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(54) Hinge for pivot windows

(57) A hinge for a pivot window, such as a roof window. The hinge comprises a passageway defined by a convex guide surface (4), a concave guide surface (7) and a leave spring (8). A curved slide member (15) is received in the passageway. The curved slide member includes a recess in which a guide pin (16) is received. The width of the curved slide member (15) at the recess is with the guide pin (16) received therein equal or slightly less than the width of the rest of the curved slide member.

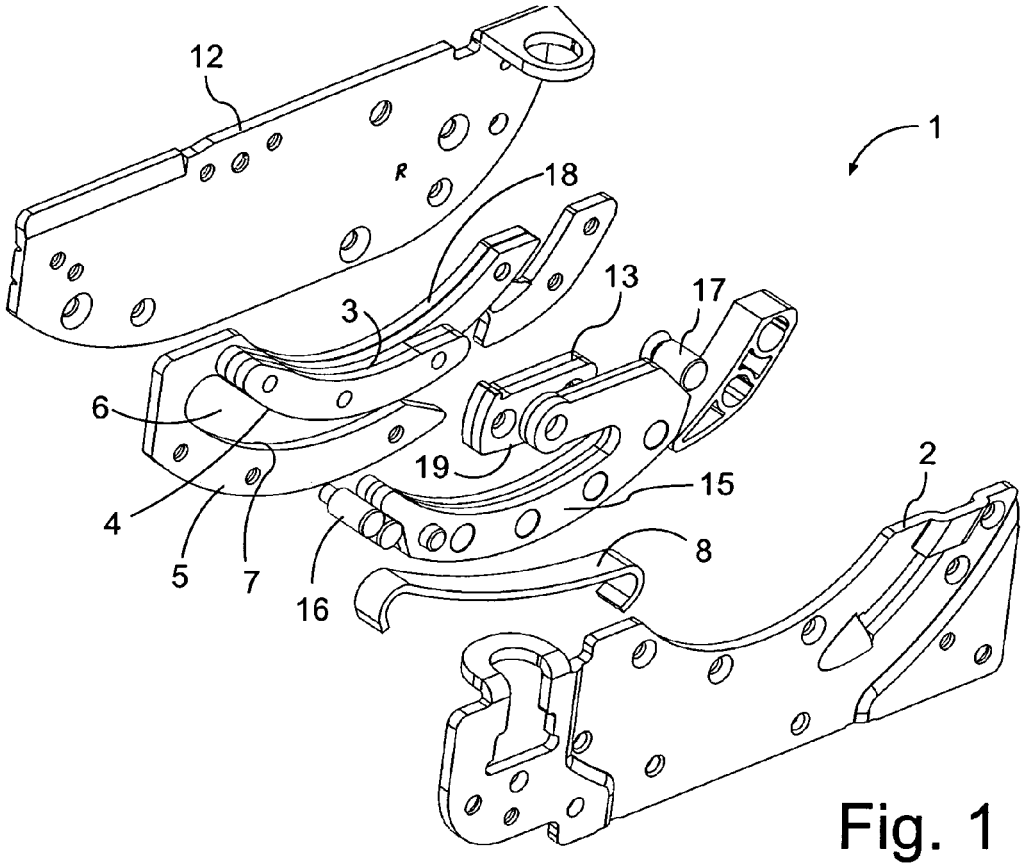

Fig. 1

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Description

FIELD OF THE DISCLOSURE

[0001] The present disclosure relates to a hinge for a pivot window, particularly, but not exclusively, a pivot window for installation in an inclined roof.

BACKGROUND OF THE DISCLOSURE

[0002] Such hinges have been proposed heretofore and consist of two hinge parts, each hinge part having a base plate for securing respectively to a frame and to a sash of a window. Both plates are intended to be fastened with their respective reverse side to the respective surface of the window. One hinge part has on an obverse face guide means in the form of a part-circular guide with the other hinge part having on its obverse face a curved slide member adapted to be displaceable in the guide between the two members. The slide member of the other hinge part also defines a tilting axis for sash movement near the closed position with the axis being outside the window thickness. The other hinge part is pivotable with respect to the one hinge part on a hinge pin carried by the slide member and is movable from a position within the window thickness to a position.

[0003] WO 90/04077 discloses such a type of hinge. A leave spring increases friction between the guide pin and the curved slice member with the passageway and ensures that the window can maintain a stable open position for small opening angles (up to approx. 45 degrees).

[0004] This known lock assembly has proven to be reliable, and satisfactory in use. However, various factors, such as increased insulation requirements have lead to a tendency of the window sash to be heavier than before and the friction created by this known hinge is not sufficient for the heaviest/largest type of windows.

DISCLOSURE

[0005] On this background, it is an object of the present disclosure to provided a hinge overcomes or at least reduces the drawbacks mentioned above.

[0006] This object is achieved by providing a hinge for a pivot window comprising two hinge parts, both hinge parts having a base plate for securing respectively to a frame and to a sash of a window, a first hinge part having on an obverse side a guide providing a part-circular passageway, said passageway being defined between a convex guide surface on one side and a concave guide surface in combination with a leave spring on the other side, a curved slide member adapted to be displaceable in said passageway and pivotally mounted to the base plate of the second hinge part, the leave spring is configured to press the curved slide member onto the convex guide surface to create friction between the curved slide member and the curved guide surface when the curved slide member is received in the passageway, a guide pin carried by the base plate of the second hinge plate and configured for engaging the curved slide member, the part of curved slide member that is receivable in the passageway has a substantially constant width with the exception of a recess in the curved slide member for receiving said guide pin, the shape and dimension of the recess and of the guide pin are such that the width of the curved slide member at the recess is substantially equal or slightly less than the with of the rest of the part of the curved slide member that is receivable in the passageway when the guide is received in the recess.

