

HINGE AND WINDOW USING SAME

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is priority to the following patent properties: Chinese

5 Patent Application CN 201510520919.8, filed on Aug. 21, 2015, the above application is hereby incorporated by reference herein as if set forth in its entirety.

BACKGROUND

1. Technical Field

[0002] The present disclosure generally relates to a window, especially to a hinge

10 used for the window.

2. Description of Related Art

[0003] Traditional windows include a casement, a frame and a hinge. The casement can be connected with the frame directly by the hinge.

[0004] Referring to FIG. 1, the hinge includes a sliding rail 10 fixed on the frame,
15 a pulling bar 20 fixed on the casement, a sliding element 101 movably mounted in the sliding rail 10, a first connecting plate 30, a second connecting plate 40, a third connecting plate 50 and a fixing element 60. One end of the first connecting plate 30 is rotatably connected with the sliding element 101, the opposite end of the first connecting plate 30 is rotatably connected with one end of the pulling bar 20. One end of the

second connecting plate 40 is rotatably connected with one end of the sliding rail 10, the opposite end of the second connecting plate 40 is connected with a middle of the pulling bar 20. One end of the third connecting plate 50 is rotatably connected with the sliding element 101, the opposite end of the third connecting plate 50 is rotatably connected with
5 a middle of the second connecting plate 40. The fixing element 60 is riveted on the end of the sliding rail 10 through a punching process.

[0005] Referring to FIGS. 2-4, the fixing element 60 has two vertical planes 601 and a horizontal plane 602 riveted on the sliding rail through the punching process. The two vertical planes 601 cooperatively form an angle. The traditional method of making
10 the hinge includes a pore 603 forming process, that is, the pore 603 can be formed on the horizontal plane 602, then portions of a bottom of the sliding rail 10 can be punched into the pore 603 through a punching machine, forming a lug 604 received in the pore 603, such that the sliding rail 1 can be connected with the fixing element 60, and the fixing strength between the fixing element 60 and the sliding rail 1 can be strong. However,
15 the lug 604 has carved edges 605, after the hinge is opened and closed tens of thousands of times, the curved edges 605 may cause the lug 604 shake in the pore 603, at worst, the lug 604 may escaped from the pore 603, such that the hinge could not work.

[0006] Therefore, a need exists in the industry to overcome the described problems.

SUMMARY

[0007] The disclosure is to offer a hinge and a window having the hinge.

[0008] A hinge for a window comprises a sliding rail fixed on a frame of the window, a sliding element movably mounted in the sliding rail, a pulling bar fixed on a casement of the window, a connecting plate, a fixing element mounted on an end of the sliding rail. The pulling bar is driven by the sliding element to move relative to the sliding rail and rotate in a direction to do an angular movement. The pulling bar is connected with the sliding element through the connecting plate. When the window is closed, a first end of the pulling bar is received in the fixing element, the fixing element includes a first surface, a second surface and a third surface, the first surface and the second surface cooperatively form a first angle, the third surface is a horizontal plane and perpendicular to the first surface or the second surface, the third surface defines a first lug, the sliding rail defines a second lug, the second lug is mounted in the first lug.

[0009] Preferably, the sliding element further includes a sliding cover, the sliding cover is connected with the sliding plate and covers the sliding plate.

[0010] Preferably, the sliding plate has at least one limiting structure, the supporter and the elastic element are located in the limiting structure.

[0011] Preferably, the limiting structure includes a first mounting hole and a second mounting hole, the first mounting hole extends downwardly from a top surface of

the sliding plate, the second mounting hole extends upwardly from a bottom surface of the sliding plate, the first mounting is connected with the second mounting hole, a diameter of the first mounting hole is smaller than a diameter of the second mounting hole; the supporter is received in the second mounting hole and passes through the first mounting hole, the elastic element is located in the second mounting hole.

[0012] Preferably, the supporter includes a first post and a second post located at the first post, the first post and the second post are made in the same process, a diameter of the second post is smaller than a diameter of the first post, the first post is positioned in the second mounting hole, the elastic element resists on a top surface of the first post.

10 **[0013]** Preferably, the first side and the second side has concave arcs.

