



\*G00002\*



\*159159\*

- 1 -

## **SASH-GUIDING DEVICE**

### **BACKGROUND OF THE INVENTION**

#### **1.FIELD OF THE INVENTION**

5 The present invention relates to a sash-guiding device for a sash window in which a sash is attached in a sash window frame of out-swinging casement window, in-swinging casement window, vertical pivoted window, and vertical sliding window such that the sash can be opened and shut.

#### **2.DESCRPTION OF RELATED ART**

10 As for a sash window in which a sash is attached in a sash window frame such that the sash can be opened and shut, there may be cases where the sash is hanged by its own weight at the time of being located at an opening position and the sash becomes difficult to be moved to a shutting position because of interfering with the sash window frame when the sash moves to the shutting position.

15 For solving such a trouble, a sash-guiding device has been proposed in the art. In this mechanism, a roller is attached on the sash and is then contacted with the sash window frame while rotating the roller to lift and move the sash to the shutting position.

For instance, Japanese Patent Application Publication No. 58-25835 (1983) discloses a sash-guiding device. In this case, a sash window includes a sash pivotably  
20 attached in a sash window frame such that the sash can be pivotably shifted between the opening position and the shutting position. A roller is rotatably attached on the lower edge member of the sash, while a support is attached on the lower frame portion of the sash window frame.

The sash-guiding device allows the roller to run on the support when the sash  
25 located at the opening position begins a pivotal movement toward the shutting position. Thus, the sash being hanged can be lifted so as to be smoothly shifted to the shutting position.

In the above sash-guiding device, the roller is rotatably supported in a frame body

through a supporting axis and the frame body is attached on the sash. Therefore, a sash-hanging dimension that allows the sash to be moved to the shutting position is small, and also the roller is easily deformed and the durability of the roller is not sufficient.

For instance, as shown in Fig. 9, a roller 2 attached on the lower portion of a sash 1 is rotatably supported around a supporting axis 3. When the sash 1 becomes hanging down, the roller 2 moves to the position lower than a guiding part 4 on the lower frame portion and then comes in contact with the tip portion 4a of the guiding part 4. Subsequently, the rotating roller 2 runs on the guiding part 4 to lift the sash 1.

As described above, on the way of moving from the position at which the roller 2 comes in contact with the tip portion 4a of the guiding part 4 to the shutting position, as indicated by the arrow a, a rotating force in the direction of the arrow b is acted on the roller 2. Then, the rotating force allows the roller 2 to run on the guiding part 4 of the lower frame portion.

The rotating force equals the product of the movement force of the sash and the diameter of the roller 2. Therefore, the reason why the roller 2 runs on the guiding part 4 while smoothly rotating is that a straight line connecting between a contact 2a of the roller 2 being contacted with the tip portion 4a of the guiding part 4 and the center 3a of the supporting axis 3 is inclined at an angle  $\theta$  of  $45^\circ$  with respect to a perpendicular line passing through the center 3a of the supporting axis 3. If the angle  $\theta$  is larger than  $45^\circ$ , the roller 4 cannot be run on the guiding part 4 while rotating smoothly.

Therefore, the sash-hanging dimension that allows the sash to smoothly move to the shutting position, i.e., the dimension S between the tip portion 4a of the guiding part 4 and the lowest portion of the roller 2 is small.

In addition, a large external force acts on the portion 2b between the contact 2a of the roller 2 and the supporting axis 3, so that the portion 2b of the roller 2 can be easily deformed and the durability of the roller 2 is poor.

## SUMMARY OF THE INVENTION

Therefore, the present invention has been accomplished in consideration of the above problems. Therefore, an object of the present invention is to provide a sash-guiding device having an excellent durability, where a sash-hanging dimension  
5 capable of smoothly moving the sash to the shutting position is large and the body of rotation is hardly deformed.

A first invention is a sash-guiding device of a sash window in which a sash 11 is installed in a sash window frame 10 such that the sash can be freely moved between an opening position and a shutting position, comprising: a rotator assembly 13 for running on,  
10 which is attached on a lower portion of the sash 11; a guiding part 15 which is provided on a lower portion of the sash window frame 10 such that the guiding part 15 faces to the rotator assembly 13, wherein the rotator assembly 13 includes a housing 20 and a rotator 21 rotatably connected with the housing 20, where the housing 20 is attached on a housing-attaching surface of the lower portion of the sash 11, and the rotator 21, which  
15 rotates while contacting with the housing 20 or both the housing 20 and the housing-attaching surface by its outer peripheral surface, includes a part of the outer peripheral surface protruding from the housing 20, where a part of the protruded portion faces to the guiding part 15.