[0007] By ensuring that the combined thickness of the guide pin and the curved slide member is equal to or less than the width of the rest of the curved slide member, the contact to the leaf spring is substantially exclusively by the corresponding surface of the curved slide member for positions that correspond to smaller opening angles of the window suspended from the hinge and is substantially exclusively by the corresponding surface of the guide pin for a larger opening angles of the window (although still within a range where the curved slide member is received in the passageway). Thus, at smaller opening angles of the window the contact is metal to metal since the leaf spring and the curved slide member are typically made of steel. But the larger opening angles the contact is plastic and metal since the outer surface of the guide pin is typically made up of plastic material.

[0008] Preferably, the width of the combination of the curved slide member and the guide pin at the recess with the guide pin received therein is slightly less than the distance between said convex guide surface and said concave guide surface. Thus, it is ensured that a controlled friction is created between the curved slide member and the convex guide surface due to the force applied by the leave spring.

[0009] Beneficially, the guide pin engages the leave spring during the first part of the inserting movement and during the last part of the retracting movement of the slide member.

[0010] Preferably, the curved slide member engages the leave spring when the curved slide member is past the first part of the inserting movement or before the last part of the retracting movement.

[0011] Beneficially, the force needed to move the curved slide member relative to the passageway is lower at positions that correspond to a small angles of opening of a window suspended by the hinge and where the curved slide member is substantially mostly inserted into the passageway than at positions that correspond to larger openings of the window where the curved slide member is only partially inserted into the passageway.

[0012] Preferably, the force needed to move the curved slide member relative to the passageway is higher in positions that correspond to larger openings of a window suspended by the hinge with the curved slide member only partially inserted into the passageway than at positions that correspond to a smaller opening angle of

the window and having the curved slide member further inserted into the passageway.

[0013] The guide pin may be received in a recess is that is positioned at the some distance from the free end of the curved slide member.

[0014] The hinge may further comprise a drive pin carried by the base plate of the second hinge plate and placed so as to engage and drive the curved slide member into the passageway during the movement of the curved slide member in a direction into the passageway.

[0015] Preferably, the outer surface of the guide pin is made up of a nonmetallic material.

[0016] Further objects, features, advantages and properties of the hinge according to the disclosure will become apparent from the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] In the following detailed portion of the present description, the disclosure will be explained in more detail with reference to the exemplary embodiments shown in the drawings, in which:

Fig. 1 is an exploded view of a hinge according to an embodiment of the disclosure,
Fig. 2 is and elevated view of the hinge of Fig. 1,
Fig. 3 is a worked open view of the hinge of Fig. 1,
Fig. 4 the other side of the worked open view of Fig. 3,
Figs. 5 to 7 illustrate the movement of the hinge according to Fig. 1 by a series of worked open side views,
Fig. 8 illustrates two positions of the hinge of Fig. 1 by a worked open side view,
Fig. 9 is a graph illustrating hinge friction as a function of opening angle, and
Figs. 10 to 12 show other embodiments of the hinge.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] In the following detailed description the hinge according to the disclosure will be described by the exemplary embodiments.

[0019] Figs. 1 to 4 are various views of a hinge part 1 for suspending a pivot window.

[0020] The hinge includes two hinge parts 1. The first hinge part 1 includes a base plate 2 that is adapted to be fastened to a not shown side element of a not shown window frame. The base plate 2 carries three stacked plates 3 that define a convex guide surface 4. The three plates 3 carry a plate 5 that includes a slot 6 that defines a concave guide surface 7 and another part of the convex guide surface 4. A steel leave spring 8 is supported by two pins 9 (the pins are part of rivets connecting the plates of the first hinge part) that are disposed between the base plate 2 and plate 5. The convex guide surface 4 and the concave guide surface 7 in combination with the leaf spring 8 form a passageway for receiving a curved slide member 15 of the other hinge part.

[0021] The second hinge part includes a base plate 12 that is adapted to be fastened to a not shown sash of the window. In the base plate 12 carries a fixed cam 13 formed by two stacked plates and a hinge pin 14 projecting from the cam. The hinge pin 14 pivotally supports the curved slide member 15. For this purpose the curved slide member 15 is provided with a bore in which the hinge pin 14 is received in an extra part of the curved slide member 15 and the extra part is not intended for being received in the passageway. The curved slide member 15 is formed by a plurality of stacked metal (steel) plates. Two of these steel plates include the extra part whilst one of these steel plates does not include the extra part. The base plate 12 also carries a guide pin 16 and a drive pin 17. The drive pine 17 is placed so as to engage and drive the curved slide member 15 into the passageway during the movement of the curved slide member 15 in a direction into the passageway.

[0022] In this embodiment the guide pin 16 includes two metal pins (rivets) embedded in plastic material that forms the outer surface of the guide pin 16. However, in other embodiments the guide pin may include only one or more than two metal pins embedded in a suitable embedding material

[0023] The at least one pin may be provided with a liner er bushing. In one embodiment the liner or bushing material has a lower coefficient of friction compared to the curved slide member.

[0024] The pin engages the spring and the engagement and deflection of the spring also creates friction. The engagement friction depends on the pin material e.g. friction properties and it depends on the pin shape. So the material and shape of the pin may be varied to increase or decrease the engagement friction. The pin shape also affects other properties of the hinge, like interaction with guide surface and the feedback feel during the movement etc. so several properties are inter related and need to be considered to obtain the desired positional stability and user experience.