[0014] Preferably, the fixing element includes two vertical surfaces and a horizontal surface, the two vertical surfaces cooperatively form an angle, the horizontal surface defines a first lug, the bottom of the sliding rail defines a second lug, the second lug is mounted in the first lug.

15 **[0015]** Preferably, edges of the second lug perpendicular to an axis of the sliding rail have tangents, portions of the second lug near the tangents form vertical cross sections, a gap is existed between the a top surface of the second lug and the bottom of the sliding rail.

[0016] Preferably, when the pulling bar moves relative to the sliding rail until the

window is closed, an first end of the pulling bar being received in the angle of the fixing element; two opposite sides of the first end have inward arcs respectively.

[0017] A window comprises a frame, a casement and a hinge used to open or close the casement, the hinge includes a sliding rail fixed on a frame of the window, a sliding element movably mounted in the sliding rail, a pulling bar fixed on a casement of the window, a connecting plate, a fixing element mounted on an end of the sliding rail. The pulling bar is driven by the sliding element to move relative to the sliding rail and rotate in a direction to do an angular movement. The pulling bar is connected with the sliding element through the connecting plate. When the window is closed, a first end of the pulling bar is received in the fixing element. The fixing element includes a first surface, a second surface and a third surface, the first surface and the second surface cooperatively form a first angle, the third surface is a horizontal plane and perpendicular to the first surface or the second surface, the third surface defines a first lug, the sliding rail defines a second lug, the second lug is mounted in the first lug.

[0018] Preferably, the sliding element further includes a sliding cover, the sliding cover is connected with the sliding plate and covers the sliding plate.

[0019] Preferably, the sliding plate has at least one limiting structure, the supporter and the elastic element are located in the limiting structure.

[0020] Preferably, the limiting structure includes a first mounting hole and a

second mounting hole, the first mounting hole extends downwardly from a top surface of the sliding plate, the second mounting hole extends upwardly from a bottom surface of the sliding plate, the first mounting is connected with the second mounting hole, a diameter of the first mounting hole is smaller than a diameter of the second mounting
5 hole; the supporter is received in the second mounting hole and passes through the first mounting hole, the elastic element is located in the second mounting hole.

[0021] Preferably, the supporter includes a first post and a second post located at the first post, the first post and the second post are made in the same process, a diameter of the second post is smaller than a diameter of the first post, the first post is positioned in
10 the second mounting hole, the elastic element resists on a top surface of the first post.

[0022] Preferably, the sliding cover and two guiding grooves formed on the two opposite edges of the sliding plate 31 can cooperatively form two sliding chutes, the sliding chutes are mounted in the sliding rail.

[0023] Preferably, the fixing element includes two vertical surfaces and a
15 horizontal surface, the two vertical surfaces cooperatively form an angle, the horizontal surface defines a first lug, the bottom of the sliding rail defines a second lug, the second lug is mounted in the first lug.

[0024] Preferably, edges of the second lug perpendicular to an axis of the sliding rail have tangents, portions of the second lug near the tangents form vertical cross

sections, a gap is existed between the a top surface of the second lug and the bottom of the sliding rail.

[0025] Preferably, when the pulling bar moves relative to the sliding rail until the window is closed, a first end of the pulling bar being received in the angle of the fixing element; two opposite sides of the first end have inward arcs respectively.

[0026] It follows that, the sliding element of the hinge would not shake relative to the sliding rail due to the supporter and the elastic element located between the supporter and the sliding plate, even the thickness of the sliding element is decreased, the sliding element would not shake, such that the quality of the hinge is improved, and the hinge can provide user a good using experience.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] Many aspects of the present embodiments can be better understood with reference to the following drawings. The components in the drawings are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of the present embodiments. Moreover, in the drawings, all the views are schematic, and like reference numerals designate corresponding parts throughout the several views.

[0028] FIG. 1 is an isometric view of a traditional hinge.

