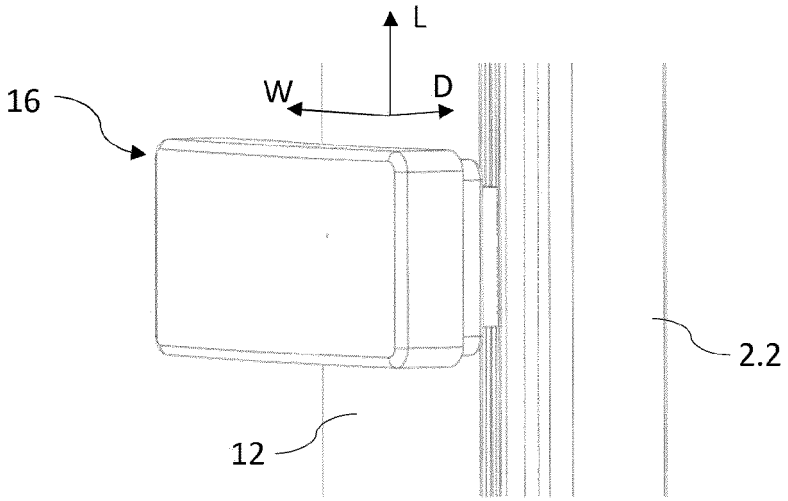

FIG. 3

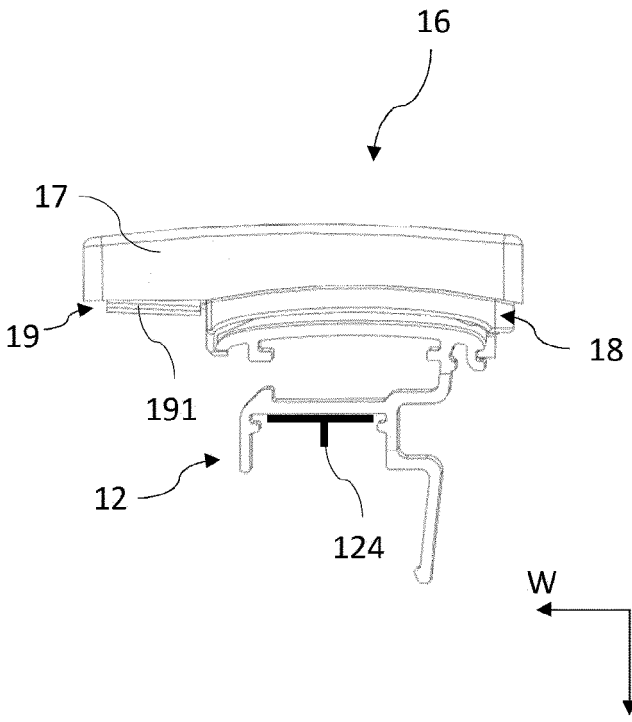

FIG. 4

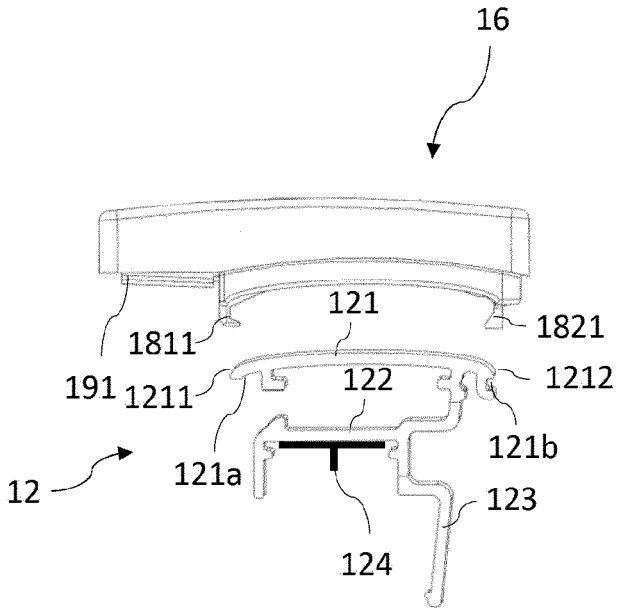

FIG. 5

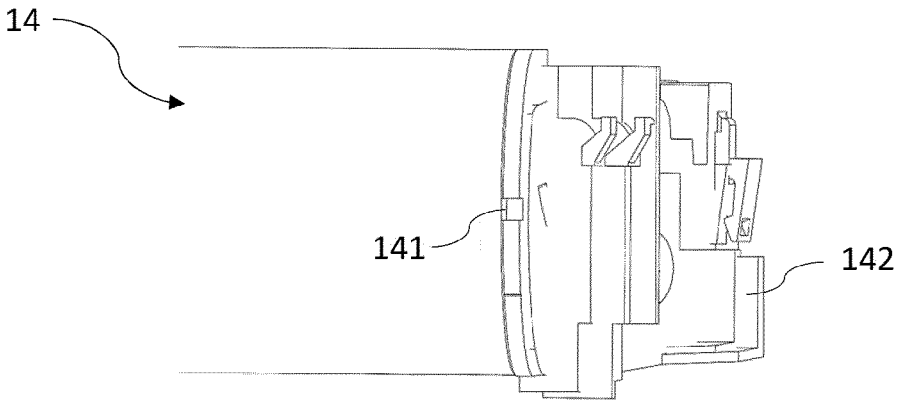

FIG. 6

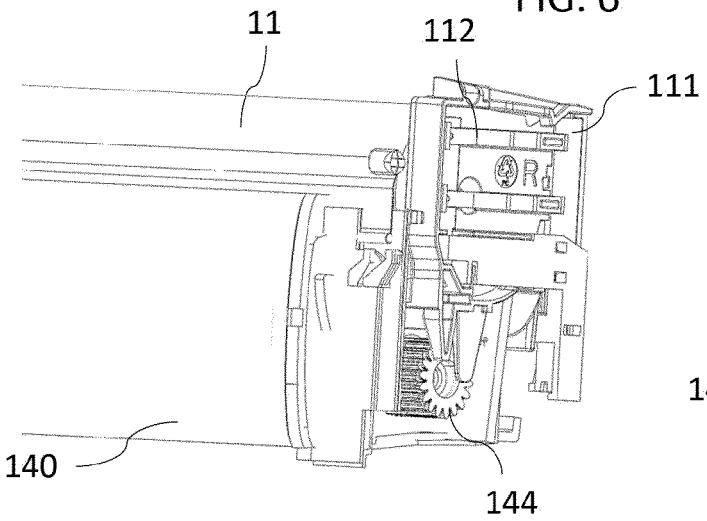

FIG. 7