[0025] In one embodiment the pin is of a metal material. Hereby the engagement friction is higher compared to plastic material.

[0026] Plate 5 and one of the plates 3 is provided with a concave guide surface 18 that follows a convex rear edge 19 of the cam 13 without need for contact. When the two hinge members 2,12 mutually rotate the cam 13 interacts with plate 5 (illustrated in Fig 7).

[0027] The distal or free end of the curved slide member 15 is provided with a recess with a shape and size that substantially corresponds to be shape and size of the guide pin 16, in at least so far as to ensure that the width of the curved slide member 15 at the guide pin 16 is equal or less than the width of the rest of the curved slide member 15. The guide pin 16 does not necessarily fill out the recess completely, but is does provide for the width of the curved slide member 15 to be substantially constant along the part of its length that is to be received

in the passageway.

[0028] The plates of the first hinge part are secured to the base plate 2 by screws and/or rivets. Other fastening techniques such as welding may also be used. The plates of the second hinge part are secured to the base plate 12 by screws and/or rivets. Other fastening techniques such as welding may also be used.

[0029] It should be understood that a corresponding, but mirror inverted hinge is mounted on the opposite pair of frame and sash side elements to define a pivot axis substantially parallel to the top and bottom elements of the sash.

[0030] Figs. 5 to 8 show the hinge of figures 1 to 4 in various positions for illustrating the operation of the hinge. In Fig. 5 the hinge is in a position that corresponds to a closed window. In Fig. 6 the hinge is in a position that corresponds to small opening of a window, such as for ventilation purposes. In Fig. 7 the hinge is in a position that corresponds to a substantially opened window and the curved slide member 15 is no longer in engagement with the passageway defined by the first hinge part. Further movement in the opening direction is not effected by movement of the curved slide member 15. Instead the base plate 12 and the cam 13 pivot about hinge pin 14 as illustrated by the interrupted lines in Fig. 7. During the first part of the opening movement where a part of the curved slide member 15 is inside the passageway a substantial amount of friction between the hinge parts needs to be overcome. Thus, a window can be moved by an operator to a ventilating position and remain there in a stable position without further locking means being required. The movement about the hinge pin 14 is not hindered by substantial friction.

[0031] The two extreme positions of the curved slide member 15 are also shown in Fig. 8.

[0032] In the position illustrated in Fig. 5 the leave spring 8 abuts with the curved guide member 15 and urges the latter into contact with the convex guide surface 4. Thus, friction is created by the metal to metal contact between the curved slide member 15 and the leave spring 8 and between the curved slide member 15 and the convex guide surface 4. This friction creates a satisfactory (static) friction for keeping the window in a stable ventilating position at small angles of opening.

[0033] In the position illustrated in Fig. 6 the leave spring 8 abuts with the guide pin 16 and urges therewith the curved guide member into contact with the convex guide surface 4. Thus, friction is created by the metal to plastic contact between the curved slide member 15 and the guide pin 15 and metal to metal contact between the curved slide member 15 and the convex guide surface 4. This friction creates a (static) friction that is higher than the friction in the position of Fig. 5 and is satisfactory for keeping the window in a stable ventilating position at less small angles of opening.

[0034] As illustrated in Fig. 7, the width sW of the portion of the curved slide member 15 that is to be inserted into the passageway is substantially constant. The width cW of the combined guide pin 16 and tip of the curved slide member 15 is equal or slightly less than the width sW of the rest of the curved slide member. The distance pW between the convex guide surface 4 and the convex guide surface 7 is slightly bigger than the width sW of the curved slide member 15. Thus, the guide pin 16 can perform its guiding function (ensuring that the base plate 12 does not start pivoting about hinge pin 14 and angles less than 45°) and the steel plate of the curved slide member 15 that does not include the extra part can be received smoothly inside the part of the passageway that is defined between the concave guide surface 4 in the convex guide surface 7.

[0035] The guide pin 16 engages the leave spring 8 during the first part of the inserting movement and during the last part of the retracting movement of the slide member 15 (typically corresponding to angles between the 30° and 45°) whereas the curved slide member 15 engages the leave spring 8 when the curved slide member 15 is past the first part of the inserting movement or before the last part of the retracting movement (typically corresponding to angles between the 0° and 30°).

[0036] The force needed to move the curved slide member 15 relative to the passageway is lower at positions that correspond to a small angles of opening of a window suspended by the hinge and where the curved slide member 15 is substantially mostly inserted into the passageway than at positions that correspond to larger openings of the window where the curved slide member 15 is only partially inserted into the passageway. The force needed to move the curved slide member 15 relative to the passageway is higher in positions that correspond to larger openings of a window suspended by the hinge with the curved slide member only partially inserted into the passageway than at positions that correspond to a smaller opening angle of the window and having the curved slide member further inserted into the passageway.

[0037] As shown in the graph of Fig 9, the force (torque) exerted by a window to the hinge caused by gravity increases linearly with the opening angle (and depends on the inclination at which the window is mounted to the roof).

[0038] The graph in fig. 9 also shows the measured force that is needed to overcome the static friction as a function of the opening angle of the window.

[0039] Line F illustrates an example of the force (torque) that the window applies due to the effect of gravity. Line A illustrates the force (torque) required to move the hinge according to the present disclosure as a function of the opening angle. Line B illustrates the force (torque) required to move the window with a prior art hinge as a function of the opening angle. It can be seen that the force (torque) is required to overcome the friction has been significantly increased with the present disclosure, especially for angles greater than 30°. As can be seen from the graph, is exactly for angles between 30 and 45° that by the window applies the highest force

(torque) to the hinge due to the effect of gravity, and therefore to be present design is very well adapted to compensate for the force (torque) applied by the window due to the effect of gravity.