- [0029]** FIG. 2 is an isometric view of a traditional fixing element and a traditional sliding rail.
- [0030]** FIG. 3A is an assembled isometric view of the traditional fixing element mounted on the traditional sliding rail shown in FIG.2.
- 5 **[0031]** FIG. 3B is an exploded isometric view of the traditional fixing element and the traditional sliding rail shown in FIG.3A.
- [0032]** FIG. 4 is a cross-section view taken along line A of FIG. 3A.
- [0033]** FIG. 5 is an isometric view of a hinge according to an exemplary embodiment.
- 10 **[0034]** FIG. 6 is an isometric view of a fixing element and a sliding rail of the hinge according to an exemplary embodiment.
- [0035]** FIG. 7A is an assembled isometric view of the fixing element mounted on the sliding rail shown in FIG.6.
- [0036]** FIG. 7B is an exploded isometric view of the fixing element and the
15 sliding rail shown in FIG.7A.
- [0037]** FIG. 7C is a bottom isometric view of the fixing element mounted on the sliding rail.
- [0038]** FIG. 8 is a cross-section view taken along line B of FIG. 7A.
- [0039]** FIG. 9 is a cross-section view of FIG. 7A, but viewed from another aspect.

[0040] FIG. 10 is an isometric view of a sliding plate of the hinge according to an exemplary embodiment.

[0041] FIG. 11 is an isometric view of a supporter of the hinge according to an exemplary embodiment.

5 **[0042]** FIG. 12 is an isometric view of an elastic element of the hinge according to an exemplary embodiment.

[0043] FIG. 13A is a plan view of the sliding plate mounted in the sliding rail shown in FIG. 10.

[0044] FIG. 13B is a cross-section view of the sliding plate mounted in the
10 sliding rail shown in FIG. 13A.

[0045] FIG. 13C is a cross-section view of the sliding plate mounted in the sliding rail shown in FIG. 13A, but viewed from another aspect.

[0046] FIG. 14 is an isometric view of a sliding element of the hinge according to an exemplary embodiment.

15 **[0047]** FIG. 15 is an isometric view of another sliding plate of the hinge according to another exemplary embodiment.

[0048] FIG. 16 is an isometric view of a sliding cover mounted with the sliding plate shown in FIG. 15.

[0049] FIG. 17A is a plan view of the sliding plate shown in FIG. 15 mounted in

the sliding rail shown in FIG. 1.

[0050] FIG. 17B is a cross-section view of the sliding plate mounted in the sliding rail shown in FIG. 17A.

[0051] FIG. 17C is a cross-section view of the sliding plate mounted in the
5 sliding rail shown in FIG. 17A, but viewed from another aspect.

[0052] FIG. 18 is a relative motion isometric view of the fixing element and the pulling bar, according to another exemplary embodiment.

[0053] FIG. 19 is an isometric view of a window according to an exemplary embodiment.

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DETAILED DESCRIPTION

[0054] The disclosure is illustrated by way of example and not by way of limitation in the figures of the accompanying drawings, in which like reference numerals indicate similar elements. It should be noted that references to “an” or “one”
15 embodiment in this disclosure are not necessarily to the same embodiment, and such references can mean “at least one” embodiment.

[0055] With reference to FIG. 1, the hinge includes a sliding rail 1, a pulling bar 2, a sliding element 3, a connecting plate 4, and a fixing element 5.

[0056] With reference to FIG. 5 and FIG. 19, the sliding rail 1 can be fixed on a

bottom of a frame 7 of a window. In at least one exemplary, the sliding rail 1 can be fixed on the frame 7 through a screw (not shown). The sliding rail 1 has a slide groove 11 extending from one side end of the sliding rail 1 to an opposite side end along an axis of the sliding rail 1, and the fixing element 5 is mounted on one side end of the sliding rail 1. The pulling bar 2 can be fixed on a bottom of a casement 8 of the window. In at least one exemplary, the pulling bar 2 can be fixed on the casement 8 through a screw (not shown). The sliding element 3 can be movably mounted in the sliding groove 11 and slide along the axis of the sliding groove 11.

