

S P E C I F I C A T I O N
INWARDLY DEMOUNTABLE SOUNDPROOF SASH WINDOW HAVING
SASH PULL-IN TIGHTENING DEVICE

The present invention relates generally to a sound-
5 proof double sliding sash window of the type having an
interior sash demountable from a window frame toward the
interior side of the sash window. More particularly, the
invention is concerned with an inwardly demountable, sound-
proof double sliding sash window which includes a device for
10 pulling or displacing the interior and exterior sashes from
their fully closed positions toward the interior side to
increase the tightness of a seal between the sashes and
weatherstrips carried on a window frame.

When a soundproof double sliding sash window is
15 closed, interior and exterior sashes are held in sealing
engagement with weatherstrips carried on the horizontal and
vertical members of a window frame, while the meeting stile
of one sash is held in sealing engagement with a weather-
strip carried on the meeting stile of the other sash. Thus,
20 the sound insulation and watertightness of the sash window
are secured. However, in order to avoid interference be-
tween the sashes and the weatherstrips during opening and
closing operation of the sashes, the sashes and the weather-
strips are disposed in closely spaced planes, with the
25 sashes located on the exterior side of the weatherstrips.

Accordingly, when the sashes are fully closed, they are pulled or displaced toward the interior side of the sash window to firmly engage the sashes and the weatherstrips.

For a purpose of achieving the inward pull or
5 displacement of the sashes, the spacing between the weatherstrips and the sashes while being open is preferably as small as possible. However, the smaller the spacing between the interior and exterior sashes, the greater the tendency that one sash while being moved comes into contact with the
10 other sash, causing the other sash to drag with the one sash. To avoid such dragging phenomenon, the interior and exterior sashes must be spaced by a predetermined distance in the direction perpendicular to the plane of the sash window. Accordingly, in order to provide a sufficient
15 degree of airtightness in the sash closed condition while maintaining a smooth opening and closing operation of the sashes, the amount of inward pull or displacement of the sashes being closed must be enlarged to a certain extent while keeping the sufficient spacing between the interior
20 and exterior sashes to avoid the sash dragging problem.

According to one prior attempt disclosed in Japanese Patent Publication No. 2-48718, the amount of inward displacement of the sashes is enlarged by using an extension bolt lock, generally known as a cremorne bolt, which in-
25 cludes a pair of vertically aligned bolts mounted in each of

the meeting stile and the abutment stiles of each sash and adapted to simultaneously project from the top and bottom rails when a lever handle is turned. The cremorne bolt is complicated in construction and hence enlarges the overall
5 size of the sash. Furthermore, to accomplish the inward pull displacement of the sashes, the cremorne bolt requires a complicated mechanism including those components which are disposed circumferentially in a sash frame to interlock the lever handle and the bolts.

10 It is, therefore, an object of the present invention to provide a soundproof double sliding sash window including a sash pull-in tightening device which is simple in construction and is capable of pulling or displacing the interior and exterior sashes toward the interior side of the
15 sash window when the sash window is closed while maintaining a smooth opening and closing operation of the sashes.

In brief, a soundproof double sliding sash window according to the present invention includes a sash pull-in tightening device for pulling or displacing each of the
20 interior and exterior sashes toward the interior side as the sash approaches its fully closed position. The sash pull-in tightening device comprises a first slide block and a second slide block fixedly mounted on a meeting stile and an abutment stile of each sash, respectively, and a first pull-in
25 member and a second pull-in member fixedly mounted on a

corresponding guide rail and a corresponding side jamb,
respectively, of a window frame and engageable with the
first and second slide blocks, respectively. At least one
of the first slide block and the first pull-in member and at
5 least one of the second slide block and the second pull-in
member are beveled such that as the sash approaches its
fully closed position, the first and second slide blocks are
brought into engagement with the first and second pull-in
members, respectively, and subsequently displaced by the
10 first and second pull-in members toward the interior side of
the sash window.

The sash pull-in tightening device is simple in
construction, able to prevent one sash from dragging with
the other sash when the other sash is opened and closed, and
15 completes the inward pull or displacement of the sash before
the arrival of the sash at its fully closed position.

The first slide block attached to the meeting stile
is disposed adjacent to the corresponding guide rail of each
of a header and a sill and engageable with at least an
20 interiorly facing surface of the guide rail to limit move-
ment of the sash in the direction perpendicular to the plane
of the sash window during the opening and closing operation
of the sash. The first pull-in member, engageable with the
first slide block, is attached to the interiorly facing
25 surface of the guide rail at a position which is correspond-

ing to the position of the meeting stile when the sash is fully closed.

The second slide block attached to the abutment stile at a side facing the corresponding side jamb. The
5 second pull-in member, engageable with the second slide block, projects from an inner surface of the side jamb facing the abutment stile and is located at a position which is corresponding to the position of the abutment stile when the sash is closed. The second pull-in member is engageable
10 with the second slide block when the sash is disposed near the fully closed position.