[0040] The pin 16 engages the spring 8 and the engagement and deflection of the spring 0 also creates friction. The engagement friction depends on the pin material e.g. friction properties and it depends on the pin shape. So the material and shape of the pin 16 may be varied to increase or decrease the engagement friction 8the friction at engagement between the guide pin 16 and the leave spring 8). The pin shape also affects other properties of the hinge, like interaction with guide surface and the feedback feel during the movement etc. Thus, several properties are inter-related and need to be considered to obtain the desired positional stability and user experience.

[0041] Fig. 10 shows another embodiment of the hinge according to the present disclosure. This embodiment is essentially identical to the embodiment described above, except for the shape of the guide pin 16 and the shape of the recess at the tip of the curved slide member 15. Also in this embodiment the width cW of the combined tip and guide pin 16 is equal or less to the width of the rest of the curved slide member 15 (or at least the part that is to be inserted into the passageway).

[0042] Fig. 11 shows another embodiment of the hinge according to the present disclosure. This embodiment is essentially identical to the embodiment described above with reference to Figs. 1 to 9, except that the recess for receiving the guide pin 16 is placed at a small distance from the tip or free end of the curved slide member 15. Still, the width Cw of the curved slide member 15 at the recess is with the guide pin received therein equal or less than the width of the rest of the curved slide member.

[0043] Fig. 12 shows another embodiment of the hinge according to the present disclosure. This embodiment is essentially identical to the embodiment described above with reference to Figs. 1 to 9, except that the shape of the guide pin 16 is almost completely complementary with the shape of the recess in the curved guide member 16. Also in this embodiment the width cW of the combined tip and guide pin 16 is equal or less to the width of the rest of the curved slide member 15 (or at least the part that is to be inserted into the passageway).

[0044] The material of the guide pin, in particular the surface material has a significant impact on the friction created at large opening angles of the hinges (approx 30 to 45 degrees). The surface material can be any suitable polymer or plastic material or metal. The pin 16 may have a metal core covered with another material that forms the surface that comes into contact with the leave spring.

[0045] The curved slide member 8 may as shown above be formed of metal plates, but alternatively the curved slide member can be made of a single metal piece, or be a composite material and/or construction. The frictions surfaces of the curved slide member (the surface that engages the convex surface 4 and the convex surface that engages the leave spring 8) are preferable formed by a material (such as steel) that creates a relatively high friction coefficient to a steel or other metal surface. In particular, this friction coefficient should be higher than the friction coefficient between low friction plastics and steel.

[0046] The edge of the guide pin 16 that engages the spring has a curvature radius equal or less than 30% of the width of the passage, preferably 25% or less of the width of the passage.

[0047] The term "comprising" as used in the claims does not exclude other elements or steps. The term "a" or "an" as used in the claims does not exclude a plurality. For example the leaf spring may be provided as plural springs which may be used in series and/or parallel.

[0048] Although the present disclosure has been described in detail for purpose of illustration, it is understood that such detail is solely for that purpose, and variations can be made therein by those skilled in the art without departing from the scope of the disclosure.

Claims

1. A hinge for a pivot window comprising two hinge parts, both hinge parts having a base plate for securing respectively to a frame and to a sash of a window,
a first hinge part having on an obverse side a guide providing a part-circular passageway, said passageway being defined between a convex guide surface on one side and a concave guide surface in combination with a leave spring on the other side,
a curved slide member adapted to be displaceable in said passageway and pivotally mounted to the base plate of the second hinge part,
the leave spring is configured to press the curved slide member onto the convex guide surface to create friction between the curved slide member and the curved guide surface when the curved slide member is received in the passageway,
a guide pin carried by the base plate of the second hinge plate and configured for engaging the curved slide member,
the part of curved slide member that is receivable in the passageway has a substantially constant width with the exception of a recess in the curved slide member for receiving said guide pin,
the shape and dimension of the recess and of the guide pin are such that the combined width of the guide pin and the of the curved slide member when the guide pin engages the curved slide member and seen in a direction perpendicular to the concave guide surface and the convex guide surface is equal or slightly less than the width of the rest of the part of the curved slide member that is receivable in the passageway when the guide is received in the recess.

2. A hinge according to claim 1, wherein the width of the combination of the curved slide member and the guide pin at the recess with the guide pin received therein is slightly less than the distance between said convex guide surface and said concave guide surface.

3. A hinge according to any of claims 1 or 2, wherein the guide pin engages the leave spring during the first part of the inserting movement and during the last part of the retracting movement of the slide member.

4. A hinge according to any of claims 1 to 3, wherein the curved slide member engages the leave spring when the curved slide member is past the first part of the inserting movement or before the last part of the retracting movement.

5. A hinge according to any of claims 1 to 4 wherein the force needed to move the curved slide member relative to the passageway is lower at positions that correspond to a small angles of opening of a window suspended by the hinge and where the curved slide member is substantially mostly inserted into the passageway than at positions that correspond to larger openings of the window where the curved slide member is only partially inserted into the passageway.

6. A hinge according to any of claims 1 to 5 wherein the force needed to move the curved slide member relative to the passageway is higher in positions that correspond to larger openings of a window suspended by the hinge with the curved slide member only partially inserted into the passageway than at positions that correspond to a smaller opening angle of the window and having the curved slide member further inserted into the passageway.