According to the first invention, when the sash 11 being hanged down at the  
20 opening position is moved to the shutting position, the outer peripheral surface of the rotator 21 comes in contact with the tip portion 15a of the guiding part 15. The rotator 21 rotates, while outer peripheral surface of the rotator 21 comes in contact with the housing 20 or both the housing 20 and the housing-attaching surface.

Therefore, the rotating force of the rotator 21 is large, and a sash-hanging  
25 dimension that allows the sash 11 to smoothly move to the shutting position is large.

Furthermore, when the outer peripheral surface of the rotator 21 comes in contact with the tip portion 15a of the guiding part 15, an external force is acted on a portion between the contacting portion with the tip portion 15a of the guiding part 15 and the outer

peripheral surface of the rotator 21. Therefore, the rotator 21 is hardly deformed and is superior in durability.

A second invention is a sash-guiding device as disclosed in the first invention, wherein the housing 20 includes a rotator-housing part 23 having openings formed in a  
5 upper surface 20a and a lower surface 20b, and the rotator 21 includes stoppers 25 on each opposite side surfaces of the roller 24 and the rotator 21 is rotatably installed in the rotator-housing part 23, where a part of the peripheral surface of the rotator 21 is ordinarily protruded from a lower surface 20b but not from the upper surface 20a of the housing 20, and a part of the peripheral surface of the roller 24 comes in contact with the  
10 housing-attaching surface and an inner surface of the rotator-housing part 23 when the part of the peripheral surface of the roller 24 comes in contact with a tip portion 15a of the guiding part 15 to run on the guiding part 15.

According to the second invention, when a part 24a of the outer peripheral portion of the roller 24 comes in contact with the tip portion 15a of the guiding part 15  
15 (i.e., at the time of running on), a part of the outer peripheral surface of the roller 24 comes in contact with each of the housing-attaching surface and the inner surface of the rotator-housing part 23, so that the roller 24 can be smoothly rotated, resulting in a large rotating force of the roller 24 and a large sash-hanging dimension that allows the sash 11 to smoothly move to the shutting position.

20 A third invention is a sash-guiding device in accordance with the second invention, wherein the rotator-housing part 23 of the housing 20 has an upper-side opening 23a which is larger than the rotator 21 and a lower-side opening 23b which is smaller than the rotator 21, and elastically deformable stopper hooks 29 for retaining the stoppers 25 of the rotator 21 is provided on the rotator-housing part 23.

25 According to the third invention, the stopper hooks 29 can be elastically deformed to retain the stopper 25 by forcefully pushing the rotator 21 into the rotator-housing part 23 of the housing 20 from the upper-side opening 23a. Thus, the rotator 21 can be installed in the rotator-housing part 23.

In a state of being installed, the rotator 21 is hardly dropped off of the lower side opening 23b of the rotator 21.

Therefore, the rotator 21 can be simply installed in the housing 20 and is hardly dropped off of the housing 20 in a state of being installed in the sash.

5           Furthermore, as the stopper 25 is retained by the stopper hook 29, so that the rotator 21 cannot be pulled off of the upper-side opening 23a at the time of installation, storage, or transportation.

          Furthermore, the stopper hook 29 becomes elastically deformed by forcefully pushing or pulling the rotator 21, so that the stopper 25 can be detached from the stopper  
10   hook 29 to remove the rotator 21 from the housing 20.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is an outside diagram of a sash window as one of preferred embodiments of  
15   the present invention;

Fig. 2 is a vertical cross-sectional diagram of the sash window shown in Fig. 1;

Fig. 3 is an exploded perspective diagram of a rotator assembly for a running-on movement;

Fig. 4 is a plane diagram of the rotator assembly for the running-on movement;

20   Fig. 5 is a cross-sectional diagram along the line A-A in Fig. 4;

Fig. 6 is a cross-sectional diagram along the line B-B in Fig. 4;

Fig. 7 is a cross-sectional diagram for illustrating a rotator and a guiding part at the time of being located at a sash-opening position;

Fig. 8 is a cross-sectional diagram for illustrating the rotator at the time of being  
25   run on; and

Fig. 9 is an explanation diagram of the conventional sash-guiding device.