[0057] The pulling bar 2 can be rotatably connected with the sliding element 3 through the connecting plate 4. The pulling bar 2 can be driven by the sliding element 3 to move relative to the sliding rail 1, and rotate in a chosen direction to achieve an angular movement. An angular between two lines can be changed during the angular movement, and the changing of the angular includes a rotation having a fixed highest point and a changing of an angular without a fixed highest point. In at least one exemplary embodiment, the angular movement can change the angular between the pulling bar 2 and the sliding rail 1 to open or close the window. In at least one exemplary embodiment, the connecting plate 4, the sliding element 3 and the pulling bar 2 can be rotatably connected with each other through rivets.

[0058] Referring to FIGS. 10-14, the sliding element 3 includes a sliding plate 31,

a supporter 33 and an elastic element 34. The sliding plate 31 can be mounted in the sliding rail 1 and move relative to the sliding rail 1. The sliding plate 3 defines two guiding grooves 311 located at two opposite sides of the sliding plate 31 contacting with the sliding rail 1. The guiding grooves 311 can be fitted within the sliding groove 11.

- 5 A limiting structure 36 and a fixing hole 312 can be formed on the sliding plate 31. The connecting element 4 can be mounted in the fixing hole 312. The supporter 33 can be mounted in the limiting structure 36.

[0059] Referring to FIG. 11, preferably, the supporter 33 can be a post, a cross section of the post can be a convex structure. The supporter 33 can include a first post 331 and a second post 332. The second post 332 can be formed on a middle of the first post 331. The first post 331 can be integrally formed with the second post 332.

[0060] Referring to FIG. 12, preferably, the elastic element 34 can be a spring, a bottom end of the elastic element 34 can resist on a top surface of the first post 331, and be coiled around the second post 332.

15 **[0061]** Referring to FIGS. 13A-13C, the limiting structure 36 can be mounting hole. The mounting hole can include a first mounting hole 361 and a second mounting hole 362. The first mounting hole 361 can extend downwardly from a top surface of the slide plate 31. The second mounting hole 362 can extend upwardly from a bottom surface of the sliding plate 31. The second mounting hole 362 can be connected with

the first mounting hole 361. A diameter of the first mounting hole 361 is smaller than a diameter of the second mounting hole 362. The supporter 33 can be received in the second mounting hole 362 and pass through the first mounting hole 361. The elastic element 34 can be received in the second mounting hole 362.

5 **[0062]** When the supporter 33 is mounted in the mounting hole, the first post 331 and the elastic element 34 can be received in the second mounting hole 362, the second post 332 can be received in the first mounting 361, and a top end of the elastic element 34 opposite to the bottom end of the elastic element 34 can resist on a top part of the second mounting hole 362.

10 **[0063]** The supporter 33 can be located between the sliding plate 31 and the bottom of the sliding rail 1, and received in the limiting structure 36. The elastic element 34 can be positioned on the supporter 33. When the sliding plate 31 is sliding along the sliding rail 1, the supporter 33 can be driven by the sliding plate 31 to move simultaneously with the sliding plate 31.

15 **[0064]** One end of the elastic element 34 can be fixed with the supporter 33, the opposite end of the elastic element 34 can resist on the sliding plate 34, and the elastic element 34 is pressed and in a pressed stage. The sliding plate 1 may be worn when the sliding plate 1 slides on the sliding rail 1 for a long time, such that a thickness of the sliding plate 31 is decreased. The elastic element 34 can support the sliding plate 31

upwardly, even the thickness of the sliding plate 31 is decreased, the elastic element 34 can also support the sliding plate 31 to maintain at a limited maximum height of the sliding groove 11, such that the sliding plate 31 would not shake in an up-and-down direction and can stably slide along the sliding rail 1.

5 **[0065]** In at least one exemplary embodiment, the supporter 33 and the elastic element 34 can be located in the limiting structure 36, such that the supporter 33 and the elastic element 34 can move simultaneously along the sliding plate 31. The two opposite ends of the elastic element 34 can support the sliding plate 31 and the supporter 33 respectively, such that the sliding plate 31 would not shake even when the thickness of
10 the sliding plate 31 is decreased, and the sliding element 3 can move smoothly in the sliding rail 1.

[0066] In at least one exemplary embodiment, the elastic element 34 can be a stainless steel shrapnel having elastic, the spring, or a plastic shrapnel.