7. A hinge according to any of claims 1 to 6, wherein the guide pin is received in a recess is that is positioned at the some distance from the free end of the curved slide member.

8. A hinge according to any of claims 1 to 7, further comprising a drive pin carried by the base plate of the second hinge part and placed so as to engage and drive the curved slide member into the passageway during the movement of the curved slide member in a direction into the passageway.

9. A hinge according to any of claims 1 to 8, wherein the outer surface of the guide pin is made up of a nonmetallic material.

10. A hinge according to any of claims 1 to 9, wherein the friction surfaces of the curved slide member are metal friction surfaces and/or are surfaces with a coefficient of friction to steel higher than plastic.

11. A hinge according to any of claims 1 to 10, wherein the force necessary to move the curved slide member is higher when the pin meets the spring and lower when the curved slide member engages the spring.

12. A hinge according to any of claims 1 to 11 wherein the edge of the guide pin that engages the spring has a curvature radius equal or less than 30% of the width of the passage, preferably 25% or less of the width of the passage.

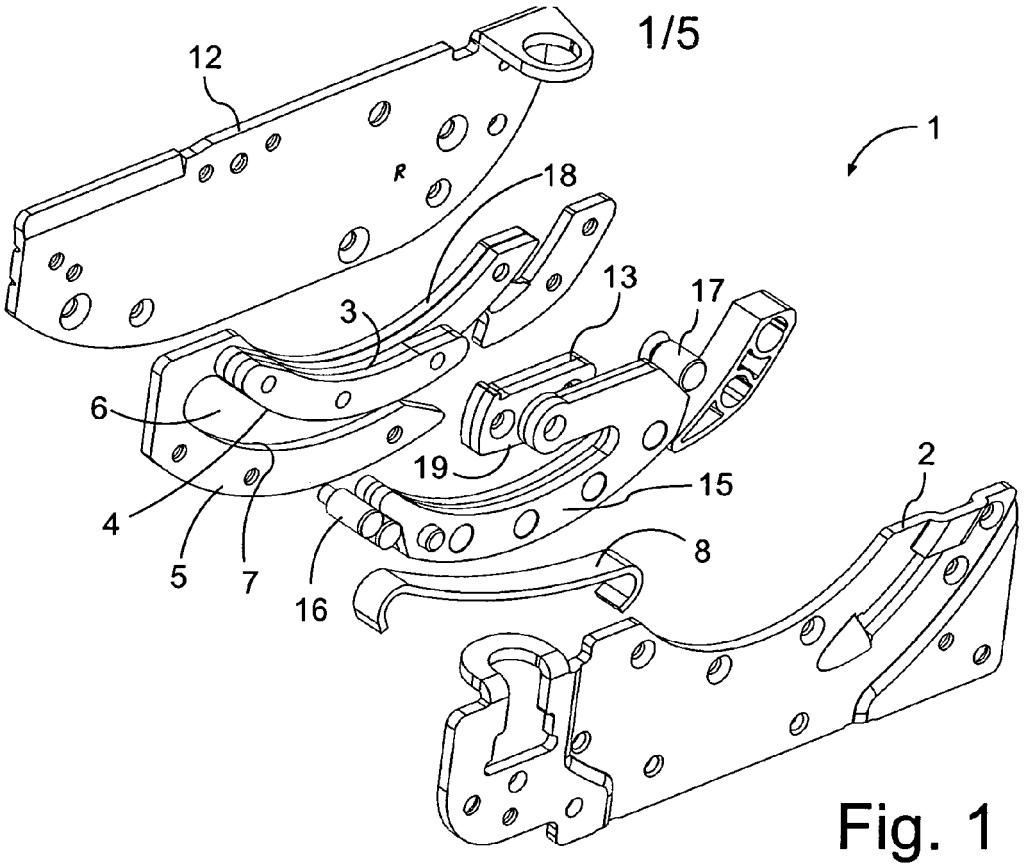
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Fig. 1

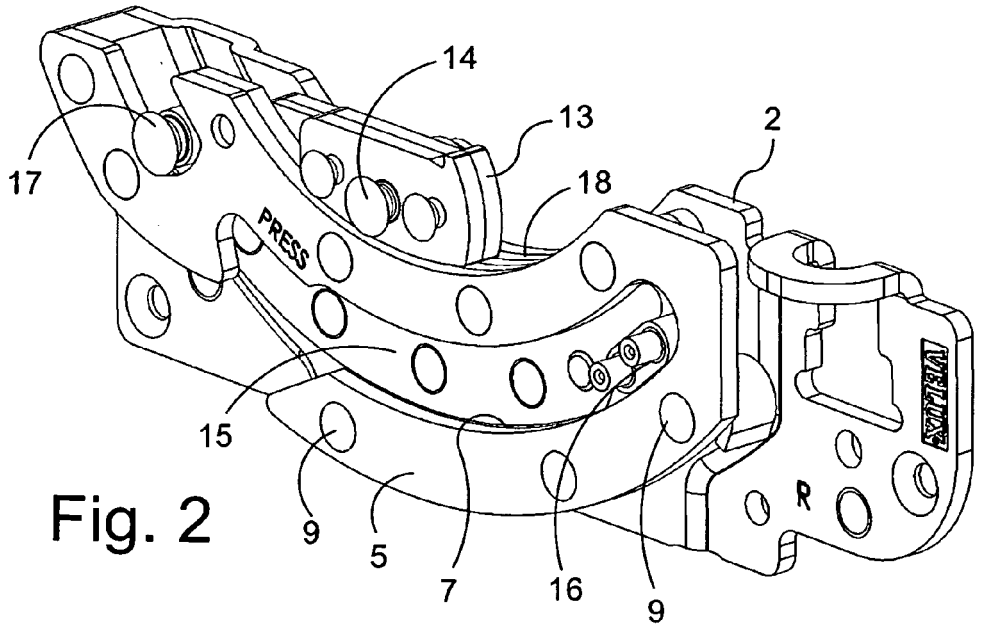
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Fig. 2