#### **DETAILED DESCRIPTION OF PREFERRED EMBODIMENT(S)**

Hereinafter, we will describe one of preferred embodiments of the present invention with reference to the attached drawings.

As shown in Fig.1, a sash window is fabricated by attaching a sash 11 in a sash window frame 10 such that the sash is allowed to move between an opening position and a closing position.

When the sash 11 is located at the opening position, the sash extends out of the sash window frame 10. When the sash 11 is located at the shutting position, the sash is housed in the sash window frame 10. Therefore, the sash 11 hangs down by its own weight or the like at the opening position.

In this embodiment, a vertical sliding window is exemplified. According to the present invention, however, the sash window is not limited to such a window. A person skilled in the art will be appreciated that another kind of the sash window may be applied.

As shown in Fig. 1 and Fig. 2, a rotator assembly 13 for allowing the sash 11 to run on a guiding part 15 is provided on a lower part, for example a lower edge member 12, of the sash 11.

The guiding part 15 is provided on the lower part, for example a lower frame portion 14, of the sash window frame 10 such that the guiding part 15 faces toward the rotator assembly 13.

As shown in Fig. 2, the rotator assembly 13 for running on is comprised of a housing 20 and a rotator 21. The rotator 21 is pivotably installed in the housing 20, while the housing 20 is fixed on a lower surface 12a of the lower edge member 12 through a screw 22. Therefore, the lower surface 12a of the lower edge member 12 is provided as a housing-mounting surface.

A part of the rotator 21 is protruded from the lower surface of the housing 20 and comes in contact with the guiding part 15.

The guiding part 15 is an upper surface 14a of the lower frame portion 14. Alternatively, the guiding part 15 and the lower frame portion 14 may be separately prepared, followed by fixing them together using a screw or the like.

The rotator 21 rotates as the outer peripheral surface of the rotator 21 touches the housing 20 or both the housing 20 and the lower surface 12a of the lower edge member 12. In addition, a part of the above outer peripheral surface is protruded from the housing 20. Such a protruded portion of the rotator 21 faces the guiding part 15.

5 Accordingly, when the sash 11 hanging down at the opening position moves to the shutting position, the outer peripheral surface of the rotator 21 comes in contact with the tip portion 15a of the guiding part 15, causing a rotating force that acts on the rotator 21.

The rotating force equals the product of a radial length and a sash-moving force, 10 where the radial length is defined as a distance between two portions of the rotator 21 in the radial direction; a contacting portion with the tip 15a of the guiding part 15 and the outer peripheral portion.

Therefore, a sash-hanging dimension that allows the sash 11 to smoothly move to the shutting position is substantially large, compared with the prior art.

15 Furthermore, when the rotor 21 comes in contact with the tip portion 15a of the guiding part 15, an external force acts on an area between the contacting portion of the rotator 15 with the tip 15a of the guiding part 15 and the outer peripheral portion of the rotator 15. Therefore, the rotator 21 is hardly deformed and is superior in durability.

Here, we will describe the configuration of the rotator assembly 13 more 20 concretely with reference to Figs. 3 to 6.

The housing 20 includes a rotator-housing part 23 which is larger than the rotator 21. The rotator-housing part 23 is formed such that its openings 23a, 23b are formed in the upper surface 20a and lower surface 20b of the housing 20. In addition, the upper-side opening 23a is larger than the rotator 21, while the lower-side opening 23b is 25 smaller than the rotator 21. The dimension between the upper surface 20a and lower surface 20b of the housing 20 (i.e., the height of the housing 20) is smaller than the diameter of the rotator 21.

Therefore, the rotator 21 is inserted into the rotator-housing part 23 through the

upper-side opening 23a. Usually, a part of the outer peripheral surface of the rotator 21 protrudes downward from the lower-side opening 23b by its own weight or the like such that a lower part of the rotator 21 is positioned below the lower surface 20b of the housing 23 while an upper part of the rotator 21 does not protrude from the upper surface 20a of the housing part 23.