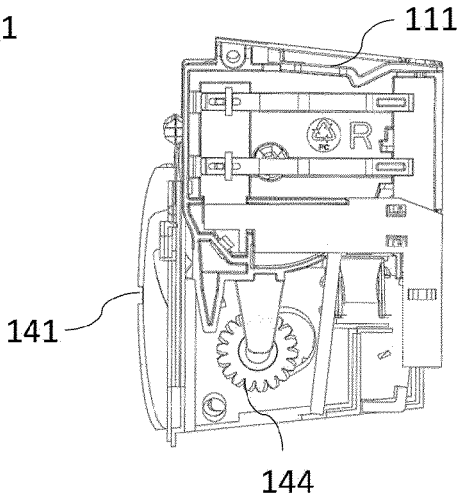

FIG. 8

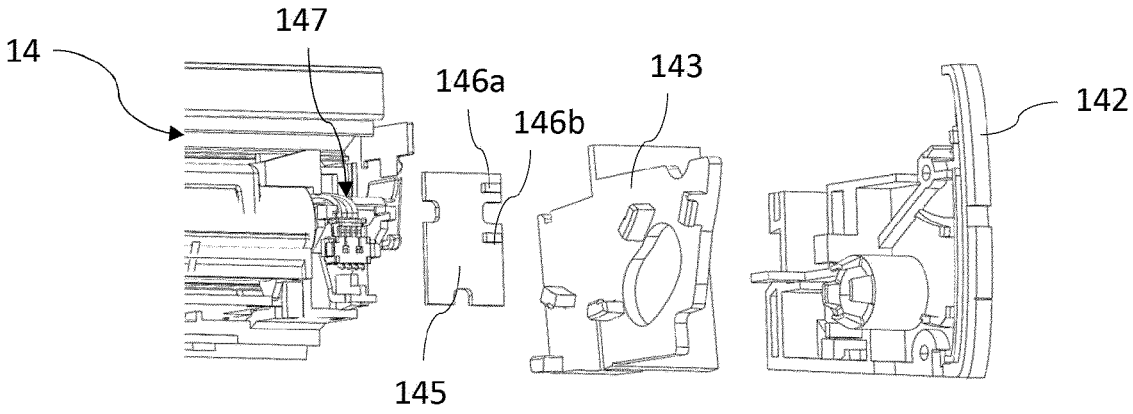

FIG. 9

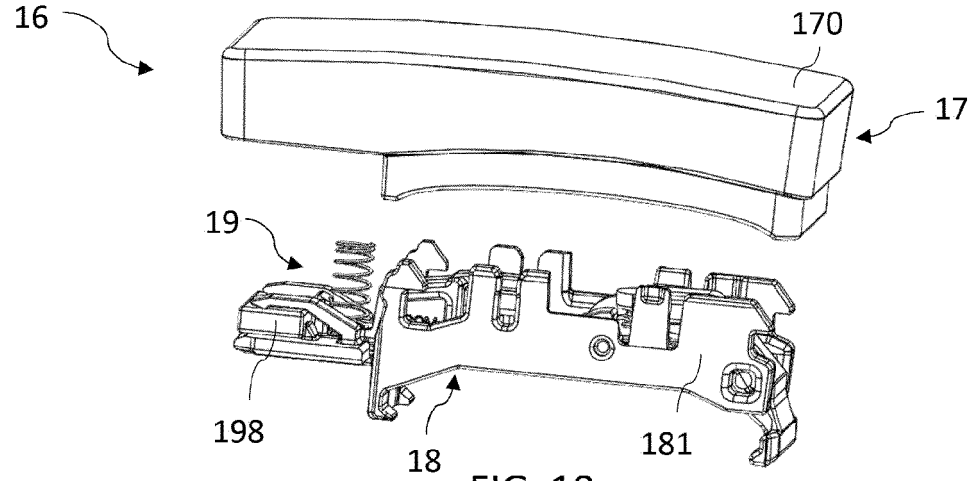

FIG. 10

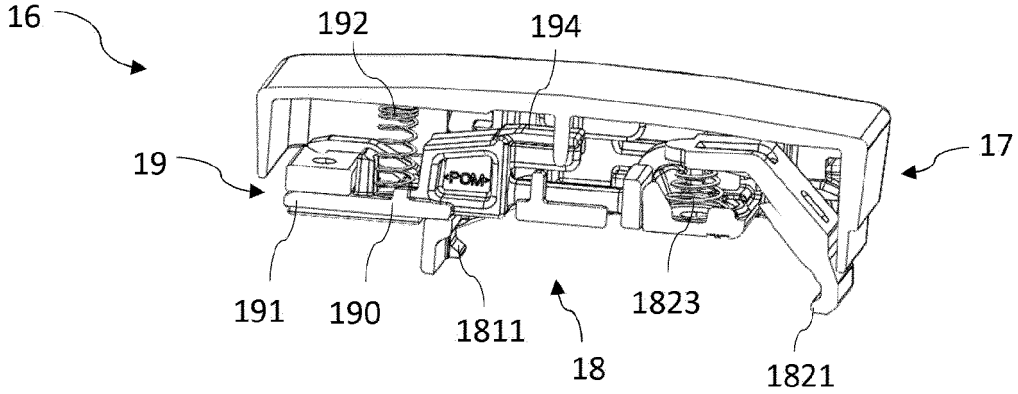

FIG. 11

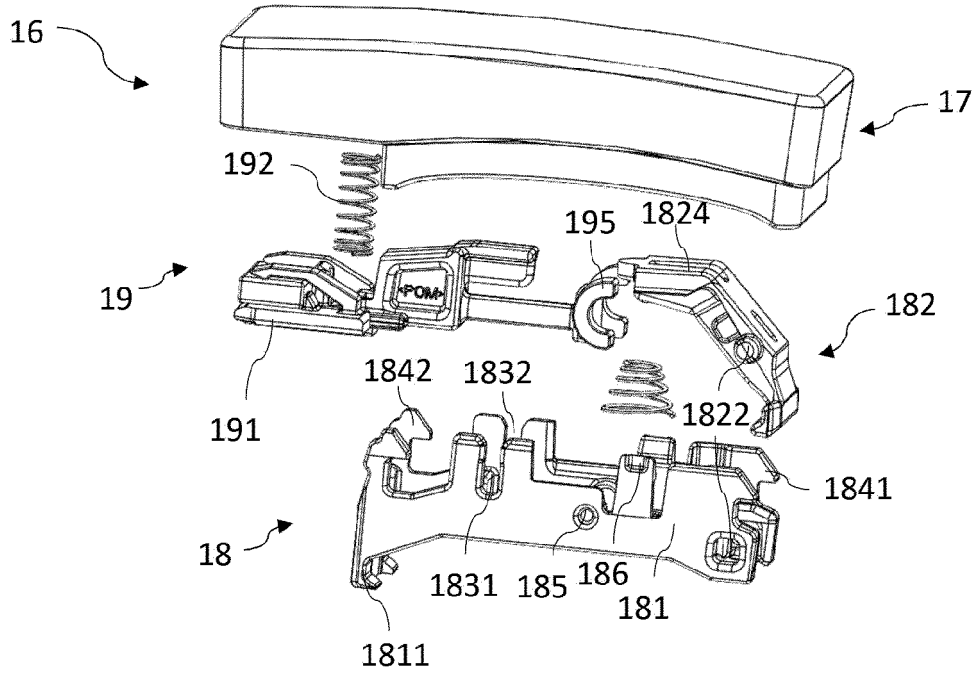

FIG. 12

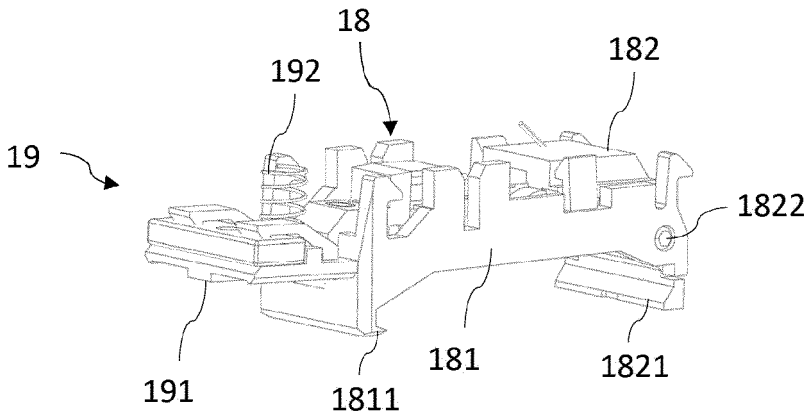

