

DOUBLE-HUNG WINDOWBACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a double-hung window having an
5 inner sliding sash and an outer sliding sash mounted within a
window frame so as to be slidably moved up and down, and more
particularly to a double-hung window arranged such that the
inner and outer sliding sashes may be slidably moved up and
down, respectively, in their rectangular stile-rail assemblies
10 of inner and outer sliding sash units without having to mount
a framework around the outer periphery of each of the stile-
rail assemblies, and the inner and outer sliding sash units
may be inclined inwardly about their hinges, respectively.

2. Disclosure of the Prior Art

15 An example of prior art double-hang windows is disclosed
in Japanese Utility Model Publication No. SHO 62-17577.

According to this prior art example, the arrangement is
made such that an inner sliding sash is mounted within a
window frame on the indoor side thereof so as to be slidably
20 moved up and down and an outer sliding sash is mounted on the
outdoor side thereof so as to be slidably moved up and down,
the inner sliding sash comprising an inner sliding sash unit
mounted within a frame assembly so that it may be inclined
inwardly about its hinge, and the frame assembly being

mounted within the window frame on the indoor side thereof so as to be slidably moved up and down freely.

In such a double-hung window, when the inner sliding sash is slidden down and inclined inwardly, the outer surface
5 of the glass of the inner sliding sash can be cleaned readily and simply from the indoor side.

However, the above-mentioned prior art double-hung window has the following disadvantages.

1. To clean the outer surface of the glass of an outer
10 sliding sash in such a double-hung window, it is necessary to slide up both the inner and outer sliding sashes to their upper positions, respectively, and then effect cleaning by extending the cleaner's hand from the lower opening of the window frame. Therefore, cleaning operation is very trouble-
15 some.

2. Since the inner sliding sash has an inner sliding sash unit mounted within a frame assembly so that it may be inclined inwardly, the weight of the frame assembly becomes heavy, and hence the weight of the inner sliding sash becomes
20 very heavy. Therefore, a high magnitude of force is required to slidably move the inner sliding sash up and down, but also since the left and right vertical frames forming the frame assembly are arranged to slidably move along the left and right vertical frames forming the window frame, the
25 resistance to sliding becomes high.

Therefore, it is not easy to slidably move the inner sliding sash up and down.

SUMMARY OF THE INVENTION

The present invention has been made in view of the
5 above-mentioned circumstances, and has for its object to provide a double-hung window wherein both inner and outer sliding sash units can be inclined inwardly about their hinges to enable the outer surfaces of the glasses of the vertically slidably movable inner and outer sliding sashes to
10 be cleaned simply and readily.

Another object of the present invention is to provide a double-hung window wherein the weight of vertically slidably movable inner and outer sliding sashes is reduced, and auxiliary vertical frames are mounted on the left and right
15 sides of the inner and outer sliding sash units without having to mount a framework around the outer periphery of each of rectangular stile-rail assemblies of the inner and outer sliding sash units so that the resistance to sliding is reduced to thereby enable the inner and outer sliding sashes
20 to be slidably moved smoothly, whereby the auxiliary vertical frames of the inner and outer sliding sashes can be slidably moved up and down freely along inner and outer guide recesses formed, respectively, in the left and right vertical frame members of a window frame.

25 To achieve the above-mentioned objects, according to the

present invention, there is provided a double-hung window comprising: - an inner sliding sash mounted so as to be slidably moved up and down freely within a window frame on an indoor side thereof; an inner sliding sash unit hingedly mounted on said inner sliding sash so that said inner sliding sash unit can be inclined inwardly; an outer sliding sash mounted so as to be slidably moved up and down freely within said window frame on an outdoor side thereof; and an outer sliding sash unit hingedly mounted on said outer sliding sash so that said outer sliding sash unit can be inclined inwardly; said double-hung window being characterized in that said window frame has upper and lower frames configured such that when said inner sliding sash is located at its lowermost position and said outer sliding sash is located at its uppermost position the upper portion of the inner sliding sash overlaps the lower portion of the outer sliding sash with each other, whilst when said inner sliding sash is located at its uppermost position and said outer sliding sash is located at its lowermost position the lower portion of the inner sliding sash is spaced apart from the upper portion of the outer sliding sash so that the outer sliding sash may be inclined inwardly about its hinge.