The rotator 21 is designed such that stoppers 25 are integrally formed on the opposite sides of a roller 24 and the stoppers 25 are concentric with the roller 24. In this embodiment, the stoppers 25 are axial protruded portions, respectively.

The rotator-housing part 23 comprises: a first housing part 26 in which the roller 24 is housed; and a pair of second parts 27, 27 in which a pair of the stoppers 25 is housed. The first and second housing parts 24, 27 are communicated with each other and are arranged almost in the shape of a cross. The length and width of the first housing part 26 is larger than the diameter and width of the roller 24, respectively. The dimensions of the second housing part 27 are larger than those of the stopper 25. The first and second housing parts 26, 27 continuously extend up to the upper surface 20a of the housing 20 without changing their dimensions. Also, the width and length of the upper-side opening 23a corresponds to those of the rotator-housing part 23.

The first-housing part 26 continuously extends to the lower surface 20b of the housing 20 without changing its dimensions. On the other hand, a pair of the second housing 27 continuously extends to in the vicinity of the lower surface 20b without changing its dimensions. The width and length of the lower-side opening 23b almost corresponds to the first-housing part 26 but smaller than those of the pair of the second housing 27, so that the bottoms of the second housing parts 27 can be provided as the stopper-receiving portions 28, respectively.

The bottom surface of each of the second housing parts 27 has an stopper hook 29 that extends upward.

The stoppers 25 are forcefully pushed into the space between the stopper hook 29, so that the roller 24 can be secured in place without pulling out of the upper-side opening

23a. If the roller 24 is forcefully pushed upward, then the stopper hooks 29 becomes elastically deformed. Therefore, the stopper 25 can be moved out of the stopper hook 29 to allow both the stopper 25 and the roller 24 to be pulled out of the upper-side opening 23a.

5           Consequently, the roller 24 can be easily housed in the rotator-housing part 23 of the housing 20 by pushing the roller 24 into the rotator-housing part 23. In addition, the roller 24 can be prevented from dropping at the time of attaching the sash in the sash window frame, or the like. Furthermore, the roller 24 can be pulled out of the housing part 23.

10           The housing 20 has attachment parts 30 with holes 31. Thus, the screw 22 is screwed in the lower edge member 12 through each of the holes 31 to attach the housing 20 on the lower surface 12a of the lower edge member 12.

          As shown in Fig. 7, if the sash 10 is located at the opening position (ordinary time), the roller 24 moves away from the guiding part 15 and then moves downward by  
15           its own weight or the like. Subsequently, the stopper 25 touches the stopper-receiving portion 28 to separate between the external peripheral surface of the roller 24 and the lower surface 12a of the lower edge member 12 while becoming free from two opposite inner surfaces 26a of the first housing part 26.

          From the above state, the lower edge member 12 moves in the direction of the  
20           arrow c in Fig. 7 as the sash 10 moves to the shutting position.

          As shown in Fig. 8, when a part 24a of the outer peripheral portion of the roller 24 comes in contact with the tip portion 15a of the guiding part 15 (i.e., at the time of running on), the roller 24 receives the actions of an upward force indicted by the arrow d and a force directed in the direction of the arrow e opposite to the direction of moving the  
25           lower edge member.

          Consequently, another part 24b of the outer peripheral surface of the roller 24 touches the lower surface 12a of the lower edge member 12 and another part 24c of the peripheral portion of the roller 24 touches one of the inner surfaces 26a of the first housing

part 26 (the inner surface of the rotator-housing part 23). At this time, the stopper 25 moves away from the stopper-receiving portion 28, so that the rotation of the roller 24 becomes free from the stopper 25.

From this state, if the sash 10 moves to the shutting position as indicated by the arrow c, the roller 24 receives the action of the rotating force in the direction of the arrow f along two contacting portions 24b, 24c described above. Therefore, such a rotating force allows the roller 24 to run on the guiding part 15 to lift the sash 10.

The rotating force equals the sash-moving force and the radial length between the contacting portion of the roller 24 with the tip portion 15a of the guiding portion 15 and the outer peripheral surface of the guiding portion 15. Therefore, the rotating force is larger than one obtained by turning around the central axis.

Therefore, even though the dimension S between the guiding part 15 and the lower part of the outer peripheral surface of the roller 24 is large, the roller 24 runs on the guiding part 15 while turning smoothly.

