

IMPROVED SAFETY MEASURES FOR WINDOWS

FIELD OF THE INVENTION

The invention relates to windows. In particular, it relates to improved safety measures to safeguard against falling window panels.

BACKGROUND

Windows are an important architectural element in a house. Windows not only protect the home owners against the weather, but also provide natural light and ventilation for the house.

However, windows can be a hazard in houses and buildings. For example in Singapore, there is an average of two cases of windows falling out of their frames reported every week. From September 2003 to December 2003, there were more than 3 cases of fallen windows per week. From 1999 to 2002, there were more than a total of 160 cases of fallen windows.

Home owners should therefore ensure that their windows are in good working order. If the windows are not properly maintained or repaired, the windows could fall and potentially cause serious injury to others.

The majority of the fallen windows are due to corrosion of the aluminum rivets holding the friction stays on casement type windows. Wear and tear over time as home owners open and close the windows daily also contributes to the risks. Besides poor maintenance and rough handling, the fallen windows hazards may also be due to poor design and workmanship.

The conventional method of checking windows is to conduct a simple visual inspection of the windows. The home owners should check for any cracks, loose panes, loose friction stays,

missing safety stopper, loose rivets / screws and missing or corroded rivets / screws and they should repair the defects accordingly to ensure that their windows are safe and secure.

This visual inspection technique requires the home owners or trained people to conduct the inspection on the windows completely. Inexperienced persons may err in this technique. There may also exist a problem that the inspection of the windows may not be exhaustive.

SUMMARY OF THE INVENTION

In accordance with an aspect of the invention, there is provided a window comprising: a window frame; a panel including a sash frame and a window pane mounted in the sash frame; one or more engaging structures pivotally engaging the panel to the window frame; and one or more securing elements separate from the engaging structures for securing the panel in a state where the panel is disengaged from the window frame.

Each securing element may be connected to the sash frame and the window frame or wall.

The engaging structure may comprises a hinge structure or a friction stay assembly.

The securing elements may comprises one or more flexible belts.

The belts may be fastened along an inner side edge of the sash frame and an adjacent edge of the window frame or wall.

The belts may be fastened along the inner side edge of the sash frame and the adjacent edge the window frame or wall by one or more fasteners.

The window may comprise three said belts.

Each said belt may be mounted onto the window frame, the sash frame, or both utilizing one or more mounting plates.

Each said belt may be mounted onto the wall, the sash frame, or both utilizing one or more mounting plates.

The mounting plates may be configured to deform upon the application of the tension to the belt when the panel is disengaged from the window frame.

The sash frame may comprises one or more sash frame segments.

One or more angle support corner plates may be fastened across adjacent sash frame segments.

The angle support corner plates may be fastened by one or more fasteners.

A width of the belt may vary along the length of the belt.

A thickness of the belt may vary along the cross-section of the belt, along the length of the belt, or both.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

Figure 1A is the perspective view of a window having belts mounted,

Figure 1B is a schematic view of a securing belt,

Figure 1C is a schematic view of a securing belt,

Figure 1D is a schematic view of a securing belt,

Figure 2 is an enlarged view of a detail of Figure 1A showing the fastening of the belt along the inner side edge of the panel and the adjacent edge of window frame,

Figures 3A is a cross sectional view of a rivet and a belt having a mounting plate sandwiched therebetween ,

Figure 3B is a cross sectional view of a rivet and a belt without having a mounting plate sandwiched therebetween,

Figure 3C and 3D depict various shapes of mounting plates,

Figure 4A is the front view of the window,

Figure 4B is an enlarged view of a detail of Figure 4A showing the interface of the panel frame,

Figures 5A to 5F depict various shapes of angle support corner plates,

Figure 6 is an enlarged view of the engaging structure of the window where the wear and tear normally occurs,

Figures 7 is a photographic representation of a typical type of casement window with a top hung window.

DETAILED DESCRIPTION

The window 1 in an example embodiment, as shown in Figure 1A, is a casement type window having a panel 2 pivotally connected or engaged to a window frame 3. The panel 2, which will be described in more detail later in Figures 4A and 4B, comprises a sash frame 4 enclosing a substantially rectangular shaped window pane 5.