FIG. 13

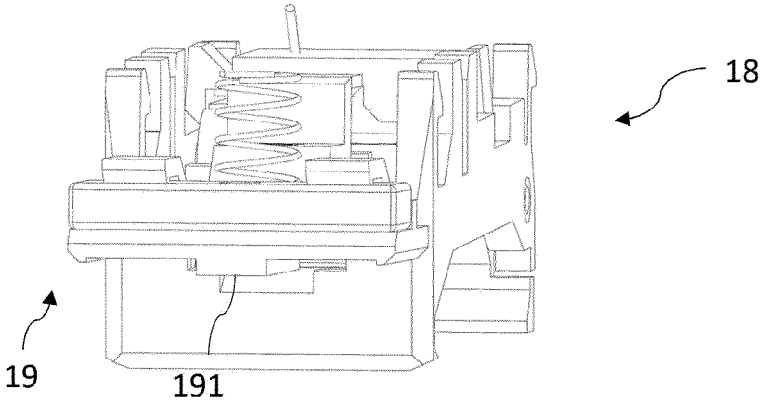

FIG. 14

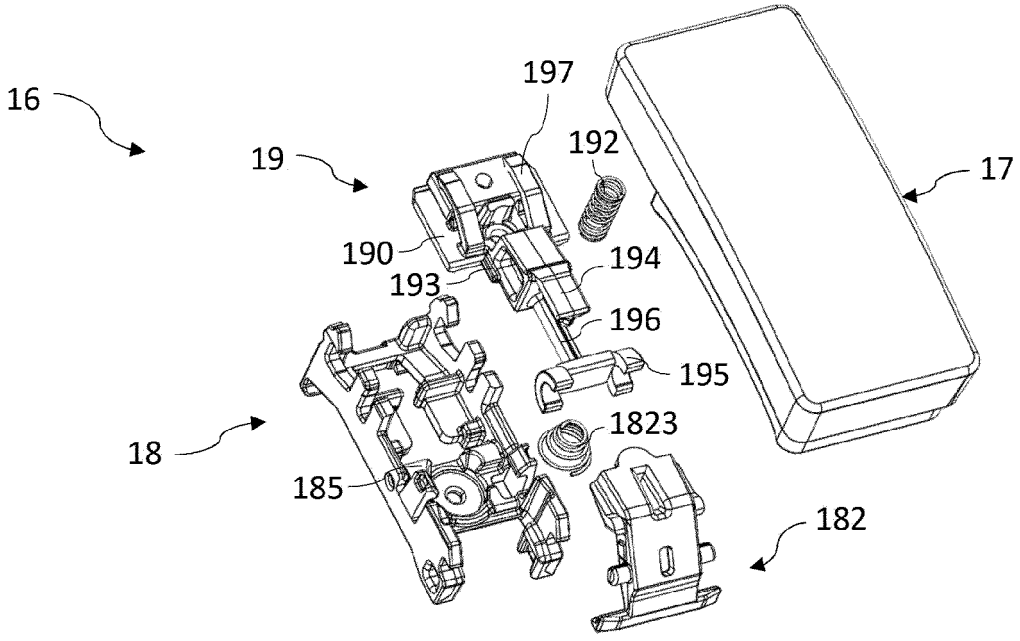

FIG. 15

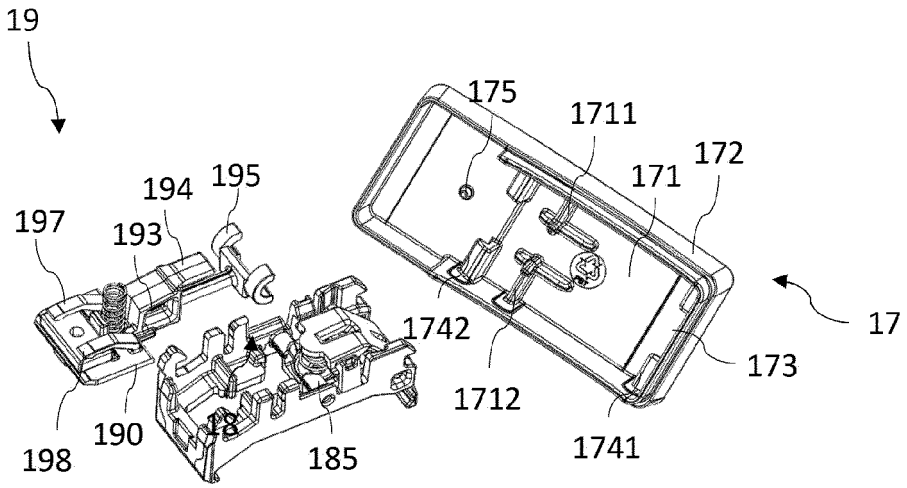

FIG. 16

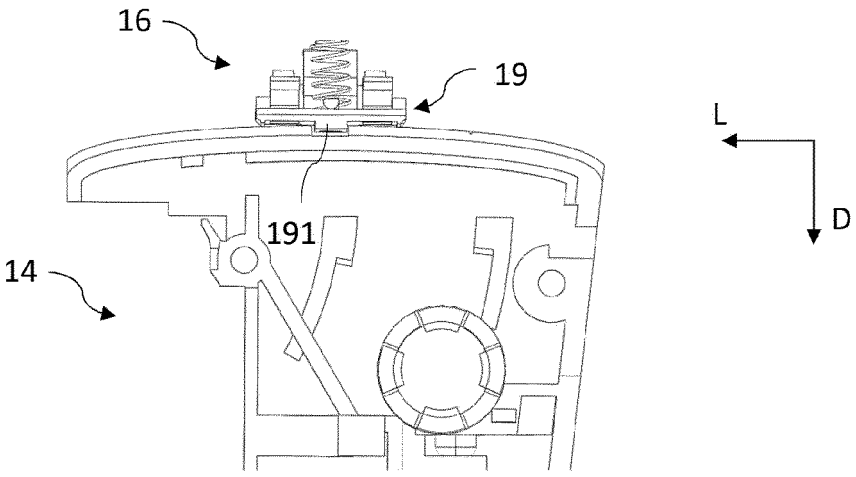

FIG. 17A

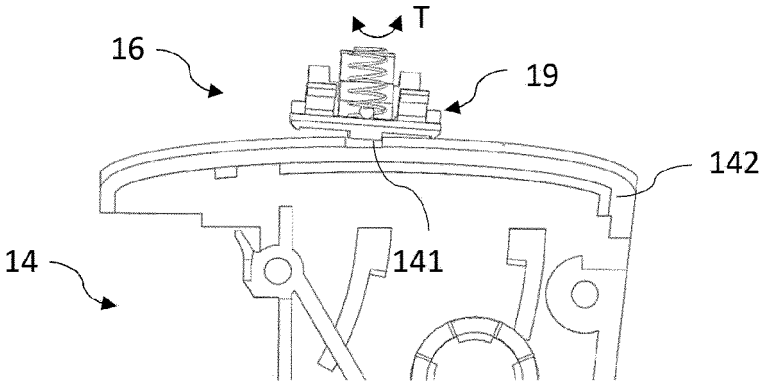