[0067] Referring to FIG.14, the sliding element 3 further includes a sliding cover
15 32. The sliding cover 32 can be fixed on the sliding plate 31, and resist on the sliding rail 1. The sliding plate 31 defines a first fixing hole 312, the sliding cover 32 also defines a second fixing holes 322. The first fixing hole 312 corresponds to the second fixing holes 322. The connecting element 4 can be located in the first fixing holes 312 and the second fixing holes 322 through a screw or a rivet.

[0068] In at least one exemplary embodiment, the connecting element 4 would not directly contacted with the sliding plate 31 and a horizontal plane of the sliding plate 31 due to the sliding cover 32, such that a friction between edges of the connecting element 4 and the edges of the sliding rail 1 can be decreased. The traditional
5 connecting element and the traditional sliding rail are always made of metal, the friction between metals can produce loud noise, and a resistance between metals is much bigger than a resistance between a metal and a plastic. After the sliding cover 32 is mounted on the sliding plate 31, the connecting element 4 can be directly contacted with the sliding cover 32, the connecting element 4 only rubs against the sliding cover 32, the
10 sliding cover 32 can be made of a plastic, such that a resistance between the sliding cover 32 and the connecting element 4 is much smaller than the resistance between metals.

[0069] In at least one exemplary embodiment, the sliding cover 32 can form a third mounting hole 321 corresponding to the first mounting hole 361, the third mounting 321 hole and the first mounting hole 361 can have the same diameter. The second post
15 332 of the supporter 33 can pass through the third mounting hole 321 and the first mounting hole 361 by increasing a height of the second post 332. The supporter 33, the sliding plate 31 and the sliding cover 32 can be fixed along a sliding direction of the sliding element 3 when the second post 332 passes through the third mounting hole 321, and the fixing strength between the sliding cover 32 and the sliding plate 31 can be

improved.

[0070] Furthermore, after the sliding cover 32 is mounted on the sliding plate 31, the sliding cover 32 and two guiding grooves 311 formed on the two opposite edges of the sliding plate 31 can cooperatively form two sliding chutes 37. The sliding chutes 37
5 can be mounted in the sliding rail 1.

[0071] Furthermore, a height and a width of the sliding chutes 37 can be confirmed according to two extension parts of the two opposite side edges of the sliding rail 1 perpendicular to the axis of the sliding rail 1.

[0072] In at least one exemplary embodiment, the connecting plate 4 can be
10 mounted on the sliding element 3 through the first fixing hole 312 and the second fixing hole 322, and the connecting plate 4 can be connected with the sliding plate 31 and the sliding cover 32 through the first fixing hole 312 and the second fixing hole 322.

[0073] Please referring to FIGS. 15-16 and 17A-17C, in at least one exemplary embodiment, the number of the limiting structure 36 can be two, such that the number of
15 the first mounting hole 361 and the number of the second mounting hole 362 can also be two respectively, and the two first mounting holes 361 can be located on the two opposite sides of the first fixing hole 312, the two second mounting holes 362 can be located on the two opposite sides of the first fixing hole 312. Meanwhile, the supporters 33 and the elastic elements 34 mounted in the limiting structures 36 can be two respectively.

[0074] In at least one exemplary embodiment, the hinge can include a plurality of limiting structures 36.

[0075] Furthermore, please referring to FIGS. 7A-7C, the fixing element 5 can include two vertical surfaces and a horizontal surface, the two vertical surfaces cooperatively forms an angle, the horizontal surface can be formed on the bottom surface of the sliding rail 1 through a punching process. After the sliding rail 1 is assembled with the fixing element 5, the horizontal surface of the fixing element 5 can form a first lug 51 through the punching process, the bottom of the sliding rail 1 can form a second lug 12 after the punching process, the second lug 12 can be fixed in the first lug 51. Two opposite edges of the second lug 12 perpendicular to the axis of the sliding rail 1 can form tangents X, portions of the second lug 12 near the tangents X can form vertical cross sections, the cross sections of the second lug 12 do not have curved edges.

