June 8, 1954 W. C. WATKINS 2,680,269

MULTIPLE PANE WINDOW AND DOOR CONSTRUCTION

Filed Sept. 18, 1950 2 Sheets-Sheet 1

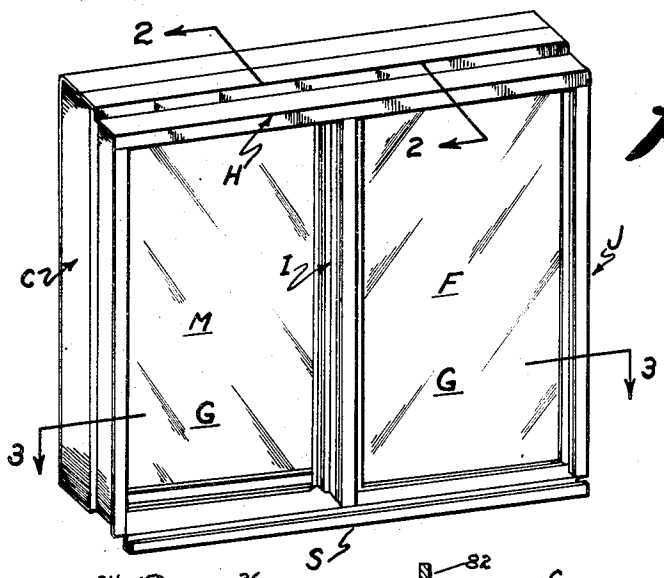


Fig. 1

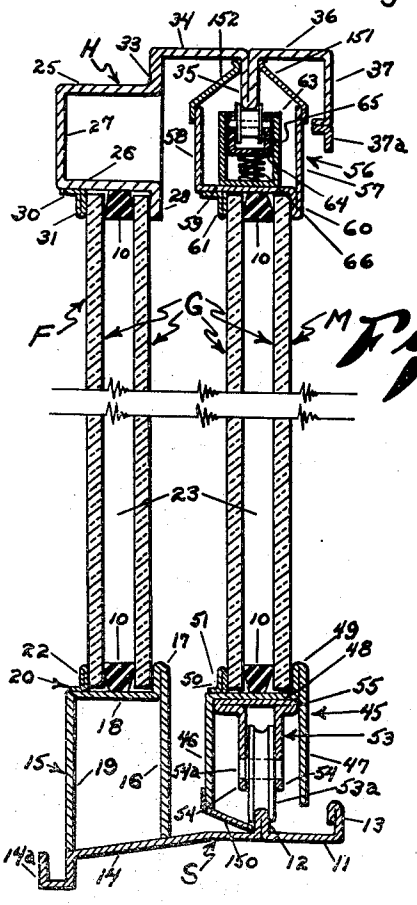


Fig. 2

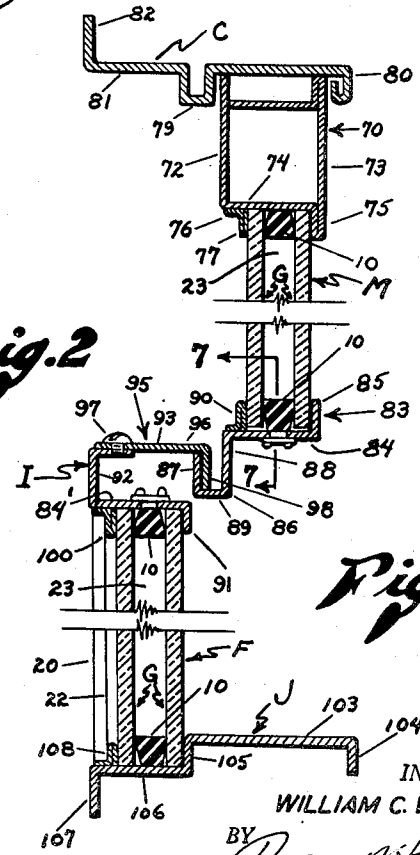


Fig. 3

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June 8, 1954 W. C. WATKINS 2,680,269