FIG. 17B

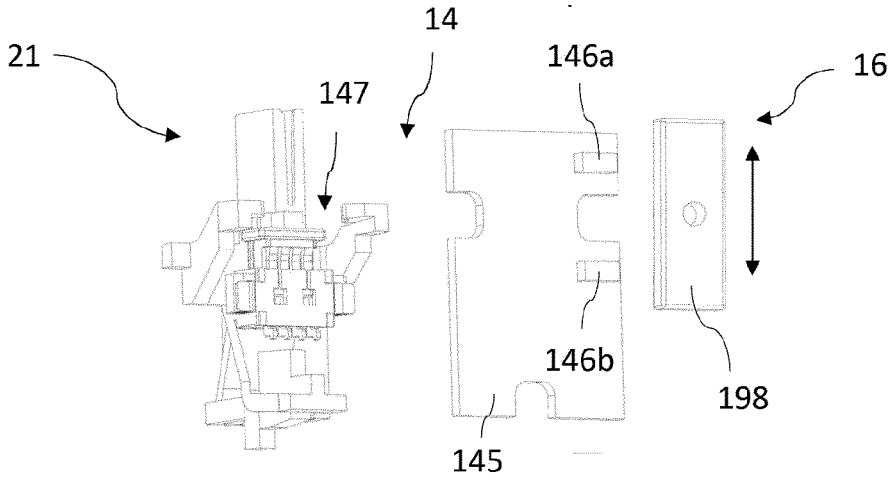

FIG. 18A

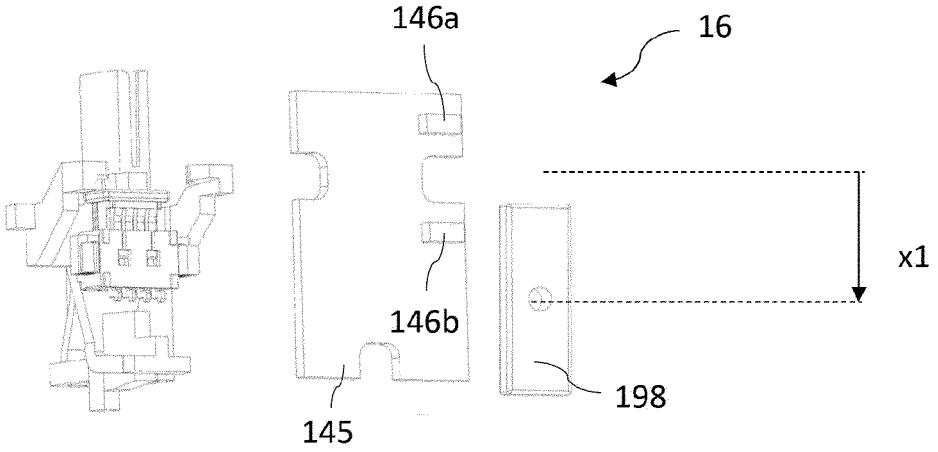

FIG. 18B

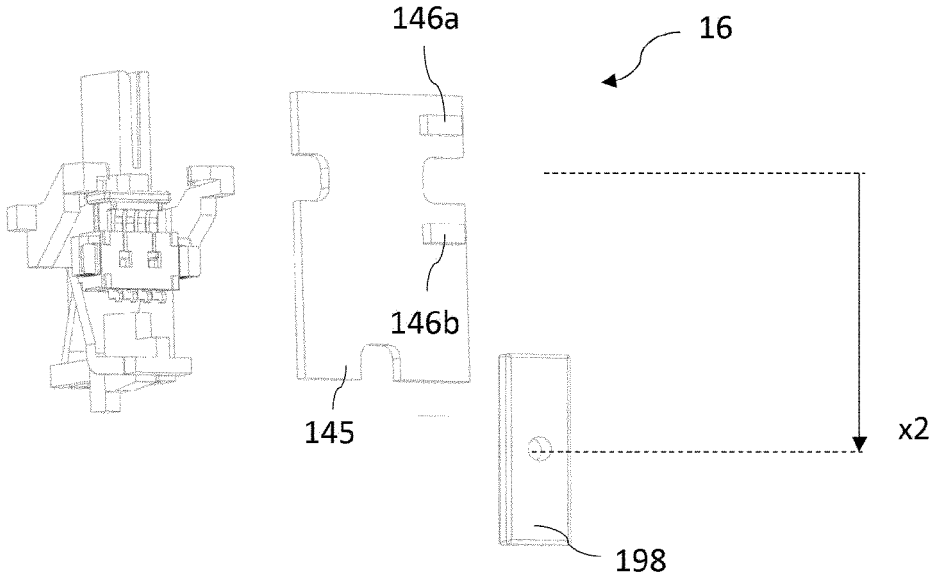

FIG. 18C

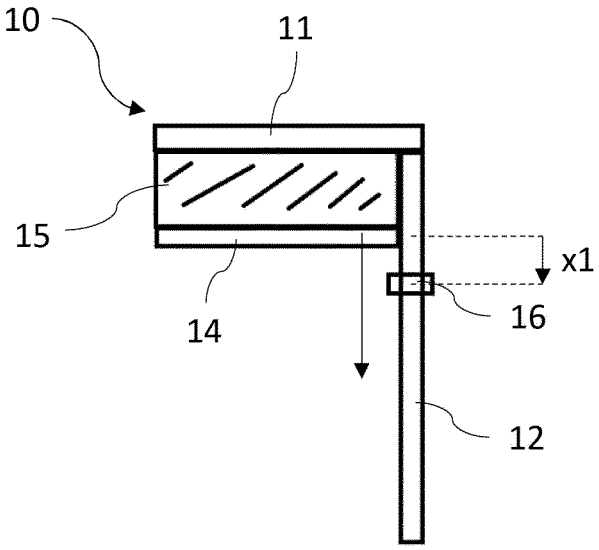

FIG. 19A

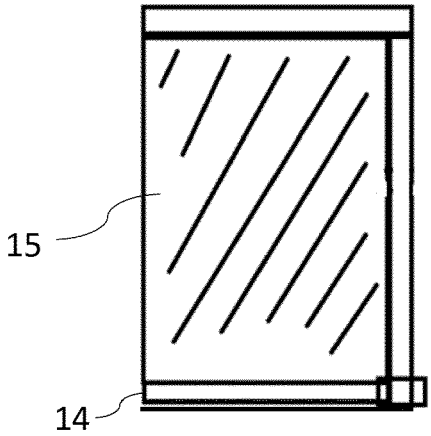