The first and second slide blocks have contact surfaces which are slidably engageable with corresponding contact surfaces of the first and second pull-in members.
15 At least one of the contact surface of the first slide block and the contact surface of the first pull-in member, and at least one of the contact surface of the second slide block and the contact surface of the second pull-in member are beveled such that the beveled contact surfaces incline from
20 the exterior side to the interior side when viewed in a direction from an open position toward the fully closed position of the sash. When the sash is moved from the open position toward the fully closed position, the first and second slide blocks are brought into engagement with the
25 first and second pull-in members, respectively, and subse-

with the other sash during the opening and closing operation of the sashes.

The above and other objects, features and advantages of the present invention will become manifest to those
5 versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example. In the drawings:--

10 FIG. 1 is a plane view of a soundproof double sliding sash window incorporating therein a sash pull-in tightening device according to the present invention, the view showing the condition in which a slide block mounted to the meeting stile adjacent a top rail of an exterior sash is
15 brought into engagement with the corresponding pull-in member;

FIG. 2 is a view similar to FIG. 1, but showing the condition in which the slide block has been pulled or displaced toward the interior side of the sash window by the
20 pull-in member;

FIG. 3 is a view similar to FIG. 1, but showing the condition in which a slide block mounted on the abutment stile adjacent the top rail of the exterior sash is brought into engagement with the corresponding pull-in member;

25 FIG. 4 is a view similar to FIG. 3, but showing the

condition in which the slide block has been pulled or displaced toward the interior side of the sash window by the pull-in member;

FIG. 5 is a view similar to FIG. 4, but showing the condition in which the interior and exterior sashes are pulled together by a crescent sash lock;

FIG. 6 is a plan view of the sash pull-in tightening device incorporated in the soundproof double sliding sash window, the view showing the condition in which a slide block mounted on the meeting stile adjacent to a bottom rail of the exterior sash is brought into engagement with the corresponding pull-in member;

FIG. 7 is a view similar to FIG. 6, but showing the condition in which the slide block has been pulled or displaced toward the interior side of the sash window by the pull-in member;

FIG. 8 is a view similar to FIG. 6, but showing the condition in which a slide block mounted on the abutment stile of the exterior sash is brought into engagement with the corresponding pull-in member;

FIG. 9 is a view similar to FIG. 8, but showing the condition in which the slide block has been pulled or displaced toward the interior side of the sash window by the pull-in member;

FIG. 10 is a view similar to FIG. 9, but shewing

the condition in which the interior and exterior sashes are pulled together by the crescent sash lock;

FIG. 11 is a vertical cross-sectional view of the sash window showing the interior and exterior sashes before
5 they are pulled together;

FIG. 12 is a view similar to FIG. 11, but showing the interior and exterior sashes after they are pulled together;

FIG. 13 is a diagrammatical front elevational view
10 showing an arrangement of weatherstrips carried on exterior surfaces of the window frame; and

FIG. 14 is a perspective view showing the positional relationship between a slide block on the meeting stile and the corresponding pull-in member.

15 As shown in FIGS. 1, 11 and 12, a soundproof double sliding sash window according to the present invention includes a window frame 7 (FIG. 11) adapted to be mounted within an opening of a building wall (not shown) and defining a window opening, a pair of relatively horizontally
20 movable, overlapping interior and exterior sashes 8 and 9 mounted within the window frame 7 in parallel, closely spaced planes. When the sash window is closed, the sashes 8, 9 are held in sealing engagement with weatherstrips 10 -
15 carried on exterior surfaces of the window frame 7. The
25 interior sash 8 is demountable from the window frame 7.

toward the interior side of the sash window.

The window frame 7 includes a header 71 (FIG. 11), a sill 72 (FIG. 11), and a pair of left and right side jambs 73, 73 (FIG. 1) connected to the header and sill 71, 72 at their ends. As shown in FIGS. 11 and 12, the header 71 has a pair of parallel spaced, interior and exterior top guide rails 711, 711 downwardly projecting therefrom. Similarly, the sill 72 has a pair of interior and exterior bottom guide rails 721, 721 upwardly projecting therefrom and substantially vertically aligned with the interior and exterior top guide rails 711, 711, respectively. Each of the interior and exterior sashes 8, 9 is horizontally, slidably supported between a corresponding pair of top and bottom guide rails 711, 721.

Each of the interior and exterior sashes 8, 9 includes a top rail 83, 93 (FIG. 11), a bottom rail 84, 94 (FIG. 11), a meeting stile 81, 91 (FIG. 1), and an abutment stile 82, 92 (FIG. 1) that are connected at their ends so as to form a rectangular sash frame.

The sash window further includes a sash pull-in tightening device 1 (FIG. 1) for automatically pulling or displacing each of the sashes 8, 9 toward the interior side of the sash window to firmly engage the sashes 8, 9 and the weatherstrips 10 - 15 as the sashes 8, 9 are moved into their fully closed positions.