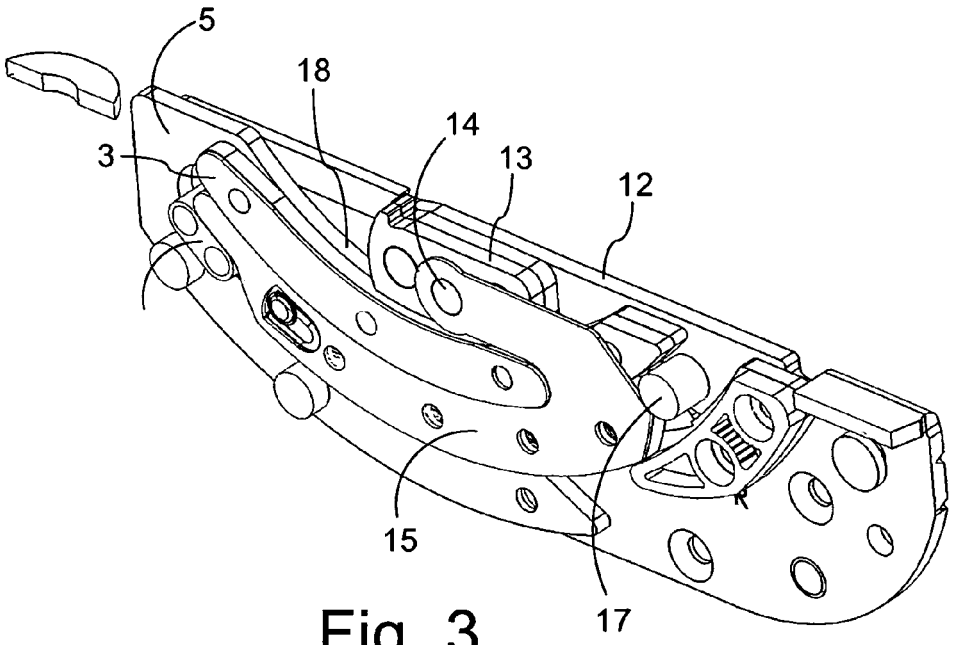

Fig. 3

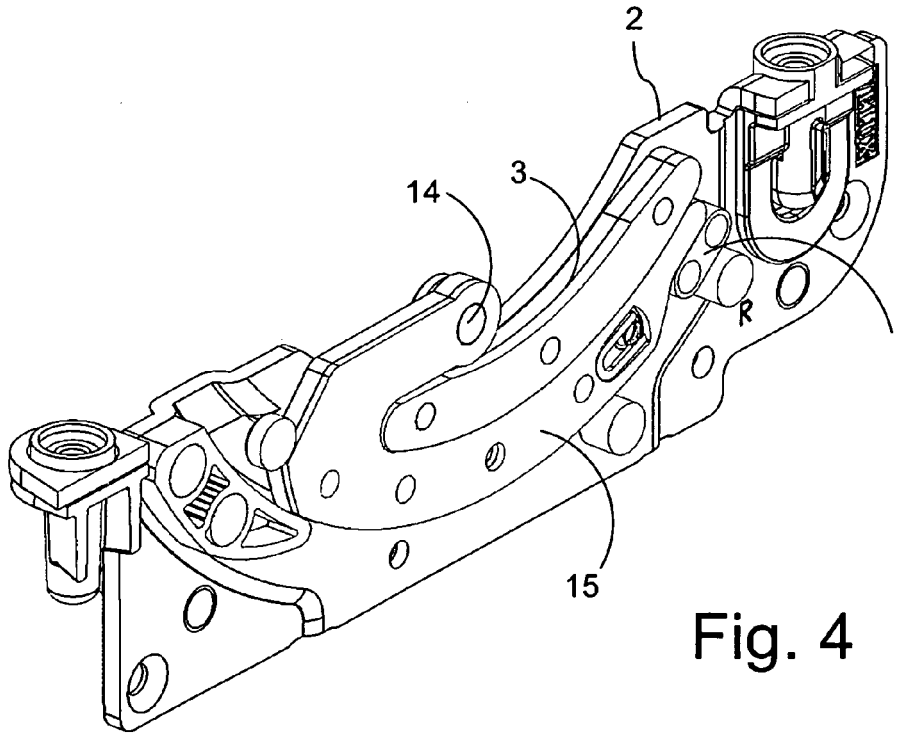

Fig. 4

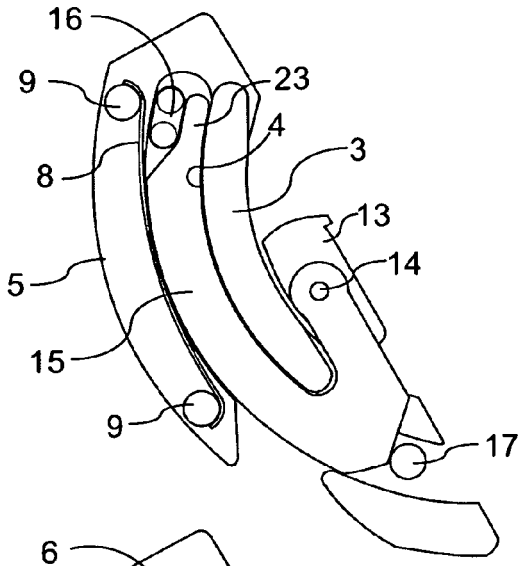

Fig. 5

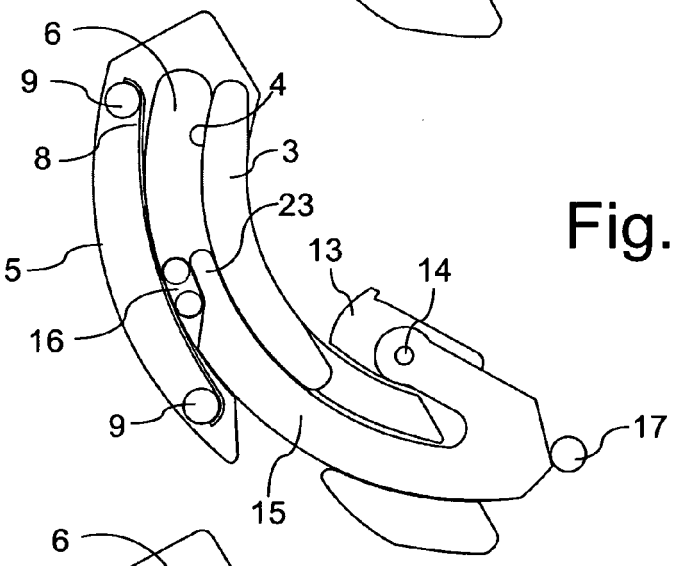

Fig. 6