It is appreciated that the window pane 5 may be made of glass, Plexiglass, shatter proof plastic, multiple-pane structure, tinted glass or any other suitable pane material. It is also appreciated that the window frame 3 and sash frame 4 may be made of steel, stainless steel, aluminum, nickel, plastic coated material, wood, timber or any other suitable rigid material.

The window 1 also has three elongate, flexible securing elements which comprise flexible belts 6 in the example embodiment. It will be appreciated that the number of securing elements may vary for different embodiments. The belts 6 are fastened along the inner side edge 4a of the sash frame 4 and the adjacent edge 3a of window frame 3 in the example embodiment. The belts 6 may be fastened at any other position of the panel 2 and the window frame 3, in different embodiments. The purpose of the belt 6 is to secure the panel 2 to the window frame or wall if the panel 2 becomes disengaged from the window frame 3 for any reason. In another example embodiment, the belts 6 may be fastened to a wall (not shown) in which the window frame 3 is installed, instead of being fastened to the window frame 3.

The belt 6 as shown in Figure 1A has a constant width in an example embodiment. In other embodiments, there may be variation in the width along the length of the belt 6. For instance, the increase of width (101, 102) along the length of the belt as shown in Figures 1B and 1C respectively could increase the structural strength of the belt 6. In Figure 1B, the increase of

width 101 is semi circular shape while in Figure 1C, the increase of width 102 is rectangular shape.

The cross sectional shape of the belt is not restricted to constant thickness, but may also include shapes with varying thickness. In an example embodiment as shown in Figure 1D, the belt has a constant thickness central area 103, and increased thickness areas 104 along the edges, for increased stability. The thickness of the belt may alternatively or additionally vary along the length of the belt.

It is appreciated that the belt 6 can be made of any flexible, robust material such as rubber, moulded rubber, plastic parts, fiber, plastic, nylon, leather, PVC, CPVC, UPVC, etc. Other securing elements may include but not be limited to steel cable, wire rope, cables / wires, cable ties, canvas material, plastic sheets, rubber coated strips, packaging material, steel hinges and rubber tubing.

As shown in Figure 2, the belt 6 is fastened along the inner side edge 4a of the sash frame 4 and the adjacent edge 3a of window frame 3 by one or more fasteners, here in the form of rivets 7 in the example embodiment. The rivets 7 and the belt 6 may also have one or more substantially rectangular shaped mounting plates 8 sandwiched therebetween. It is appreciated that the rivets 7 can be made of stainless steel, mild steel, galvanized steel, copper, brass, steel bolts, etc.

Figure 3A shows a cross sectional view of a rivet 7 and a belt 6 having a mounting plate 8 sandwiched therebetween in the example embodiment. As shown in Figure 3A, by having a mounting plate 8 sandwiched between the rivet 7 and the belt 6, the compression force is distributed over a larger area on the belt 6 in the example embodiment. Thus the belt 6 may be fastened more securely onto the window frame 3, compared with a belt 6 being fastened

on the window frame 3 without a mounting plate sandwiched therebetween as shown in Figure 3B. It will be appreciated that the shape of the mounting plate 8 is not restricted to rectangular as shown in the example embodiment.

Figure 3C and 3D depict various shapes of mounting plate in the example embodiment. In particular, Figure 3C shows a tension shim plate 300 mounting plate and Figure 3D shows a substantially rectangular shape shim plate. In an example embodiment in which the tension shim plate 300 is used, the fastened belt (not shown) folds around the side portion 304. When the panel is displaced from the window frame upon failure of the engaging structures, the portion 304 is deformed, bending across the gap 302. In this way, at least a portion of the energy transferred through the belts is absorbed by the plate deformation, thus reducing the likelihood of cutting or ripping of the belt.

As shown in Figure 4A, the panel 2 comprises a sash frame 4 enclosing a substantially rectangular shaped window pane 5 in the example embodiment. Other shapes of the window pane 5 may include but not be limited to a circular or oval shape. There may also be more than one window pane 5 in different embodiments. In the example embodiment, the sash frame 4 comprises of four elongate extruded sash elements (4w, 4x, 4y, 4z) being internally secured together utilizing fasteners such as rivets or screws.