The sash pull-in tightening device 1 comprises a first slide block 2 fixedly mounted on the meeting stile 81, 91 of each of the interior and exterior sashes 8, 9, a first pull-in member 3 fixedly mounted on each of the header 71 and the sill 72 and engageable with the first slide block 2, a second slide block 4 fixedly mounted on the abutment stile 82, 92 of each sash 8, 9, and a second pull-in member 5 projecting from each of the side jambs 73 and engageable with the second slide block 4. The first and second pull-in members 3, 5 are engageable with first and second slide blocks 2, 4, respectively, to force the slide blocks 2, 4 toward the interior side of the sash window to pull or displace each respective sash 8, 9 toward the interior side as the sash 8, 9 approaches its fully closed position.

As shown in FIGS. 1 and 11, the first slide block 2 is attached to the meeting stile 81, 91 of each sash 8, 9 adjacent each of the top guide rail 711 and the corresponding bottom guide rail 721. The first slide block 2 is engageable with at least an interior surface of each of the top guide rail 711 and the bottom guide rail 721 to limit transverse displacement of the sash 8, 9 (viz., the displacement in the direction perpendicular to the plane of the sash window) during the opening and closing operation of the sash 8, 9. The first slide block 2 has an engagement strip 21 disposed on the interior side of each of the top and

bottom guide rails 711, 721 for engagement with the guide rail 711, 721. The engagement strip 21 has a contact surface 23 facing exteriorly and engageable with the guide rail 711, 721 and the first pull-in member 3. In the illustrated embodiment, the first slide block 2 mounted on the exterior sash 9 adjacent the head 71 has two confronting engagement strips 21, 22 disposed astride the exterior top guide rail 711 for engagement respectively with interior and exterior surfaces of the exterior top guide rail 711. In this case, the first pull-in member 3 is engageable with the exteriorly facing contact surface 23 of the interior engagement strip 21. To attach the first slide block 2 to the meeting stile 81, 91, the first slide block 2 is firmly fitted in a hollow interior space of the meeting stile 81, 91.

The first pull-in member 3 is fixedly mounted on the interior surface of each of the top rail 711 and the corresponding bottom rail 721 at a position which corresponds to the position of the meeting stile 81, 91 of a corresponding one of the interior and exterior sashes 8, 9 when the corresponding sash 8, 9 is disposed in its fully closed position. As shown in FIGS. 11 and 14, the first pull-in member 3 is secured to the head 71 or the sill 72 by means of a screw (not shown) threaded into the head 71 or the sill 72 through a hole (shown in FIG. 14) formed in an integral flange 31 of the first pull-in member 3. The first

pull-in member 3 has an interiorly facing contact surface 32 which is engageable with the exteriorly facing contact surface 23 of the first slide block 2.

At least one of the contact surface 23 of the interior engagement strip 21 of the first slide block 2 and the contact surface 32 of the first pull-in member 3 is beveled or slanted such that the beveled contact surface 23, 32 inclines from the exterior side toward the interior side when viewed in a direction from an open position toward the closed position of the sash 8, 9. In other word, the contact surface 23, 32 is beveled at an operative edge from which the contact surface 23, 32 moves into engagement with the mating contact surface 32, 23. That is, the beveled operating edge is a front edge as viewed from the direction of movement of the sash 8, 9 when the sash 8, 9 is closed. With the contact surfaces 23, 32 thus profiled, the first slide block 2 is smoothly brought into engagement with the first pull-in member 3 and then gradually displaced toward the interior side of the sash window by the first pull-in member 3 as the interior sash 8 or the exterior sash 9 approaches its fully closed position.

The first slide block 2 is displaced toward the interior side of the sash window by a distance which is equal to an extent of the first pull-in member 3 which projects interiorly from the top guide rail 711 or the

bottom guide rail 721. In the case of the first slide block 2 which is disposed on the exterior sash 9 adjacent the header 71, the exterior engagement strip 22 is also engageable with the top guide rail 711. In order to permit the inward movement of the exterior sash 9, the exterior top guide rail 711 has a recess 712 (FIGS, 1 and 14) opening exteriorly for receiving therein the exterior engagement strip 22 when the first slide block 2 is displaced toward the interior side as the exterior sash 9 approaches its fully closed position.

As shown in FIG. 1, the second slide block 4 is attached to the abutment stile 82, 92 of each sash 8, 9 and located at a side facing the corresponding side jamb 73. The second slide block 4 serves either independently, or in cooperation with the first slide block 2, to pull or displace the corresponding sash 8, 9 toward the interior side of the sash window. The second slide block 4 has a wedge-shaped engagement strip 41 tapering toward the corresponding side jamb 73. The engagement strip 41 has an exteriorly facing contact surface 42 engageable with the second pull-in members 5. The second slide block 4 is firmly fitted in a hollow interior space of the abutment stile 82, 92 in the same manner as the first slide block 2.