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Filed Sept. 18, 1950 2 Sheets-Sheet 2

Fig. 4

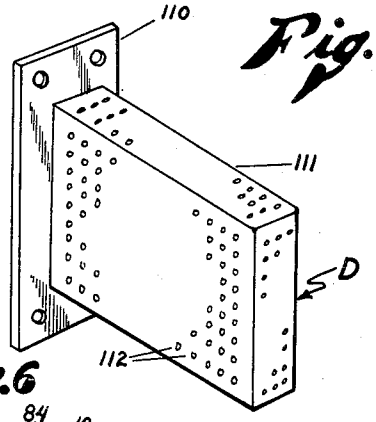


Fig. 5

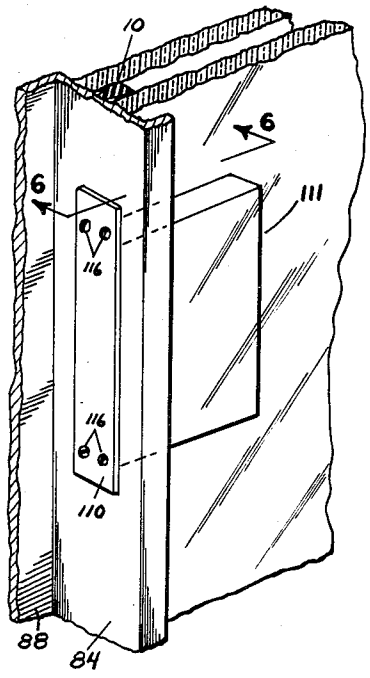
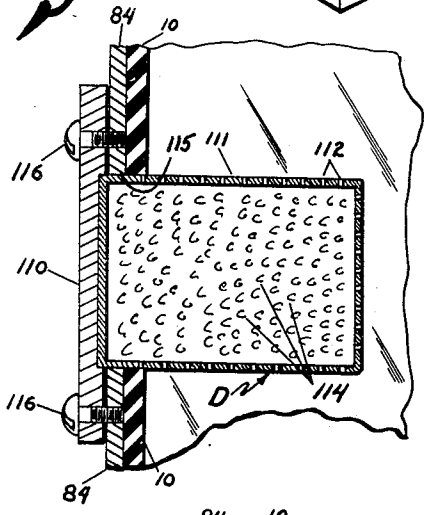


Fig. 6



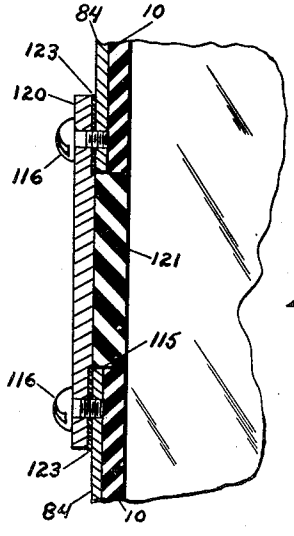


Fig. 7

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MULTIPLE PANE WINDOW AND DOOR CONSTRUCTION

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2 Claims. (Cl. 20—40.5)

1

My invention relates to the field of windows and doors, and more particularly to a door and window having multiple panes forming a part thereof.

Although windows and doors that have a multiple pane construction with a heat insulating medium situated between the panes have been in use for some time, and are now manufactured in considerable volume, these windows have the disadvantage that they must be fabricated at a factory and shipped completely assembled to the location where they are to be used. It will be readily apparent that the packing and shipping of large doors and windows that are glazed require great care and greatly increases the cost of the products to the ultimate purchaser.

Another disadvantage of the presently available multiple pane windows or doors is that they are only fabricated in stock sizes, and the architect or engineer designing a structure must incorporate such stock sizes of windows or doors therein, rather than being able to specify a window or door of the desired or appropriate size.

The primary purpose in devising my present invention is to provide a door or window having multiple panes forming a part thereof, and one that permits the door or window to be assembled on the job, rather than requiring the use of a stock size door or window that must be completely assembled at the factory prior to delivery to the job site.