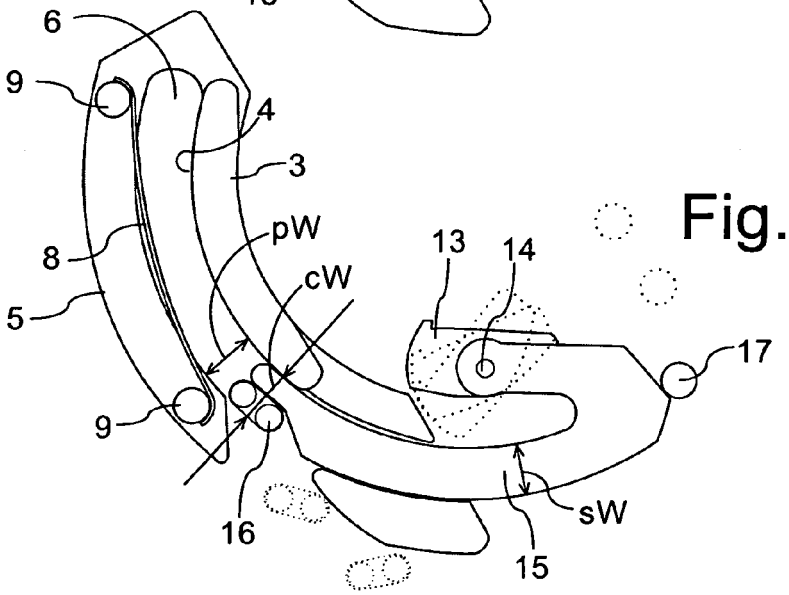

Fig. 7

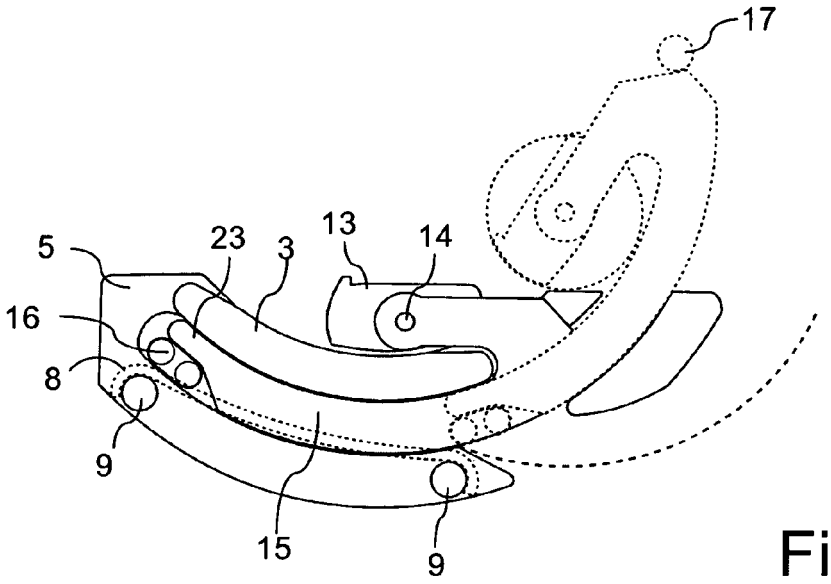

Fig. 8

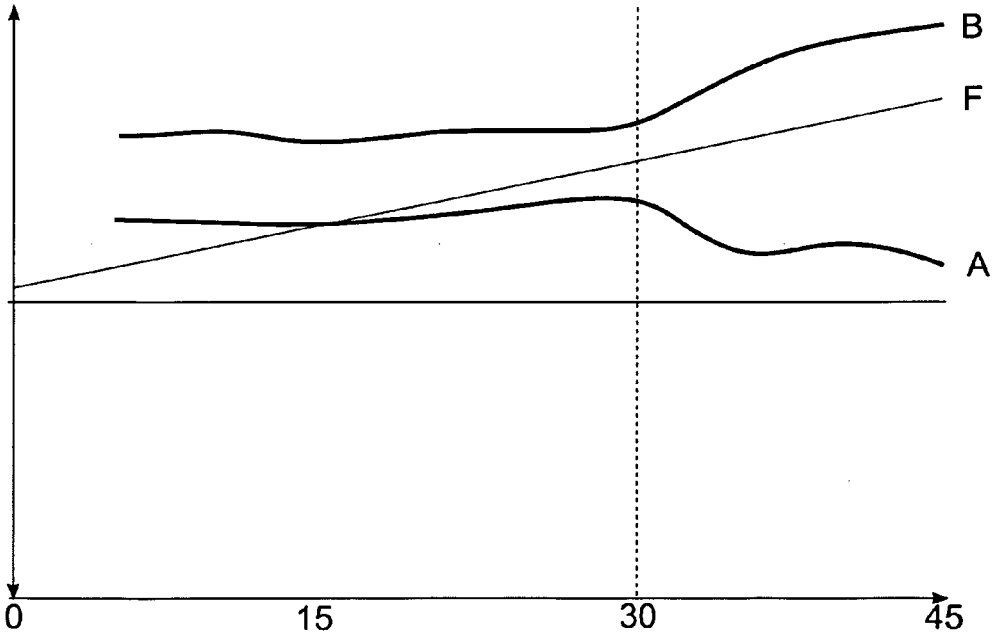

Fig. 9

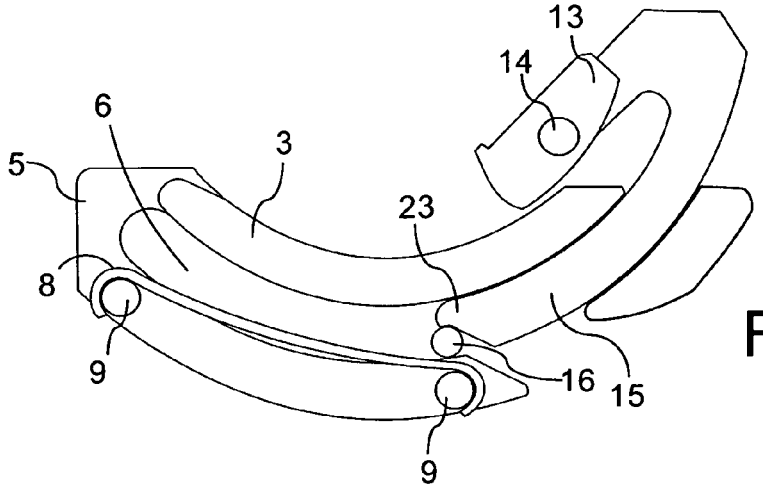

Fig. 10