Therefore, a sash-hanging dimension (the above dimension S) that allows the sash to smoothly move to the shutting position is large.

As described above, two opposite portions 24b, 24c of the outer peripheral surface of the roller 24 touch the guiding portion 15 and the inner side 26a of the first housing part 26, so that the roller 24 is allowed to move smoothly and the sash-hanging dimension becomes more large.

Furthermore, when the roller 24 runs on the guiding part 15 after contacting with the tip portion 15a of the guiding part 15, an external force (compressive force) acts on a portion between the contacting portion with the tip portion 15a of the guiding part 15 and the outer peripheral surface of the roller 24, so that the roller 24 is hardly deformed and is superior in durability.

Next, we will describe another embodiment of the present invention.

The stopper 25 is provided as a circular recessed portion formed in each of the opposite side surfaces of the roller 24. Thus, the stopper hooks 29 are protruded to the

recessed portions, so that the stopper hooks 29 can be held in the opposite side surfaces of the roller 24, respectively. In this case, it may be designed that the roller 24 in such a state is forcefully pushed upward to remove the stopper hook 29 from the recessed portion.

In addition, the rotator-housing part 23 of the housing 20 is designed such that an  
5 opening is formed in the lower surface 20b and an upper surface is provided as an upper wall portion 15a to allow a part of the outer peripheral surface of the roller 24 to come in contact with the upper wall portion of the rotator-housing part 23 when the roller 24 touches the tip portion 15a of the guiding part 15.

In this case, the roller 24 is inserted into the rotator-housing part 23 from the  
10 lower-surface's side opening 23b. Thus, the stopper hooks are provided on the upper wall portion to retain the roller 24 such that the roller 24 can be forcefully pushed in the rotator-housing part 23 through the use of the elastic deformation of the stopper hook and the roller 24 can be removed from the rotator-housing part 23 by forcefully pulling the roller 24.

15 The housing 20 may be designed to have a generally circular rotator-housing part by connecting an upper member and a lower member together through screws. In this case, the roller 24 can be installed in the rotator-housing by pushing the roller 24 in the rotator-housing.

In each of the above embodiments, the rotator 21 may be shaped like a ball and  
20 the rotator-housing part of the housing 20 may be one having a generally spherical surface.

**WHAT IS CLAIMED IS:**

1. A sash-guiding device of a sash window in which a sash 11 is installed in a sash window frame 10 such that the sash can be freely moved between an opening position  
5 and a shutting position, comprising:

a rotator assembly 13 for running on, which is attached on a lower portion of the sash 11;

a guiding part 15 which is provided on a lower portion of the sash window frame 10 such that the guiding part 15 faces to the rotator assembly 13, wherein

10 the rotator assembly 13 includes a housing 20 and a rotator 21 rotatably connected with the housing 20, where the housing 20 is attached on a housing-attaching surface of the lower portion of the sash 11, and

the rotator 21, which rotates while contacting with the housing 20 or both the housing 20 and the housing-attaching surface by its outer peripheral surface, includes a  
15 part of the outer peripheral surface protruding from the housing 20, where a part of the protruded portion faces to the guiding part 15.

2. A sash-guiding device as claimed in Claim 1, wherein

the housing 20 includes a rotator-housing part 23 having openings formed in a  
20 upper surface 20a and a lower surface 20b, and

the rotator 21 includes stoppers 25 on each opposite side surfaces of the roller 24, and the rotator 21 is rotatably provided in the rotator-housing part 23 where

a part of the peripheral surface of the rotator 21 is ordinarily protruded from a lower surface 20b but not from the upper surface 20a of the housing 20, and

25 a part of the peripheral surface of the roller 24 comes in contact with the housing-attaching surface and an inner surface of the rotator-housing part 23 when the part of the peripheral surface of the roller 24 comes in contact with a tip portion 15a of the guiding part 15 to run on the guiding part 15.

3. A sash-guiding device as claimed in Claim 2, wherein
- the rotator-housing part 23 of the housing 20 has an upper-side opening 23a which is larger than the rotator 21 and a lower-side opening 23b which is smaller than the
- 5 rotator 21, and
- elastically deformable stopper hooks 29 for retaining the stoppers 25 of the rotator 21 is provided on the rotator-housing part 23.