Preferably, said inner sliding sash comprises said inner

sliding sash unit, auxiliary vertical frames connected, respectively, to left and right stiles of the inner sliding sash unit, hinges fixedly secured, respectively, to the lower parts of the opposite inside portions of the auxiliary vertical frames, engaging members fixedly secured, respectively, to the lower parts of the opposite outside portions of the left and right stiles of said inner sliding sash unit and which are engaged with said hinges so that the inner sliding sash unit may be inclined inwardly about its hinge relative to said auxiliary vertical frames, inner sliding sash locks mounted, respectively, across each side of the upper rail of said inner sliding sash unit and each of said left and right auxiliary vertical frames, and connecting members and socket members mounted on said left and right auxiliary vertical frames at upper and lower positions thereof, respectively, so that they may be vertically slidably engaged with indoor side guide recesses formed so as to extend, respectively, in the longitudinal direction of the opposite inside portions of the left and right vertical frame members of the window frame.

Preferably, said outer sliding sash comprises said outer sliding sash unit, auxiliary vertical frame members, connected,

respectively, to the left and right stiles of the outer sliding sash unit, hinges fixedly secured, respectively, to the lower parts of the opposite inside portions of the auxiliary vertical frames, engaging members fixedly secured, respectively, to the lower parts of the outside portions of the left and right stiles of said outer sliding sash unit and which are engaged with said hinges so that the outer sliding sash unit may be inclined inwardly about its hinge relative to said auxiliary vertical frames, outer sliding sash locks mounted, respectively, across each side of the upper rail of said outer sliding sash unit and each of said left and right auxiliary vertical frames, and connecting members and socket members mounted on said left and right auxiliary vertical frames at upper and lower positions thereof, respectively, so that they may be vertically slidably engaged with outdoor side guide recesses formed so as to extend, respectively, in the longitudinal direction of the opposite inside portions of the left and right vertical frame members of the window frame.

The present invention incorporating the above-mentioned aspects has the following advantages.

Stating in brief, when the inner sliding sash is located at its lowermost position and the outer sliding sash is located at its uppermost position and the inner sliding sash unit is inclined inwardly about its hinge, the outer surface

of the glass of the inner sliding sash can be cleaned readily. Whilst, when the inner sliding sash is located at its uppermost position and the outer sliding sash is located at its lowermost position and the outer sliding sash unit is
5 inclined inwardly about its hinge, the outer surface of the glass of the outer sliding sash can be cleaned readily.

Further, since each of the inner and outer sliding units is mounted on the left and right vertical frames so that it may be inclined inwardly about its hinge without the need
10 for mounting a framework around each of them, the weight of the inner and outer sliding sashes becomes less than that of the prior art one comprising a framework, and since the connecting members and the socket members connected to the upper and lower parts of the outside portions of the left
15 and right auxiliary vertical frames are allowed to slidably move along the indoor and outdoor side guide recesses, formed, respectively, in the opposite inside portions of the window frame, the resistance to sliding of the inner and outer sliding sashes along the window frame can be reduced so that
20 the inner and outer sliding sashes can be slidably moved up and down smoothly.

The above-mentioned and other objects, aspects and advantages of the present invention will become apparent to those skilled in the art from the following detailed description when taken in conjunction with the accompanying
25

drawings in which a preferred embodiment incorporating the principles of the present invention is shown by way of illustration only.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Fig. 1 is a schematic, overall front view of an embodiment of the present invention;

 Figs. 2 and 3 are longitudinal sectional views of the embodiment of the present invention at two different operational positions, respectively;