FIG. 19B

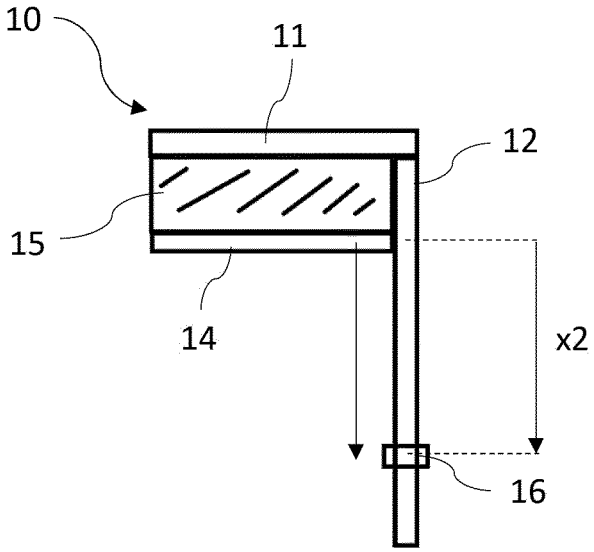

FIG. 19C

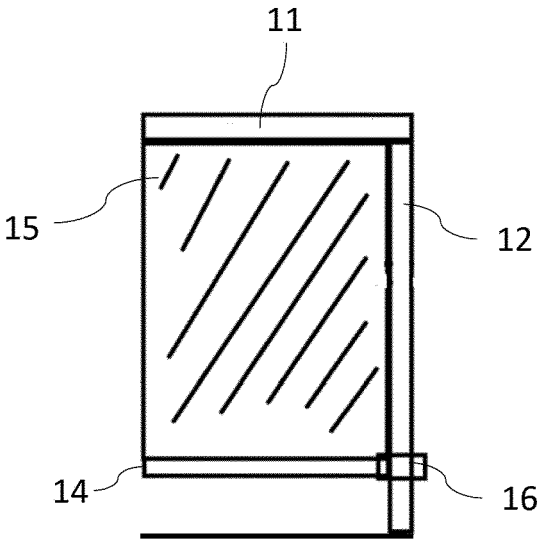

FIG. 19D

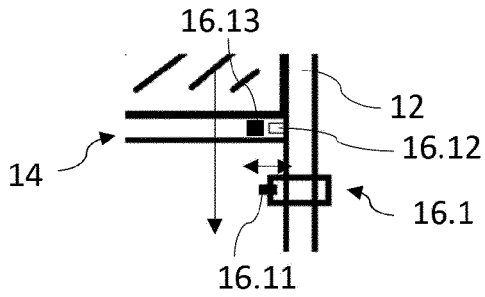

FIG. 20A

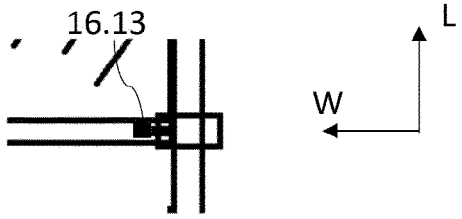

FIG. 20B

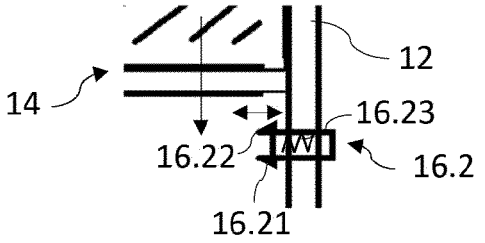