[0076] Please referring to FIG. 6 and comparing to FIG. 2, in at least one exemplary embodiment, the horizontal surface of the fixing element 5 does not form holes, such that a process forming holes can be omitted, and the fixing element 5 can be made easily than the traditional fixing element, and the production efficiency can be improved.

[0077] The tangents X of the second lug 12 can enable the edges of the second lug 12 to form vertical cross sections, rather than curved cross sections, the vertical cross

sections of the second lug 12 are in the same plane, such that the fixing strength along the axis of the sliding rail 1 between the fixing element 5 and the sliding rail 1 can be improved. When the fixing element 5 is punched to be mounted on the sliding rail 1, a shape and a structure of a knife element of a punching machine (not shown) can be adjusted to form the tangents X on the second lug 12. The edges of the knife element can form cutting edges, the cutting edges can cut off the sliding rail 1 during the punching process, forming the vertical cross sections on the second lug 12.

[0078] Please referring to FIGS. 7C, 8 and 9, a gap 6 can be formed between a protruded top surface of the second lug 12 and the bottom surface of the sliding rail 1. The gap 6 could enhance a fixing strength between the second lug 12 and the edges of the first lug 51, and also bear an expansive force between the second lug 12 and the edges of the first lug 51, such that the hinge is easier to adapt to the environment temperature.

[0079] Furthermore, the second lug 12 and the first lug 51 can be rectangular block. A dimension of the second lug 12 is smaller than a dimension of the first lug 51.

[0080] Furthermore, please referring to FIG. 18, the pulling bar 2 defines a first end 21, when the pulling bar 2 is closed with the sliding rail 1, the first end 21 of the pulling bar 2 can resist on the fixing element 5, the first end 21 includes a first side and a second side opposite to the first side, the first side and the second side can have concave arcs 211 respectively, the arcs 211 can ensure that the pulling bar 2 would not contact

with the fixing element 5 when pulling bar 2 moves relative to the sliding rail 1.

[0081] In at least one exemplary embodiment, when the pulling bar 2 is forced to move relative to the sliding rail 1 until the window is closed, the pulling bar 2 also rotate in the chosen direction to do the angular movement, meanwhile, the first end 21 of the pulling bar 2 can move towards the fixing element 5. And the first surface 501 and the second surface 502 cooperatively form the angle, during the movement of the pulling bar 2, the first end 21 can move relative to the angle of the fixing element and be received in the angle of the fixing element. As the first end 21 of the pulling bar 2 cannot directly contact with the fixing element 5, there is no friction existed between the fixing element 5 and the pulling bar 2, and the pulling bar 2 can move smoothly relative to fixing element 5 until the window is closed or opened. In at least one exemplary embodiment, a movement of the pulling bar 2 can be affected by a center, a diameter and an arc length of each arc 211, such the center, the diameter and the arc length of each arc 211 should be proper.

[0082] In at least one exemplary embodiment, the movement of the first end 21 of the pulling bar 2 relative to the sliding rail 1 can be fixed after a dimension of the connecting plate 4 and a fixing position of the connecting plate 4 located on the pulling bar 2 are fixed. The movement of the pulling bar 2 relative to the sliding rail 1 near the fixing element 5 is similar to a straight line movement. A dimension and a shape of the

pulling bar 2 should be confirmed, such that dimensions and shapes of the first surface 501 and the second surface 502 of the fixing element 5 can be confirmed according to the pulling bar 2, and vice versa.

[0083] Here, it is assumed that lengths of the two vertical surface are confirmed, and a degree of the angle between the two vertical surface is fixed, in at least one exemplary embodiment, the degree of the angle can be 120° , such that when the window is closed, no matter what the length of the pulling bar 2, the pulling bar 2 can not directly contact with the two vertical surfaces of the fixing element 5 during the movement of the pulling bar 2, or a theoretical point can be formed on the pulling bar 2 during the closing movement, and the movement of the theoretical point can be located on the two vertical surfaces of the fixing element 5. The theoretical point can be assumed as Y, Y should be a point nearest to the fixing element 5 during the movement of the pulling bar 2. In at least one exemplary embodiment, Y can be formed on the arcs 211. Particularly, arcs 211 can begin from Y, distances between the other points on the arcs 211 and the fixing element 5 are all longer than a distance between Y and the fixing element 5. The arcs 211 can extend to two opposite edges of the pulling bar 2 respectively.