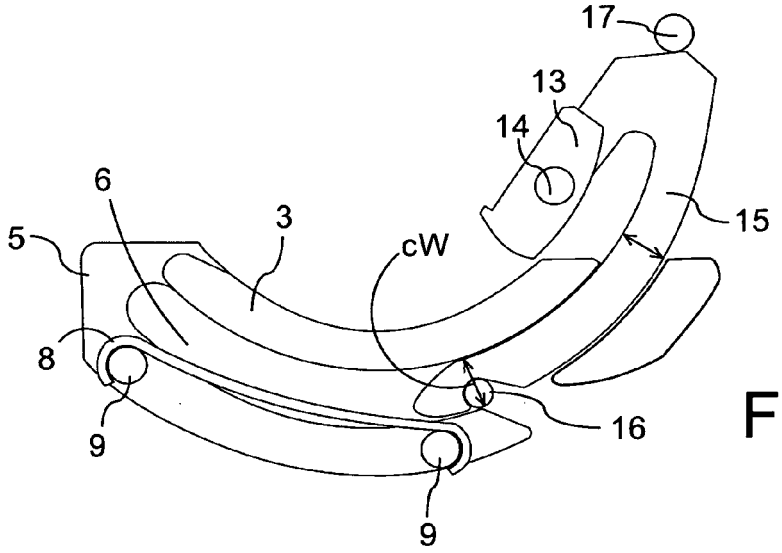

Fig. 11

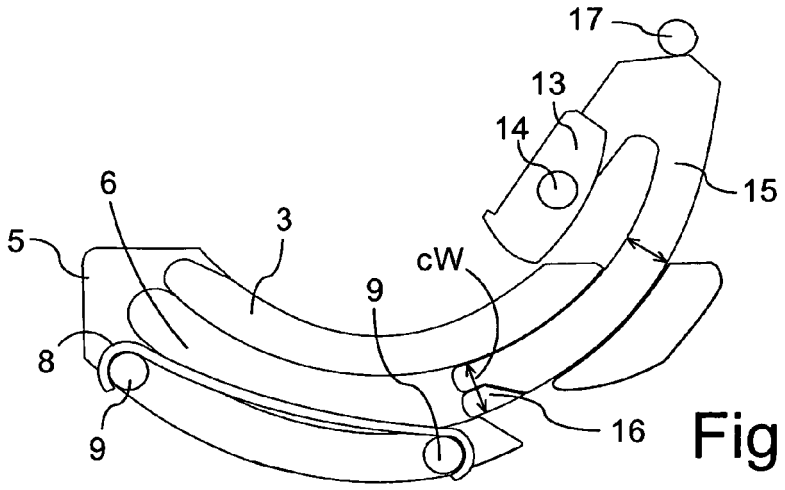

Fig. 12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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