The second pull-in member 5 projects from the inner surface of each of the side jambs 73 into the window opening

and is disposed in a position which is corresponding to the position of the abutment stile 82, 92 of a corresponding one of the sashes 8, 9. When the corresponding sash 8, 9 is closed, the second pull-in member 5 is engaged with the second slide block 4 mounted on the abutment stile 82, 92 of the sash 8, 9. The second pull-in member 5 has an interiorly facing contact surface 51 engageable with the engagement strip 41 of the second slide block 4. In the illustrated embodiment, the second pull-in member 5 is formed by a longitudinal portion of a vertical fin extending along the length of each side jamb 73.

At least one of the contact surface 42 of the engagement strip 41 of the second slide block 4 and the contact surface 51 of the second pull-in member 5 is slanted or beveled such that the beveled contact surface 42, 51 inclines from the exterior side toward the interior side when viewed in a direction from an open position toward the fully closed position of the sash 8, 9. In other word, the contact surface 42, 51 is beveled at an operative edge from which the contact surface 42, 51 moves into engagement with the mating contact surface 51, 42. That is, the beveled operating edge is a front edge as viewed from the direction of movement of the sash 8, 9 when the sash 8, 9 is closed. With the contact surfaces 42, 51 thus profiled, the second slide block 4 is smoothly brought into engagement with the

second pull-in member 5 and then gradually displaced toward the interior side of the sash window by the second pull-in member 3 as the interior sash 8 or the exterior sash 9 approaches its fully closed position. The amount of inward displacement of the second slide block is equal to an extent of the contact surface 51 of the second pull-in members 5 in the direction of perpendicular to the plane of the sash window.

The first and second slide blocks 2, 4 and the first and second pull-in members 3, 5 of the sash pull-in tightening device 1 are associated, in pairs, with each of the top rail 83 and the bottom rail 84 of the interior sash 8 and with each of the top rail 93 and the bottom rail 94 of the exterior sash 9, so as to pull or displace the respective sashes 93 toward interior side as the sashes approach their fully closed positions. With The sashes thus displaced, the top and bottom rails 83, 84 of the interior sash 8 and the top and bottom rails 93, 94 of the exterior sash 9 are firmly engaged with the weatherstrips 10 and 12; 11 and 13, respectively.

Referring now to FIGS. 1 through 5, there is shown the manner in which the exterior sash 9, as it is closed, is displaced toward the interior side of the sash window. FIGS. 1 - 5 show an upper portion of the sash pull-in tightening device 1 associated with the top rail 83, 93 of each

of the interior and exterior sashes 8, 9. For purposes of illustration, operation begins with parts in the condition shown in FIG. 1, in which the exterior sash 9 is moved to a position shortly ahead of its fully closed position, the first slide block 2 associated with the exterior sash 9 has just come into engagement with the first pull-in member 3, and the interior sash 8 is fully closed and hence has already pulled or displaced toward the interior side by means of the sash pull-in tightening device 1.

As the exterior sash 9 is further moved in the sash closing direction from the position of FIG. 1 to the position shown in FIG. 2, the contact surface 23 of the interior engagement strip 21 is brought into sliding engagement with the contact surface 32 of the first pull-in member 3. With this engagement between the contact surfaces 23, 32, the first slide block 2 is displaced by the first pull-in member 3 toward the interior side, thereby forcing the exterior sash 9 toward the interior side. Thus, the exterior sash 9 is displaced toward the interior side by a distance which is equal to an extent of the first pull-in member 3 which projects from the exterior top guide rail 711 toward the interior side of the sash window.

A further advancing movement of the exterior sash 9 causes the engagement strip 41 of the second slide block 4 to engage the second pull-in member 5 on the side jamb 73,

as shown in FIG. 3. As the advancing movement of the exterior sash 9 continues, the engagement strip 41 is gradually displaced toward the interior side, thereby forcing the exterior sash 9 toward the interior side, as shown in FIG.

5 4. In this instance, the amount of displacement of the exterior sash 9 is equal to an extent of the contact surface 42 of the engagement strip 41 in the direction perpendicular to the plane of the sash window. In the illustrated embodiment, the engagement between the first slide block 2 and the
10 first pull-in member 3 and the engagement between the second slide block 4 and the second pull-in member 5 take place separately such that the inward displacement of the exterior sash 9 caused by the inward displacement of the second guide block 4 occurs after the inward displacement of the exterior
15 sash 9 caused by the inward displacement of the first guide block 2. Since the exterior sash 9 is pulled or displaced interiorly at two stages, it becomes necessary to pull the abutment stile 92 and the meeting stile 91 evenly toward the interior side as the exterior sash 9 is displaced interiorly
20 depending on the inward displacement of the second slide block 4. To this end, a wedge-shaped third pull-in member 6 is mounted on the interior side of the meeting stile 91 of the exterior sash 9. The wedge-shaped third pull-in member 6 is engageable with a wedge-shaped angled plate 811 on the
25 meeting stile 81 of the interior sash 8 in synchronism with