[0084] Referring to FIG. 19 and FIG. 2, the window includes the hinge, the pulling bar 2 can be fixed on a bottom of the casement 8, the sliding rail 1 can be fixed on a bottom of the frame 7. The connecting plate 4 can be located between the sliding rail

1 and the pulling bar 2.

[0085] When user pushes the casement 8 to open the window, the sliding element 3 can move in the sliding rail 1 along an axis of the sliding rail 1. When user pulls the casement 8 to close the window, the sliding element 3 can move back along the sliding rail 1.

[0086] When mounting the window, firstly, the sliding rail 1 can be fixed on the bottom of the frame 7, the fixing element 5 can be located at a corner of the frame 7. Then, the pulling bar 2 can be mounted on the bottom of the casement 8. When user pushes the window to open the window, the casement 8 and the pulling bar 2 can be driven to move, such that the pulling bar 2 and the frame 7 can cooperatively form an angle, when the casement 8 moves to a suitable position, user can stop pushing the window. When user pulls the window to open the window, the casement 8 and the pulling bar 2 can be driven to move back, the angle between the pulling bar 2 and the frame 7 can be decreased, such that the window can be closed.

[0087] The pulling bar 2 can be received in the angle of the fixing element 5 when the window is closed. In at least one exemplary embodiment, Y of the pulling bar 2 can resist on the fixing element 5.

[0088] The sliding element 3 can slide along the sliding rail 1 during the closing or the opening process, and the friction between the sliding element 3 and the connecting

plate 4 can be a friction between a metal and a plastic, compared with the friction between metals, the sliding element 3 and the connecting plate 4 can have a higher wear-resistance, and would not produce loud, shrill noise.

[0089] Furthermore, the elastic element 34 can be located between the sliding
5 element 3 and the sliding rail 1. The sliding element 3 may be worn, the elastic element 34 can support the sliding element 3, such that the sliding element 3 would not shake in the sliding rail at the up-and-down direction.

[0090] The tangents X of the second lug 12 enable the portions of the second lug
12 near the tangents X to form vertical cross sections, the cross sections of the second lug
10 12 can be mounted in the first lug 51 of the fixing element 5. The fixing element 5 can be firmly mounted in the sliding rail 1 due to the vertical cross sections of the second lug 12, and the fixing element 5 would not shake in the sliding rail 1.

[0091] Although the features and elements of the present disclosure are
described as embodiments in particular combinations, each feature or element can be
15 used alone or in other various combinations within the principles of the present disclosure to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

CLAIMS

What is claimed is:

1. A hinge for a window, comprising,
 - a sliding rail fixed on a frame of the window;
 - 5 a fixing element mounted on an end of the sliding rail,
 - a sliding element movably mounted in the sliding rail;
 - a pulling bar fixed on a casement of the window, the pulling bar being driven by the sliding element to move relative to the sliding rail and rotate in a direction to do an angular movement; and
 - 10 a connecting plate, the pulling bar being connected with the sliding element through the connecting plate, the sliding element comprising:
 - a sliding plate movably mounted in the sliding rail;
 - a supporter located between the supporter and a bottom of the sliding plate, the supporter moving simultaneously with the sliding plate; and
 - 15 an elastic element mounted between the supporter and the sliding plate, the sliding element moving in the sliding rail.
2. The hinge for a window of claim 1, wherein the sliding element further includes a sliding cover, the sliding cover is connected with the sliding plate and covers the sliding plate.