FIG. 21A

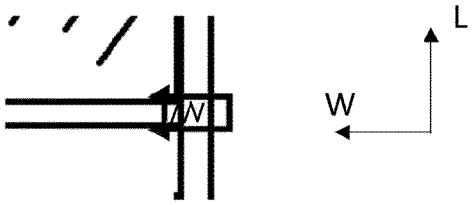

FIG. 21B

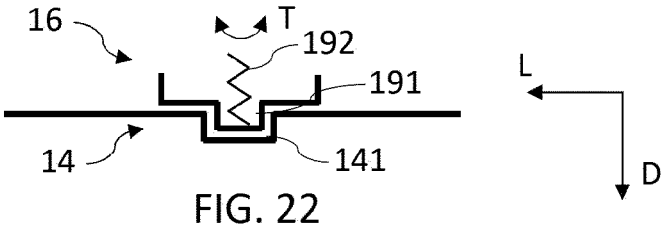

FIG. 22

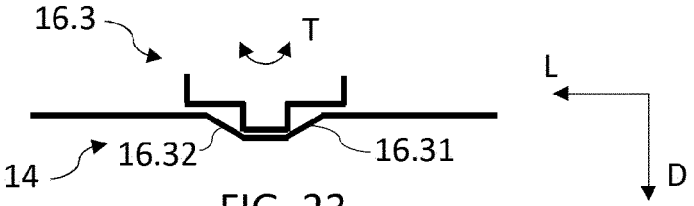

FIG. 23

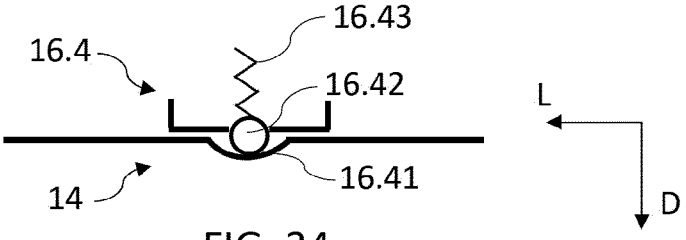

FIG. 24

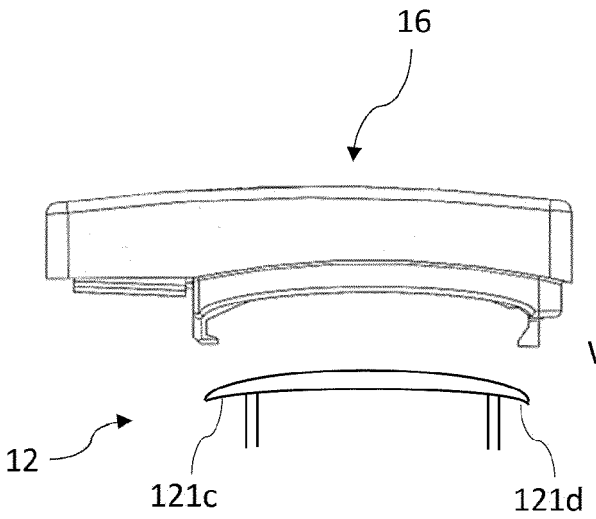