the engagement between the second slide block 4 and the second pull-in member 5. The third pull-in member 6 is attached to an angled plate 911 projecting interiorly from the meeting stile 91 of the exterior sash 9 and facing toward the exterior side. When the second slide block 4 of the abutment stile 92 comes into engagement with the second pull-in member 5, an exteriorly facing contact surface 61 of the wedge-shaped third pull-in member 6 is brought into engagement with the wedge-shaped angled plate 811 of the interior sash 8. Upon engagement with the angled plate 811, the third pull-in member 6 is displaced toward the interior side, so that the meeting stile 91 of the exterior sash 9 is pulled or displaced interiorly by a distance equal to the amount of inward displacement of the third pull-in member 6, as shown in FIG. 4. In order to equalize the amount of displacement of the abutment stile 92 and the amount of displacement of the meeting stile 91, the contact surface 42 on the wedge-shaped engagement strip 41 of the second slide block 4 has the same angle of inclination as the wedge-shaped third pull-in member 6.

The exterior sash 9 shown in FIG. 4 is displaced interiorly from the position of FIG. 1 by a distance which is equal to the sum of the displacement caused due to the engagement between the first slide block 2 and the first pull-in member 3 and the displacement caused due to the

engagement between the second slide block 4 and the second pull-in member 5.

After the exterior sash 9 is moved to its fully closed position shown in FIG. 4, a crescent sash lock (not shown) is secured whereupon the exterior sash 9 is further pulled toward the interior sash 8. The inward displacement of the exterior sash 9 is thus completed.

FIGS. 6 through 10 illustrate the operation of the sash pull-in tightening device 1 associated with the bottom rail 84, 94 of each of the interior and exterior sashes 8, 9. In this case, by virtue of the engagement between the first slide block 2 and the first pull-in member 3, the engagement between the second slide block 4 and the second pull-in member 5, and the engagement between the third pull-in member and the angled plate 811, the exterior sash 9 is pulled in the same manner as described above with respect to the operation of the sash pull-in tightening device 1 associated with the top rail 83, 93 of each sash 8, 9.

When the exterior sash 9 is fully pulled or displaced toward the interior side, the sashes 8, 9 are firmly engaged with the weatherstrips 10 - 15, as shown in FIGS. 10 and 12.

When the interior and exterior sashes 8, 9 are disposed in the fully closed position shown in FIG. 11, the top rail 83 of the interior sash 8 and the top rail 93 of

the exterior sash 9 are firmly engaged with the first weatherstrip 10 and the second weatherstrip 11, respectively.

The first and second weatherstrips 10, 11 are carried on the exterior surface of the interior top guide rail 711 of the header 71 in vertical juxtaposition and extend in the longitudinal direction of the interior top guide rail 711.

Similarly, the bottom rail 84 of the interior sash 8 and the bottom rail 94 of the exterior sash 9 are firmly engaged with the third weatherstrip 12 and the fourth weather strip 13, respectively, which are carried on the exterior surface of the interior bottom guide rail 721 of the sill 72 in vertical juxtaposition and extend in the longitudinal direction of the interior bottom guide rail 721. On the other hand, the abutment stile 82 of the interior sash 8 and the abutment stile 92 of the exterior sash 9 are firmly engaged with the fifth weatherstrip 14 and the sixth weatherstrip 15, respectively, which are carried on the side jambs 73, 73, respectively, to face toward the exterior side and extend in the longitudinal direction of the side jambs 73.

Similarly, a weatherstrip 18, which is carried on the interior side of the meeting stile 91 of the exterior sash 9 and extends along the length of the meeting stile 91, is firmly engaged with the exterior surface of the meeting stile 81 of the interior sash 8. With this arrangement of seals, sufficient sound insulation and waterproofing are secured between

the sashes 8, 9 and the window frame 7.

As shown in FIG. 11, the interior sash 8 has an exterior plate 841 downwardly projecting therefrom. Since the distance H_1 between a lower end of the exterior plate 841 and an upper end of the interior bottom guide rail 721 of the sill 72 is smaller than the amount of allowable vertical displacement of the interior sash 8 (which is determined by a smaller one of the distance H_2 between the top rail 83 and the header 71 measured at an upper end of the top rail 83 and the distance H_3 between the top rail 83 and the header 71 measured at the lower end of the interior top guide rail 711), the interior sash 8 can be removed from the window frame 7 toward the interior side of the sash window. To remove the interior sash 8, the interior sash 8 is lifted up into the space between the top rail 83 and the header 71, and while keeping this condition, the interior sash 8 is pulled interiorly to turn about its upper edge.