3. The hinge for a window of claim 1, wherein the sliding plate has at least one limiting structure, the supporter and the elastic element are located in the limiting structure.
4. The hinge for a window of claim 3, wherein the limiting structure includes a first mounting hole and a second mounting hole, the first mounting hole extends downwardly from a top surface of the sliding plate, the second mounting hole extends upwardly from a bottom surface of the sliding plate, the first mounting is connected with the second mounting hole, a diameter of the first mounting hole is smaller than a diameter of the second mounting hole; the supporter is received in the second mounting hole and passes through the first mounting hole, the elastic element is located in the second mounting hole.
5. The hinge for a window of claim 4, wherein the supporter includes a first post and a second post located at the first post, the first post and the second post are made in the same process, a diameter of the second post is smaller than a diameter of the first post, the first post is positioned in the second mounting hole, the elastic element resists on a top surface of the first post.
6. The hinge for a window of claim 2, wherein the sliding cover and two guiding grooves formed on the two opposite edges of the sliding plate 31 can cooperatively form two sliding chutes, the sliding chutes are mounted in the sliding rail.

7. The hinge for a window of claim 1, wherein the fixing element includes two vertical surfaces and a horizontal surface, the two vertical surfaces cooperatively form an angle, the horizontal surface defines a first lug, the bottom of the sliding rail defines a second lug, the second lug is mounted in the first lug.
- 5 8. The hinge for a window of claim 7, wherein edges of the second lug perpendicular to an axis of the sliding rail have tangents, portions of the second lug near the tangents form vertical cross sections, a gap is existed between the a top surface of the second lug and the bottom of the sliding rail.
9. The hinge for a window of claim 7, wherein when the pulling bar moves relative to
- 10 the sliding rail until the window is closed, an first end of the pulling bar being received in the angle of the fixing element; two opposite sides of the first end have inward arcs respectively.
10. A window, comprising:
- a frame, a casement and a hinge used to open or close the casement, the hinge
- 15 including:
- a sliding rail fixed on a frame of the window;
- a fixing element mounted on an end of the sliding rail,
- a sliding element movably mounted in the sliding rail;
- a pulling bar fixed on a casement of the window, the pulling bar being driven by the
- 20 sliding element to move relative to the sliding rail and rotate in a direction to do an

angular movement; and

a connecting plate, the pulling bar being connected with the sliding element through the connecting plate, the sliding element comprising:

a sliding plate movably mounted in the sliding rail;

5 a supporter located between the supporter and a bottom of the sliding plate, the supporter moving simultaneously with the sliding plate; and

an elastic element mounted between the supporter and the sliding plate, the sliding element moving in the sliding rail.

11. The window of claim 10, wherein the sliding element further includes a sliding
10 cover, the sliding cover is connected with the sliding plate and covers the sliding plate.

12. The window of claim 10, wherein the sliding plate has at least one limiting structure, the supporter and the elastic element are located in the limiting structure.

13. The window of claim 12, wherein the limiting structure includes a first mounting
hole and a second mounting hole, the first mounting hole extends downwardly from a
15 top surface of the sliding plate, the second mounting hole extends upwardly from a
bottom surface of the sliding plate, the first mounting is connected with the second
mounting hole, a diameter of the first mounting hole is smaller than a diameter of the
second mounting hole; the supporter is received in the second mounting hole and passes
through the first mounting hole, the elastic element is located in the second mounting

hole.

14. The window of claim 13, wherein the supporter includes a first post and a second post located at the first post, the first post and the second post are made in the same process, a diameter of the second post is smaller than a diameter of the first post, the first post is positioned in the second mounting hole, the elastic element resists on a top surface of the first post.

15. The window of claim 11, wherein the sliding cover and two guiding grooves formed on the two opposite edges of the sliding plate 31 can cooperatively form two sliding chutes, the sliding chutes are mounted in the sliding rail.

16. The window of claim 10, wherein the fixing element includes two vertical surfaces and a horizontal surface, the two vertical surfaces cooperatively form an angle, the horizontal surface defines a first lug, the bottom of the sliding rail defines a second lug, the second lug is mounted in the first lug.

17. The window of claim 16, wherein edges of the second lug perpendicular to an axis of the sliding rail have tangents, portions of the second lug near the tangents form vertical cross sections, a gap is existed between the a top surface of the second lug and the bottom of the sliding rail.

18. The window of claim 16, wherein when the pulling bar moves relative to the sliding rail until the window is closed, an first end of the pulling bar being received in the angle

of the fixing element; two opposite sides of the first end have inward arcs respectively.

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