10 Figs. 4 and 5 are sectional views of the embodiment taken along lines IV - IV and V - V, respectively, in Fig. 1;

 Figs. 6, 7 and 8 are a fragmentary longitudinal sectional view, a fragmentary side elevational view, and a fragmentary exploded perspective view, respectively, of a connecting
15 portion of an auxiliary vertical frame of an inner sliding sash and a stile of an inner sliding sash unit;

 Figs. 9 and 10 are an exploded perspective view and a longitudinal sectional view, respectively, of an inner sliding sash lock;

20 Figs. 11, 12 and 13 are a fragmentary longitudinal sectional view, a fragmentary side elevational view, and a fragmentary exploded perspective view, respectively, of a connecting portion of an auxiliary vertical frame of an outer sliding sash and a stile of an outer sliding sash unit; and

25 Figs. 14 and 15 are an exploded perspective view and a

longitudinal sectional view, respectively, of an outer sliding sash lock.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

One embodiment of the double-hung window according to the present invention will now be described below in detail with reference to the accompanying drawings.

As shown in Fig. 1, a window frame 1 is a rectangular member which is comprised of an upper frame member 2, a lower frame member 3, and left and right vertical frame members 4, 4. An inner sliding sash 5 is mounted within the window frame 1 on the indoor side thereof in such a manner that it may be vertically slidably moved, and an outer sliding sash 6 is mounted on the outdoor side thereof in the manner such that it may be vertically slidably moved whereby forming a double-hung window.

The above-mentioned inner sliding sash 5 is comprised of left and right auxiliary vertical frames 10, 10 and an inner sliding sash unit 11. The inner sliding sash unit 11 is a glazed panel of the type commonly used, i.e., a glass 15 fitted in a rectangular stile-rail assembly which is formed by an upper rail 12, a lower rail 13, and left and right stiles 14, 14. Each of the auxiliary vertical frames 10, 10 has a socket member 16 attached to the lower part thereof, and a connecting member 17 connected to the upper part thereof. As shown in Fig. 4, the socket members 16 and the

connecting members 17 are arranged so as to be slidably moved up and down freely along indoor side guide recesses 18 of the vertical frame members 4, 4 so that the left and right auxiliary vertical frames 10, 10 may be slidably moved up and
5 down.

Each of the auxiliary vertical frames 10 and each of the stiles 14 are pivotally connected by means of a hinge 9 at the lower parts thereof so that the stiles 14 may be inclined inwardly about the hinge. Further, an inner sliding sash
10 lock 20 is mounted on the upper portion of each of the auxiliary vertical frames 10 and that of each of the stiles 14.

As shown in Figs. 6, 7 and 8, the above-mentioned hinge 9 comprises a pin-shaped insertion member 21 fitted to the
15 lower part of the auxiliary vertical frame 10, and a plate-shaped engaging member 22 fitted to the lower part of the stile 14. The engaging member 22 has an engaging recess 23 formed therein and adapted to be engaged from above with the insertion member 21 so that the stile 14 may be turned.

20 Further, an arm 24 is pivotally connected to the stile 14 at one end thereof by means of a pin 25, has a pin 26 attached to the other end thereof and which is slidably fitted in an elongated hole 28 formed in a longitudinal plate 27, which is fitted to the above-mentioned auxiliary vertical frame 10,
25 whereby forming an inward inclination stopper 29 for the

inner sliding sash unit 11.

Further, in Fig. 6, reference numeral 80 denotes a bal-
ancer of which fixed side 80a is connected to the side of the
upper frame 2 and whose movable side 80b is connected to the
5 socket member 16 so that the weight of the inner sliding sash
5 can be carried and held at a predetermined vertical position.
Each of the above-mentioned connecting members 17 has a
notched recess 17a formed therein for insertion of the
movable member 80b as shown in Fig. 4, and has also grooves
10 17b each adapted to engage with each one of projections 18a
formed in an indoor side guide recess 18.