The first and second weatherstrips 10, 11 with which the top rails 83, 93 are firmly engaged, respectively, are fitted in a pair of parallel juxtaposed horizontal grooves or pockets 713, 713, respectively, formed longitudinally in the interior top guide rail 711 of the header 71. The pockets 713, 713 open toward the exterior side of the header 71, so that the weatherstrips 10, 11 received in the pockets 713, 713 are faced exteriorly. Similarly, the third

and fourth weatherstrips 12, 13 respectively engageable with the bottom rails 84, 94 are fitted in a pair of parallel juxtaposed horizontal grooves or pockets 722, 722, respectively, formed longitudinally in the interior bottom guide rail 721 of the sill 72. The pockets 722, 722 open toward the exterior side of the sill 72, so that the weatherstrips 12, 13 received in the pockets 722, 722 are faced exteriorly.

The weatherstrips 10, 12 respectively received in the pockets 713, 722 for sealing engagement with the interior sash 8 are located inwardly of the weatherstrips 11, 13 which are respectively received in the pockets 713, 722 for sealing engagement with the exterior sash 9. The weatherstrips 10, 11 and the weatherstrips 12, 13 extend along the interior top guide rail 711 and the interior bottom guide rail 721, respectively, over a length which is at least equal to the length of the top and bottom rails 83, 84; 93, 94 of the interior and exterior sashes 8, 9.

FIG. 13 diagrammatically shows the arrangement of the weatherstrips 10 - 15 mounted on the exterior surfaces of the window frame 7 along an inner peripheral edge of the window frame 7. The weatherstrip 10 provided for engagement with the top rail 83 of the interior sash 8 extends between an inner surface of the side jamb 73 facing the abutment stile 82 of the interior sash 8, and a substantially central

portion of the header 71 where the meeting stile 81 overlaps with the meeting stile 91 of the exterior sash 9. Similarly, the weatherstrip 11 provided for engagement with the top rail 93 of the exterior sash 9 extends between an inner
5 surface of the side jamb 73 facing the abutment stile 92 of the exterior sash 9, and the substantially central portion of the header 71 where the meeting stile 91 overlaps with the meeting stile 81 of the interior sash 8. At the substantially central portion of the header 71, the weather-
10 strips 10, 11 are integrally connected together. The joint portion between the weatherstrips 10, 11 has an exteriorly facing surface which is sealingly engageable with upper end portions of the respective meeting stiles 81, 91 of the interior and exterior sashes 8, 9.

15 Likewise the weatherstrips 10, 11 on the top rail side, the weatherstrips 12, 13 on the bottom rail side have a length which is equal to the length of the bottom rails 84, 94 of the interior and exterior sashes 8, 9. The weatherstrip 12 provided for engagement with the interior sash 8
20 extends between an inner surface of the side jamb 73 facing the abutment stile 82, and a substantially central portion of the sill 72. The weatherstrip 13 provided for engagement with the exterior sash 9 extends between an inner surface of the side jamb 73 facing the abutment stile 92, and the
25 substantially central portion of the sill 72. The weather-

strips 12, 13 are integrally connected together at the substantially central portion of the sill 72. The joint portion between the weatherstrips 12, 13 has an exteriorly facing surface with which lower end portions of the respective meeting stiles 81, 91 of the interior and exterior sashes 8, 9 are firmly engageable.

As shown in FIG. 6, the side jamb 73 which is engageable with the abutment stile 82 of the interior sash 8 has a longitudinal groove or pocket 731 opening exteriorly for receiving therein the weatherstrip 14. Similarly, the side jamb 73 engageable with the abutment stile 92 of the exterior sash 9 has a longitudinal groove or pocket 732 opening exteriorly for receiving therein the weatherstrip 15. The weatherstrips 14, 15 are fitted in the pockets 731, 732, respectively, and face toward the exterior side of the sash window.

The pocket 731 formed in the side jamb 73 (which is the left side as illustrated in FIGS. 6) is disposed in such a position that the weatherstrip 14 received in this pocket 731 lies in substantially the same vertical plane as the weatherstrips 10, 11, 12, 13 and is engageable with a side flange or plate 821 projecting from the exterior side of the abutment stile 82 toward the side jamb 73 which is the right side in FIG. 6). With this arrangement of the pocket 731, the continuity between the weatherstrip 14 and the weather-

strips 10 - 13 is secured. Similarly, the pocket 732 formed in the left side jamb 73 is disposed in such a position that the weatherstrip 15 received in the pocket 732 is engageable with a side flange or plate 921 projecting from the interior side of the abutment stile 92 toward the left side jamb 73 so as to secure the continuity between the weatherstrip 15 and the weatherstrips 10 - 13. When the interior and exterior sashes 8, 9 are pulled or displaced toward the interior side, as shown in FIG. 10, the abutment stiles 82, 92 are firmly engaged with the weatherstrips 14, 15, respectively, thereby securing the airtightness and watertightness between the sashes 8, 9 and the corresponding side jambs 73.