A major object of my invention is to provide a door or window that is delivered to the job site in an unglazed condition, and is so constructed that multiple panes may be installed in the door or window on the job site, with the space existing between the panes being filled with dry air to prevent frosting of the panes and excessive heat loss when the door or window is used in a cold climate.

Another object of my invention is to supply multiple paned windows and doors that may be fabricated from standard commercially available materials, can be installed by workmen having no more than average skill, and are so constructed that air situated in the space between the panes may be dried after the doors or windows are installed in a home or building.

A still further object of my invention is to furnish a multiple pane door and window of such simplified structure and low cost that it will increase the demand for such devices amongst that portion of the public to which they have hitherto been unavailable due to their high cost.

These and other objects and advantages of my invention will become apparent form the following description of a preferred form thereof, and from the drawing illustrating that form in which:

Figure 1 is a perspective view of one of my multiple pane door or window frames;

2

Figure 2 is a vertical cross-sectional view of my device taken on the line 2—2 of Figure 1;

Figure 3 is a horizontal cross-sectional view of the device taken on the line 3—3 of Figure 1;

Figure 4 is a perspective view of one of my air drying elements;

Figure 5 is a fragmentary perspective view of one of the end pieces of the panels constituting a portion of the door or window, with one of the air drying elements being situated in place therein;

Figure 6 is a vertical cross-sectional view of one of the air drying elements installed in one of the end pieces of the device taken on the line 6—6 of Figure 5, and,

Figure 7 is a fragmentary vertical cross-sectional view of one of the end pieces after the drying element is removed therefrom and taken on line 7—7 of Figure 3.

Referring now to Figure 1 for the general arrangement of my invention it will be seen that the device may be used in either the capacity of a door or window, or a combination of both, and is formed with a fixed panel F, and a longitudinally movable panel M. The device, as may best be seen in Figures 2 and 3, includes a horizontally positioned sill S and head member H, with the member H being supported in the desired position by a fixed jamb J, a closing jamb C, and an interlocking mullion I.

Each of the panels F and M has multiple panes of glass G situated therein, with the panes being separated from one another by a strip of sealing material 10 that extends substantially around the outer edges of each of the panes of glass as will hereinafter be described in detail. Although my multiple pane construction may be used in doors and windows of various designs, I prefer to use it in a door or window that has one or more slidably mounted panels forming a part of the door or window construction.

My window or door, as seen in Figure 1, has the sill S extending longitudinally between the fixed jambs J and the closing jamb C. The sill S preferably has a cross section as shown in Figure 2 that includes a substantially horizontal portion 11 that has the center portion doubled over to form an upwardly and longitudinally extending rail 12, and the inner end of the portion 11 being doubled over to form a lip 13. The outer end of the sill portion 11 develops into a downwardly extending section 14 that terminates on its outer end in a member 14a of U-shaped cross section. A fixed bottom rail 15 extends the longitudinal length of the sill S between the closing jamb C and the fixed jamb J, and has a vertical cross section as seen in Figure 2.

The bottom rail 15 has a vertical cross section that includes an inwardly positioned vertical leg 16 that has the upper portion doubled over to form a flange 17 and an outwardly extending horizontal member 18 that supports two of the panes of glass G thereon, with the outer ends of the member 18 terminating in a downwardly extending leg 19 that rests on the extreme outer end of the sill portion 14. The lower ends of the legs 16 and 19 are welded or otherwise secured to the upper surface of the sill portion 14.

A member 20 of L-shaped cross section extends longitudinally between the fixed interlocking mullion I and the fixed jamb J, and has a vertically positioned flange 22 that engages the lower exterior surface of one of the panes of glass G to prevent outer movement thereof. Two of the panes of glass G, as seen in Figure 2, have the lower portions thereof held in the desired position between flanges 17 and 22, with the sealing strip 10 situated therebetween and forming a space 23 that contains dry air for heat insulating purposes, as will hereinafter be described in detail.