As shown in Figs. 9 and 10, each of the above-mentioned
inner sliding lock 20 comprises a lock body 30 adapted to be
fitted in a hollow portion 12a of the upper rail 12 so as to
15 be fixedly secured thereto, and a locking rod 31 adapted to
be fitted in an inward recess 10a formed in the auxiliary
vertical frame 10 and which is arranged to be horizontally
slidably moved along a guide groove 32 formed in the body 30,
and a connecting rod 33 arranged to be slidably moved up and
20 down and biased downwardly by means of a spring 34. The
connecting rod 33 has a knob 36 attached thereto and which
projects above the elongated hole 35 formed in the lock body
30. The knob 36 consists of a lower cylindrical body 36a
and an upper rectangular body 36b. The above-mentioned
25 elongated hole 35 has a first circular recess 37 and a second

circular recess 38 formed therein on the longitudinal both sides thereof and in each of which the lower cylindrical body 36a can be fitted. The arrangement is made such that when the knob 36 is held and lifted by the operator's hand to pull up the connecting rod 33 against the biasing force of the spring 34 the lower cylindrical body 36a is withdrawn either from the first circular recess 37 or from the second circular recess 38, and when the connecting rod 33 is moved in the elongated hole 35 the locking rod 31 is moved either to a projecting position where it is fitted in the inward recess 10a of the auxiliary vertical frame 10 or to a withdrawal position where it is withdrawn therefrom, and further when the knob 36 is released from the operator's hand the lower cylindrical body 36a is fitted either in the first circular recess 37 or in the second circular recess 38 by the resilient force of the spring 34 so that the locking rod 31 may be held either at the above-mentioned projecting position or at the withdrawal position.

The above-mentioned outer sliding sash 6 comprises, as shown in Fig. 1, left and right auxiliary vertical frames 40, 40 and an outer sliding sash unit 41. The outer sliding sash unit 41 is a glazed panel of the type commonly used, i.e., a glass 45 fitted in a rectangular stile-rail assembly which is formed by an upper rail 42, a lower rail 43, and left and right stiles 44, 44. Each of the auxiliary

vertical frames 40 has a socket member 46 attached to the lower part thereof, and a connecting member 47 connected to the upper part thereof. As shown in Fig. 5, the socket members 46 and the connecting members 47 are arranged so as to be slidably moved up and down freely along outdoor side guide recesses 48 so that the left and right auxiliary vertical frames 40, 40 may be slidably moved up and down.

Each of the auxiliary vertical frames 40 and each of the stiles 44 are pivotally connected by means of a hinge 49 at the lower parts thereof so that the stiles 44 may be inclined inwardly about the hinge. Further, an outer sliding sash lock 50 is mounted on the upper portion of each of the auxiliary vertical frames 40 and that of each of the stiles 44.

The above-mentioned hinge 49 comprises, as shown in Figs. 11, 12 and 13, a pin-shaped insertion member 51 fitted to the lower part of the auxiliary vertical frame 40, and a plate-shaped engaging member 52 fitted to the lower part of the stile 44. The engaging member 52 has an engaging recess 53 formed therein and adapted to be engaged from above with the insertion member 51 so that the stile 44 may be turned. Further, an arm 54 is pivotally connected to the stile 44 at one end thereof by means of a pin 55, and has a pin 56 attached to the other end thereof and which is slidably fitted in an elongated hole 58 formed in a longitudinal plate 57, which is fitted to the above-mentioned auxiliary

vertical frame 40, whereby forming an inward inclination stopper 59 for the outer sliding sash unit 41.

Further, in Fig. 11, reference numeral 60 denotes a balancer whose fixed side 60a is connected to the side of the upper frame 2 and whose fixed side 60b is connected to a socket member 46 so that the weight of the outer sliding sash 6 can be carried and held at a predetermined vertical position. Each of the above-mentioned connecting members 47 has a notched recess 47a formed therein for insertion of the movable member 60b as shown in Fig. 5, and has also grooves 47b each adapted to engage with each one of projections 48a formed in an outdoor side guide recess 48.