The weatherstrip 15 adapted to be engaged with the abutment stile 92 of the exterior sash 9 is somewhat displaced toward the exterior side from the common vertical plane of the weatherstrips 10 - 14. However, as shown in FIG. 13, the weatherstrip 15 is connected at its upper end with the weatherstrip 11 by means of a first corner weatherstrip 16 and, at its lower end, with the weatherstrip 13 by means of a second corner weatherstrip 17. With the corner weatherstrips 16, 17 thus provided, the continuity between the weatherstrip 15 and the weatherstrip 11 and also between the weatherstrip 15 and the weatherstrip 13 can be maintained.

As shown in FIG. 6, the meeting stile 91 of the

exterior sash 9 has a longitudinal groove or pocket 912 formed in an interior surface thereof and opening toward the interior side to receive therein the weatherstrip 18. When the interior and exterior sashes 8, 9 are pulled or displaced interiorly, as shown in FIG. 10, the weatherstrip 18 fitted in the pocket 912 is firmly engaged with the exterior surface of the meeting stile 81 of the interior sash 8 to secure the airtightness and watertightness between the interior and exterior sashes 8, 9.

10 By virtue of the weatherstrips 10 - 15 provided along the inner peripheral edge of the window frame 7 and the weatherstrip 18 acting between the respective meeting stiles 81, 91 of the interior and exterior sashes 8, 9, the sash window has sufficient airtightness and watertightness
15 and is able to isolate the interior side of the sash window from the interior side.

As described above, a sash pull-in tightening device according to the present invention includes a first slide block and a second slide block fixedly mounted on a
20 meeting stile and an abutment stile, respectively, of each sash, and a first pull-in member and a second pull-in member fixedly mounted on a corresponding guide rail and a corresponding side jamb, respectively, of a window frame. The first and second pull-in members are engageable with the
25 first and second slide blocks, respectively. The first

slide block has a contact surface engageable with a contact surface of the first pull-in member. Similarly, the second slide block has a contact surface engageable with a contact surface of the second pull-in member. At least one of the
5 contact surface of the first slide block and the contact surface of the first pull-in member and at least one of the contact surface of the second slide block and the contact surface of the second pull-in member are beveled or slanted such that the beveled contact surfaces incline from the
10 exterior side toward the interior side when viewed in a direction from an open position of the sash toward the fully closed position. With the contact surfaces thus profiled, as the approaches its fully closed position, the first and second slide blocks are brought into engagement with the
15 first and second pull-in members and subsequently displaced by the pull-in members toward the interior side. As a consequence of the inward displacement of the slide blocks, the sash is displaced toward the interior side and hence is firmly engaged with weatherstrips carried on the window
20 frame. The sash pull-in tightening device is simple in construction and able to pull or displace the sashes toward the interior side as the sashes approach their fully closed position.

In the case where the first slide block mounted on
25 the meeting stile and the second slide block mounted on the

abutment stile are engaged with the corresponding pull-in members independently from one another, the sash is displaced interiorly by a distance which is equal to the sum of the amount of displacement of the first slide block and the amount of displacement of the second slide block. Thus, the amount of inward pull or displacement of the sash is enlarged. Accordingly, it becomes possible to provide a space between the interior and exterior sashes and a space between the sashes and the weatherstrips, both in the sash opening condition, which are large enough to prevent objectionable interference between the sashes and the weatherstrips and dragging of one sash with the other sash during the opening and closing operation of the sashes.

Obviously, various minor changes and modifications of the present invention are possible in the light of the above teaching. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

There follows a list of parts shown in the drawings:-

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Parts List

- 1: pull-in tightening device of soundproof sash window
- 2: slide block fixed to each of 81 and 91
- 5 3: pull-in member slidably engageable with 2
- 4: slide block fixed to each of 82 and 92
- 5: pull-in member slidably engageable with 4
- 7: window frame
- 8: interior sash
- 10 9: exterior sash
- 10: weatherstrip
- 11: weatherstrip
- 12: weatherstrip
- 13: weatherstrip
- 15 14: weatherstrip
- 15: weatherstrip
- 16: weatherstrip (corner) between 11 and 15
- 17: weatherstrip (corner) between 13 and 15
- 18: weatherstrip on 91 of 9
- 20 21: engagement strip of 2 (interior side)
- 22: engagement strip of 2 (exterior side)
- 23: contact surface (exteriorly facing surface) of 21
engageable with 32 of 3
- 31: flange of 3
- 25 32: contact surface (interiorly facing surface) of 3

- 41: engagement strip of 4
- 42: contact surface (exteriorly facing surface) of 41
engageable with 51 of 5
- 51: contact surface (interior facing surface) of 5
- 5 71: header of 7
- 72: sill of 7
- 73: jamb of 7
- 81: meeting stile of 8
- 82: abutment stile of 8
- 10 83: top rail of 8
- 84: bottom rail of 8
- 91: meeting stile of 9
- 92: abutment stile of 9
- 93: top rail of 9
- 15 94: bottom rail of 9
- 711: top guide rail of 71
- 712: recess formed in 711 for receiving therein 22
- 713: pocket of 71 for weatherstrip 10, 11
- 721: bottom guide rail of 72
- 20 722: pocket of 72 for weatherstrip 12, 13
- 731: pocket of 73 for weatherstrip 14
- 732: pocket of 73 for weatherstrip 15
- 811: hook-shaped engagement member on 81
- 821: outwardly directed exterior plate on 82 of 8
- 25 841: downwardly directed exterior plate on 84 of 8