Figure 4B shows an enlarged view of the interface 9 between the sash elements 4w and 4x in the example embodiment. Over time, the fasteners securing the sash elements 4w and 4x may be weakened by fatigue or corrosion. As a result, the fasteners securing the sash elements (4w, 4x, 4y, 4z) may fail, allowing the frame elements to separate upon the application of load, for example when the panel 2 is displaced from the window frame 3 when opening the window. This could cause the window pane 5 to fall from the frame 4 and potentially cause serious injury to others. By fastening one or more substantially rectangular

shaped angle support corner plates (not shown in the Figure) using, for example one or more rivets, screws or other suitable fasteners on opposing sides of the interface 9 in the example embodiment, the interface 9 between the frame elements 4w and 4x would be reinforced and thus more secured.

It is appreciated that the shape of the angle support corner plate is not restricted to a rectangular shape. As shown in Figures 5A to 5F, other shapes of the angle support corner plate may include but not limited to L-shaped (See Figure 5A), cross-shaped (see Figure 5B), triangular-shaped (see Figure 5C), disc-shaped (see Figure 5D), circular shaped (see Figure 5E) and pentagon-shaped (see Figure 5F).

It is also appreciated that the angle support corner plate can be made of steel such as mild steel, tool steel or stainless steel, copper, aluminum, PVC, plastic, steel sheets, etc.

The window 1 is inevitably subjected to wear and tear over time as home owners open and close the window 1 daily. The wear and tear may weaken the engaging structure such as the friction stay assembly 13 in the example embodiment, including a beam 10 as shown in Figure 6. In particular, the wear and tear may be exacerbated as a result of corrosion of the rivets 10a securing the friction stays 11. It is also known that the friction stay 11 may become loose or bent over time as homeowners open and close the window daily. As a result of the wear and tear occurring at the beam 10 and the friction stay 11 becoming bent or loose, the panel 2 could be disengaged from the frame 3. In the event that the panel 2 is disengaged from the frame 3, it is the objective of the belt 6 to secure the panel 2 in a state where the panel 2 is disengaged from the window frame 3. It will be appreciated that other engaging structures between the panel 2 and the window frame 3, such as hinge structures, may also be subjected to such failure.

The window 1 described hereinbefore is a casement window. The safety measures could also be applied to top hung windows 12 as depicted in Figure 7.

It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

Claims

1. A window comprising:
a window frame;
a panel including a sash frame and a window pane mounted in the sash frame;
one or more engaging structures pivotally engaging the panel to the window frame;
and
one or more securing elements separate from the engaging structures for securing the panel in a state where the panel is disengaged from the window frame.
2. The window according to claim 1, wherein each securing element is connected to the sash frame and the window frame or wall.
3. The window according to claim 1 or 2, wherein the engaging structure comprises a hinge structure or a friction stay assembly.
4. The window according to any one of claims 1 to 3, wherein the securing elements comprises one or more flexible belts.
5. The window according to claim 4, wherein the belts are fastened along an inner side edge of the sash frame and an adjacent edge of the window frame or wall.
6. The window according to claim 4 or 5, wherein the belts are fastened along the inner side edge of the sash frame and the adjacent edge the window frame or wall by one or more fasteners.
7. The window according to any one of claims 4 to 6, comprising three said belts.

8. The window according to any one of claims 4 to 7, wherein each said belt is mounted onto the window frame, the sash frame, or both utilizing one or more mounting plates.
9. The window according to any one of claims 4 to 7, wherein each said belt is mounted onto the wall, the sash frame, or both utilizing one or more mounting plates.
10. The window according to claim 8 or 9, wherein at least one mounting plates is configured to deform upon the application of tension to the belt when the panel is disengaged from the window frame.
11. The window according to any one of the preceding claims, wherein the sash frame comprises one or more sash frame segments.
12. The window according to claim 11, where one or more angle support corner plates fastened across adjacent sash frame segments.
13. The window according to claim 11, wherein the angle support corner plates are fastened by one or more fasteners.
14. The window according to any one of the preceding claims, wherein a width of the belt varies along the length of the belt.
15. The window according to any one of the preceding claims, wherein a thickness of the belt varies along the cross-section of the belt, along the length of the belt, or both.
16. A window substantially as hereinbefore described with reference to the accompanying drawings.