The head member H shown in Figures 1 and 2, extends between the fixed jamb J and closing jamb C. The head member H has a vertical cross section that includes two parallel vertically spaced legs 25 and 26 that are connected on their outer ends by a vertical member 27. The inner end of leg 26 terminates in a downwardly extending flange 28 that engages the inner upper edge of one of the panes of glass G situated in the fixed panel F. A member 30 of L-shaped cross section is affixed to the under side of legs 26, and has a flange 31 that engages the exterior outer surface of one of the panes of glass G. The two panes of glass G are separated from one another by the sealing member 10.

The leg 25 terminates on its inner end in an upright 33 that is bent or otherwise formed to provide a substantially horizontal supporting member 34. The inner end of member 34 is bent downwardly and doubled over to form a vertical and longitudinally extending rail 35 between the fixed jamb J and closing jamb C. A member 36 of inverted L-shaped cross section extends the length of the rail 35 and includes a horizontal leg 37, and a vertical leg 37 that serves to conceal the upper portion of panel M. The leg 37 and a downwardly extending portion 37a tend to prevent movement of cold air through the upper portion of my device.

The movable panel M is formed from a rectangular frame that includes a lower horizontal member 45. The member 45 has a vertical cross section as may best be seen in Figure 2 that includes an outer vertical leg 46 and an inner vertical leg 47 that are joined by a horizontal supporting member 48. Member 48 and leg 47 are doubled over at their juncture to provide an upwardly extending flange 49. A member 50 of L-shaped cross section rests on the upper surface of supporting member 48 parallel to the flange 49, and has a vertical leg 51 that engages the lower outer surface of one of the panes G. The other pane G mounted on the panel M has its lower inner edge engaging flange 49. The two panes G in panel M are separated by a sealing strip 10.

A number of inverted U-shaped members 53 having two laterally spaced legs 54 are longitudinally spaced within the legs 46 and 47. The legs 54 are connected by a doubled over portion 55 that is affixed to the under side of member 48. Each of the pairs of legs 48 is provided with a horizontal shaft 54a that rotatably supports a grooved roller 53a. Each of the rollers 53a rests on the upper edge of the rail 12, and is adapted to travel therealong.

An upper horizontal member 56 is provided for panel M, and has a vertical cross section as shown in Figure 2 that includes an inner and outer leg 57 and 58 respectively, that are joined by a horizontal supporting member 59. The supporting member 59 and leg 57 are doubled over at the juncture to form a downwardly extending flange 60. A member 61 of inverted L-shaped cross section extends between the styles of panel M. The panes G in panel M have their upper horizontal edges engaging flange 60 and member 61, and are separated from one another by sealing member 10. A number of longitudinally spaced cylindrical cups 63 are supported on the upper surface of member 59, with each of the cups having a second 64 slidably mounted therein. Each of the cups 64 has a grooved roller 65 rotatably mounted within the confines thereof, with the cup being urged upwardly by a helical spring 66 situated in cup 63 to maintain each of the rollers 65 in contact with the lower edge of roller 39.

A vertical closing stile 70, as best seen in Figure 3, includes two laterally spaced parallel legs 72 and 73 that are connected by a web 74. The web 74 and leg 73 at their juncture are doubled over to provide a flange 75 that engages the vertical edge of one of the panes of glass G that is mounted in the movable panel M. A vertically positioned member 76 of L-shaped cross section is affixed to web 74, with one of the legs 77 of member 76 engaging and holding the outer edge of the other pane of glass G in panel M in the desired position. The two panes of glass G in panel M are separated from one another by the sealing member 10. The closing jamb C has a horizontal cross section as shown in Figure 3 that includes two inwardly extending doubled over portions 79 and 80 that are engaged by legs 72 and 73 when panel M is in the closed position. An arm 81 extends outwardly from the bent over member 79 and terminates in a flange 82 that is normal thereto.