FIG. 25A

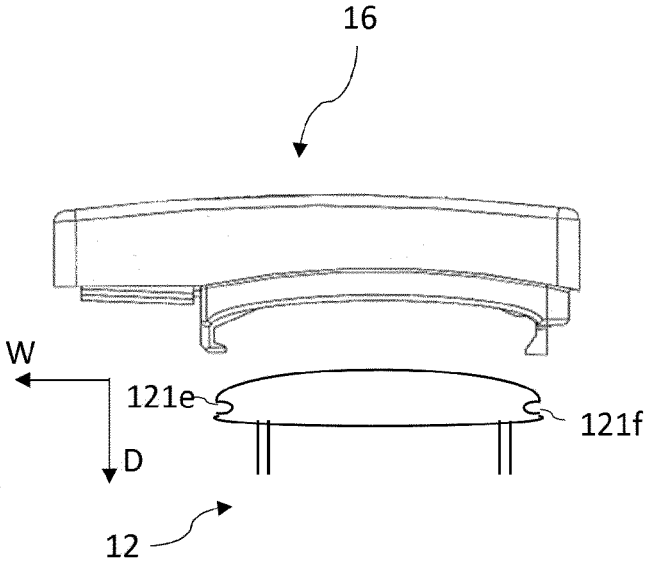

FIG. 25B

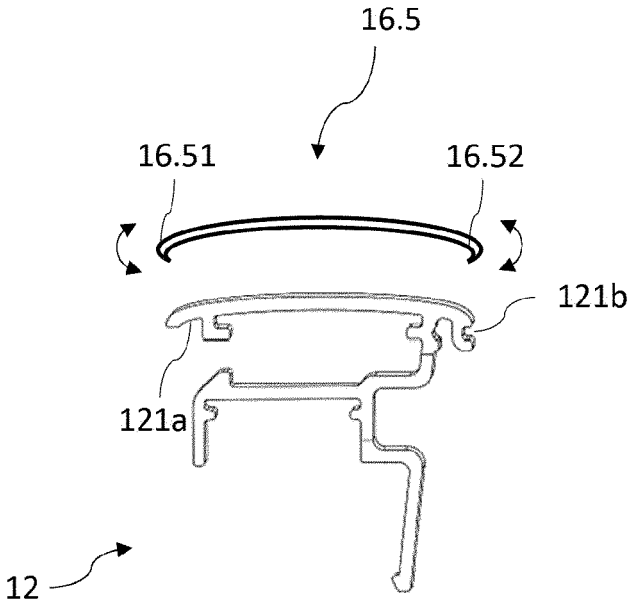

FIG. 26A

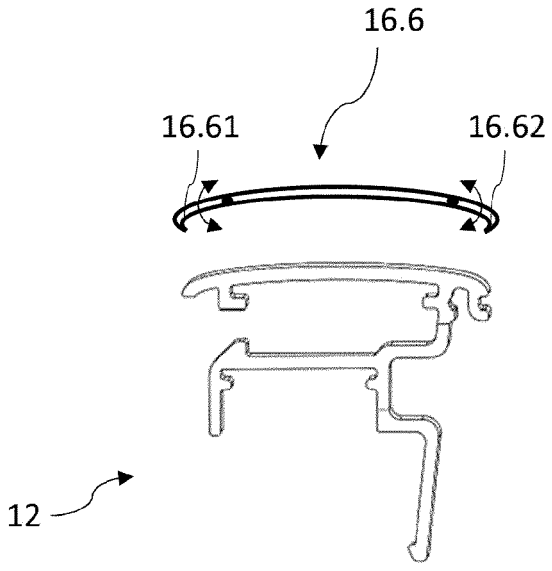

FIG. 26B

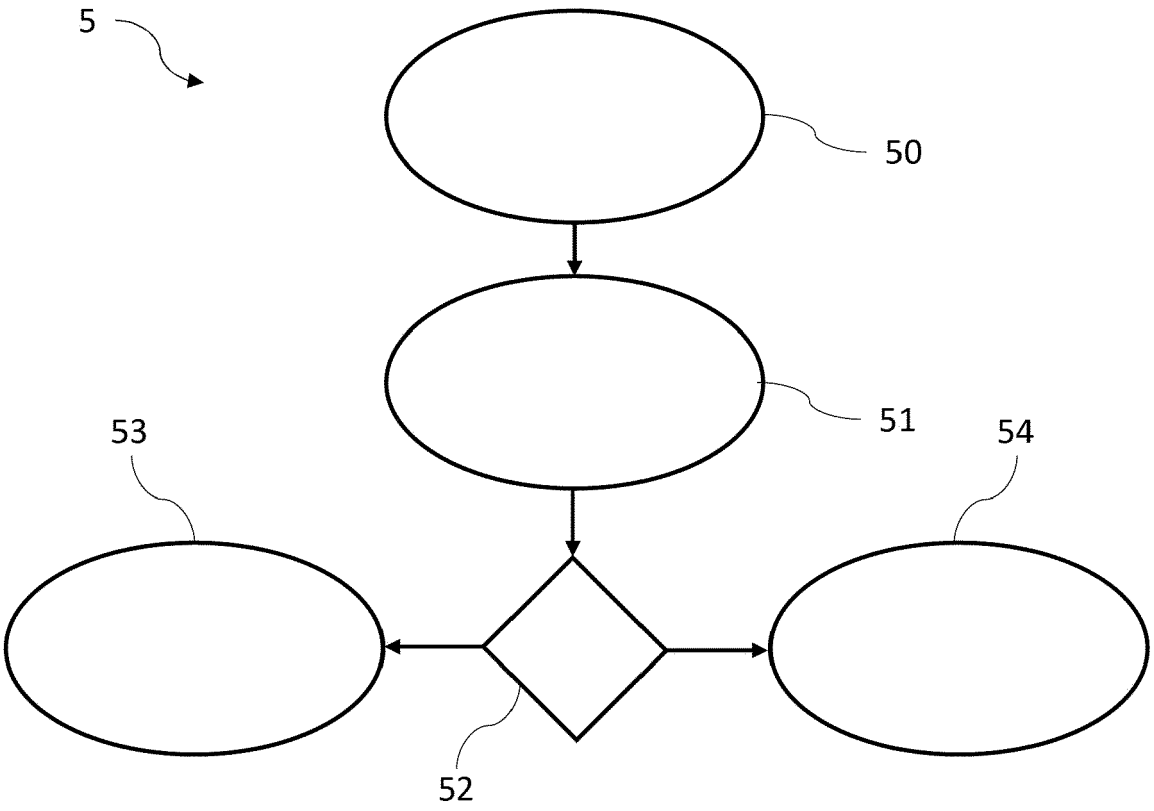

FIG. 27

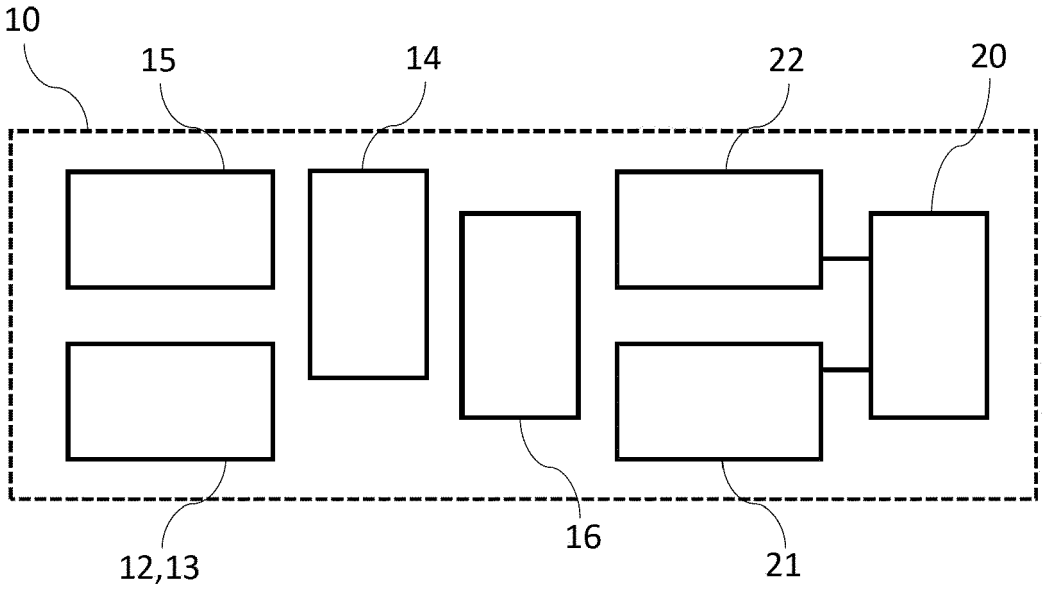

FIG. 28

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2886784 A **[0002]**
- EP 2738342 A **[0101]**
- EP 2738343 A **[0101]**
- EP 2738344 A **[0101]**
- EP 3258055 A **[0101]**
- EP 3492686 A **[0101]**
- EP 2002079 A **[0102]**
- EP 3203008 A **[0102]**