Each of the above-mentioned outer sliding sash lock 50 comprises, as shown in Figs. 5, 14 and 15, a lock body 61 adapted to be fitted in a recessed groove 42a which opens towards the indoor side and a hollow portion 42b of the upper rail 42 so as to be fixedly secured thereto, and a locking rod 62 adapted to be fitted in an inward recess 40a formed in the auxiliary vertical frame 40 and which is arranged to be horizontally slidably moved along a guide groove 63 formed in the body 61, and a connecting rod 64 arranged to be horizontally slidably moved and biased inwardly by means of a spring 65. The connecting rod 64 has a knob 67 attached thereto and which projects outside an elongated hole 66 formed in the lock body 61. The knob 67

consists of a lower cylindrical body 67a and an upper rectangular body 67b. The above-mentioned elongated hole 66 has a first circular recess 68 and a second circular recess 69 formed therein on the longitudinal both sides thereof and in each of which the lower cylindrical body 67a can be fitted. The arrangement is made such that when the knob 67 is held and lifted by the operator's hand to pull up the connecting rod 67 against the biasing force of the spring 65 the lower cylindrical body 67a is withdrawn either from the first circular recess 68 or from the second circular recess 69, and when the connecting rod 67 is moved in the elongated hole 67 the locking rod 62 is moved either to a projecting position where it is fitted in the inward recess 40a of the auxiliary vertical frame 40 or to a withdrawal position where it is withdrawn therefrom, and further when the knob 67 is released from the operator's hand the lower cylindrical body 67a is fitted either in the first circular recess 68 or in the second circular recess 69 so that the locking rod 62 may be held either at the above-mentioned projecting position or at the withdrawal position.

Thus, the inner sliding sash 5 can be slidably moved up and down freely as shown in Figs. 2 and 3 by allowing it to slidably move up and down through the connecting members 17 and socket members 16 along the indoor side guide recesses 18. When the inner sliding sash 5 is slidably moved to its

lowermost position and the locking rod 31 of the inner sliding sash lock 20 is set at its withdrawal position as shown in Fig. 3, the locking rod 31 is withdrawn from the inward recess 10a of the auxiliary vertical frame 10 so that the inner sliding sash unit 10 may be inclined inwardly about the hinge 19, thereby making it possible to clean the outer surface of the inner sliding sash unit 11 readily.

Further, since the upper rail 2 has an inner sliding sash receiving recess 70 formed on the indoor side thereof and the outer portion 3a of the lower rail 3 is lower than the inner portion 3b thereof and is of a stepwise configuration, if the inner sliding sash 5 is located at its lowermost position and the outer sliding sash 6 is located at its uppermost position as shown in Fig. 3, then the upper portion of the inner sliding sash 5; that is, the upper rail 12 will overlap the lower portion of the outer sliding door 6; that is, the lower rail 43 with each other in the vertical direction so that the window frame 1 can be closed. Whilst, if the inner sliding sash 5 is located to its uppermost position and the outer sliding sash 6 is located at its lowermost position in the reverse manner as shown in Fig. 2, then the lower portion of the inner sliding sash 5; that is, the lower rail 13 is vertically spaced apart from the upper portion of the outer sliding sash 6; that is, the upper rail 42 by a distance W. If, in this condition, the locking rods

62 of the outer sliding sash locks 50 are moved to their withdrawal positions to withdraw them from the inward recesses 40a formed in the auxiliary vertical frames 40, then the outer sliding door unit 41 can be inclined inwardly about the hinge 49 thereby making it possible to clean the outer surface of the glass of the outer sliding sash unit 41 readily.

Further, in order to achieve the same functions obtainable by the arrangement as shown in Figs. 2 and 3, it is possible to form only the inner sliding sash receiving recess 70 in the upper frame 2, or form only the lower frame 3 stepwise.

Stating in brief, it is only necessary to define the configuration of the upper frame 2 or the lower frame 3 in such a manner that when the inner sliding sash 5 is located at its lowermost position and the outer sliding sash 6 is located at its uppermost position the upper portion of the inner sliding sash 5 overlaps the lower portion of the outer sliding sash 6, whilst when the inner sliding door 5 is located at its uppermost position and the outer sliding sash 6 is located at its lowermost position the lower portion of the inner sliding sash 5 is spaced apart from the upper portion of the outer sliding sash 6.