H1: distance between 841 and 721

911: hook-shaped engagement member on 91

912: pocket of 91 for weatherstrip 18

921: outwardly directed interior plate on 92 of 9

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CLAIMS:

1. A soundproof double sliding sash window comprising:

(a) a window frame including a header, a sill and a pair of side jambs connected to said header and said sill at their ends so as to define a window opening, said header having a pair of parallel spaced top guide rails downwardly projecting therefrom, said sill having a pair of parallel spaced bottom guide rails upwardly projecting therefrom and vertically aligned with said top guide rails, respectively;

(b) a pair of relatively movable, overlapping interior and exterior sashes mounted within said window frame for opening and closing said window opening, said interior and exterior sashes being horizontally slidably supported between one pair of vertically aligned top and bottom guide rails and the other pair of vertically aligned top and bottom guide rails, respectively, said interior sash being demountable from said window frame toward the interior side of said sash window, each of said interior and exterior sashes including a top rail, a bottom rail, and a meeting stile and an abutment stile facing a corresponding one of said side jambs; and

(c) a sash pull-in tightening device for pulling interior and exterior sashes toward the interior side of said sash window to force said sashes against weatherstrips



carried on exteriorly facing surfaces of said window frame as the interior and exterior sashes approach their fully closed positions, said sash pull-in tightening device including

5 (i) a first slide block fixedly mounted on said meeting stile adjacent each of said top guide rail and said bottom guide rail of each top and bottom guide rail pair and engageable with at least an interiorly facing surface of the corresponding guide rail to limit displacement of each respective sash in a direction perpendicular to the plane of said sash window,

(ii) a first pull-in member fixedly mounted on said interiorly facing surface of each guide rail at a position corresponding to the position of said meeting stile 15 of the corresponding sash being closed, said first pull-in member being engageable with said first slide block when the corresponding sash is closed,

(iii) a second slide block fixedly mounted on said abutment stile and disposed at a side facing a corresponding one of said side jambs, and 20

(iv) a second pull-in member projecting from an inner surface of the corresponding side jamb and located at a position corresponding to the position of said abutment stile of the corresponding sash being closed, said second 25 pull-in member being engageable with said second slide block



when the corresponding sash is closed,

wherein said first slide block and said first pull-in member have contact surfaces engageable together, said second slide block and said second pull-in member have
5 contact surfaces engageable together, and at least one of said contact surfaces of said first slide block and said first pull-in member and at least one of said contact surfaces of said second slide block and said second pull-in member are beveled from the exterior side toward the interior side when viewed in a direction from an open position
10 toward the fully closed position of the sash.

2. A soundproof double sliding sash window according to claim 1, wherein said first slide block has an engagement strip disposed on the interior side of said guide
15 rail and having an exteriorly facing surface forming said contact surface of said first slide block.

3. A soundproof double sliding sash window according to claim 2, wherein said exteriorly facing contact surface of said engagement strip is beveled.

20 4. A soundproof double sliding sash window according to claim 3, wherein said contact surface of said first pull-in member faces toward the interior side of said sash window and is beveled.

5. A soundproof double sliding sash window according to claim 1, wherein said first slide block has two
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confronting, interior and exterior engagement strips disposed on interior and exterior sides of said guide rail, said interior engagement strip having an exteriorly facing surface forming said contact surface of said first slide
5 block, said guide rail having a recess opening exteriorly for receiving therein said exterior engagement strip when said first slide block is displaced toward the interior side as the said sash approaches its fully closed position.

6. A soundproof double sliding sash window according to claim 5, wherein said exteriorly facing contact
10 surface of said interior engagement strip is beveled.

7. A soundproof double sliding sash window according to claim 6, wherein said contact surface of said first pull-in member faces toward the interior side of said sash
15 window and is beveled.

8. A soundproof double sliding sash window according to claim 1, wherein the second slide block is displaced by said first pull-in member toward the interior side after said second first slide block is displaced by said first
20 pull-in member toward the interior side.

9. A soundproof double sliding sash window according to claim 8, wherein said sash pull-in tightening device further includes a third pull-in member mounted on the interior side of said meeting stile of said exterior sash and
25 engageable with an angled plate on said meeting stile of



said interior sash to pull or displace said meeting stile of
said exterior sash while said abutment stile of said exteri-
or sash is being displaced interiorly due to engagement
between said second slide block and said second pull-in
5 member.

10. A soundproof double sliding sash window ac-
cording to claim 9, wherein said third pull-in member is
wedge-shaped and has the same angle of inclination as said
beveled contact surface at least one of said second slide
10 block and said second pull-in member.

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