Further, if it is desired to clean the outer surface of the glass readily, it is only necessary to mount the inner

and outer sliding sashes 5 and 6 in the auxiliary stile-rail assembly so that the inner and outer sliding sash units can be inclined inwardly around their respective hinges, or make arrangement to allow the auxiliary vertical frames 10, 40 and the stiles of the auxiliary stile-rail assembly to slidably move directly along the left and right vertical frames 4, 4 of the window frame 1, or alternatively make arrangement to allow inner and outer slides to slide freely along the left and right vertical frames 4, 4 of the window frame and connect the inner and outer sliding sash units to the inner and outer slides so that the inner and outer sliding sash units can be inclined inwardly about their respective hinges.

It is to be understood that the foregoing description is merely illustrative of preferred embodiments of the present invention, and that the scope of the invention is not to be limited thereto, but is to be determined by the scope of the appended claims.



CLAIMS: -

1. A double-hung window comprising: - an inner sliding sash mounted so as to be slidably moved up and down freely within a window frame on an indoor side thereof; an inner sliding sash unit hingedly mounted on said inner sliding sash so that said inner sliding sash unit can be inclined inwardly; an outer sliding sash mounted so as to be slidably moved up and down freely within said window frame on an outdoor side thereof; and an outer sliding sash unit hingedly mounted on said outer sliding sash mounted thereon so that said outer sliding sash unit can be inclined inwardly; said double-hung window being characterized in that said window frame has upper and lower frames configured such that when said inner sliding sash is located at its lowermost position and said outer sliding sash is located at its uppermost position the upper portion of the inner sliding sash overlaps the lower portion of the outer sliding sash with each other, whilst when said inner sliding sash is located at its uppermost position and said outer sliding sash is located at its lowermost position the lower portion of the inner sliding sash is spaced apart from the upper portion of the outer sliding sash.

2. A double-hung window as claimed in claim 1, characterized in that said inner sliding sash comprises said inner sliding sash unit, auxiliary vertical frames connected, respectively, to left and right stiles of the inner sliding sash unit, hinges fixedly secured, respectively, to the lower



parts of the opposite inside portions of the auxiliary vertical frames, engaging members fixedly secured, respectively, to the lower parts of the outside portions of the left and right stiles of said inner sliding sash unit and which are engaged with said hinges so that the inner sliding sash unit may be inclined inwardly about its hinge relative to said auxiliary vertical frames, inner sliding sash locks mounted, respectively, across each side of the upper rail of said inner sliding sash unit and each of said left and right auxiliary vertical frames, and connecting members and socket members mounted on said left and right auxiliary vertical frames at upper and lower positions thereof, respectively, so that they may be vertically slidably engaged with indoor side guide recesses formed so as to extend, respectively, in the longitudinal direction of the opposite inside portions of the left and right vertical frame members of the window frame.

3. A double-hung window as claimed in claim 1 or 2, characterised in that said outer sliding sash comprises said outer sliding sash unit, auxiliary vertical frames connected, respectively, to the left and right stiles of the outer sliding door unit, hinges fixedly secured, respectively, to the lower parts of the opposite inside portions of the auxiliary vertical frames, engaging members fixedly secured, respectively, to the lower parts of the outside portions of the left and right stiles of



10 said outer sliding sash unit and which are engaged with
said hinges so that the outer sliding sash unit may be
inclined inwardly about its hinge relative to said auxiliary
vertical frames, outer sliding sash locks, mounted, re-
spectively, across each side of the upper rail of said
outer sliding sash unit and each of said left and right
15 auxiliary vertical frames, and connecting members and
socket members mounted on said left and right auxiliary
vertical frames at upper and lower positions thereof,
respectively, so that they may be vertically slidably
engaged with outdoor side guide recesses formed so as to
20 extend, respectively in the longitudinal direction of the
opposite inside portions of the left and right vertical frame
members of the window frame.