A vertical interlocking stile 83 is provided for the other end of panel M, and has a horizontal cross section as shown in Figure 3. The stile 83 includes an upright 84 having a flange 85 along one side thereof and a U-shaped member 86 on the other end thereof. The member 86 includes two laterally spaced flanges 87 and 88 that are connected by a web 89. A member 90 of L-shaped cross section is affixed to the exterior side of member 84 and engages one of the panes of glass G, while the other pane is engaged by the other leg 85, and the panes of glass being laterally spaced from one another by the member 10.

Interlocking mullion I, as may best be seen in Figure 3, has a horizontal cross section which includes an upright 84', a flange 91 on one end thereof, and an L-shaped member 92 on the opposite end. The member 92 includes a leg 93 that has a number of vertically spaced tapped bores (not shown) formed therein. A vertically positioned member 95 of L-shaped cross section is provided and includes a flange 95 having vertically spaced bores formed therein that are in alignment with the bores formed in leg 93, and

upon screws 97 engaging the bores the member 95 may be removably held in position on the interlocking mullion I for reasons which will hereinafter become apparent. Member 95 is formed with a flange 98 that engages the U-shaped member 86 to effect a seal between the fixed panel F and the movable panel M when the movable panel is in the closed position. A vertically movable member of L-shaped cross section is affixed to the upright 84' with the member 100 and leg 91 serving to hold the vertical edges of the panes of glass G situated in the fixed panel F in the desired position, and the panes being separated by the sealing member 10.

The fixed jamb J, seen in Fig. 3, has a horizontal cross section that includes a member 103 having a flange 104 on the inner end thereof. The outer end portion of member 103 is bent or otherwise formed into an arm 105, that has a flange 106 extending outwardly therefrom. A lip 107 is formed on the outer edge of flange 106. A member 108 of L-shaped cross section is affixed to the face of flange 106, with this member and arm 105 engaging the exterior edge portion of the two panes G mounted in the fixed panel F, and the panes being held in spaced relationship with one another by the sealing member 10. Thus, from the above description it will be seen that my door or window includes a rectangular framework having a fixed panel F and a movable panel M that may be longitudinally moved to the open position, or closed to effect a weathertight joint with panel M. The panels F and M each have multiple panes of glass G or other transparent material mounted therein, with the panes having an air space 23 formed therebetween.

The drying element D used in removing moisture from the air situated in the space 23 between the panes G is shown in Figure 4. An elongated strip of rigid material 110 is provided and supports an outwardly extending rectangular shell 111 that has a number of perforations 112 formed in the walls thereof. The shell 111 may be fabricated from a relatively lightweight sheet metal, and as may best be seen in Figure 5, is completely filled with a dehydrating agent 114 such as silica gel, calcium chloride, or other moisture removing agents.

A rectangular longitudinally extending opening 115 is formed in the uprights 84 and 84' of the interlocking stile 83 and interlocking mullion I respectively, as may be seen in Figures 5, 6 and 7. The sealing strips 10 terminate at the top and bottom edges of each of the openings 115. After my window or door is installed in the desired structure and glazed, one of the drying elements D is inserted in each of the openings 115 and affixed to the uprights 84 or 84' by screws 116. The width of the shell 111 is somewhat less than that of the space 13 existing between two of the panes G, in order that the air situated in the space may be subjected to as much of the surface area of the silica gel 113 or other drying agents as possible. The drying agent D is left in the position shown in Figure 5 until substantially all of the moisture is removed from the air in the space 23, which I have found from experience will take approximately twenty-four hours.

After the air in the space 23 has had the moisture removed therefrom, the drying element D is removed by loosening the screw 116 and removing the plate 110. The plate 110 is immediately replaced with a plate 120 that is similar in construction to plate 110, but has a centrally

disposed, longitudinally extending, resilient member 121 affixed to one side thereof. The member 121 is of such a length that it may be slidably inserted in the opening to fill the gap existing between the ends of the sealing strip 10 as may be seen in Figure 6. If desired, a resilient gasket 123 may be positioned between the inner face of the plate 120 and the exterior face of the upright 84 to more effectively complete an air-tight seal around the opening 115. The plate 120 is affixed to the upright 84 by using the screws 116 that held the plate 110 in position on the upright 84.

The plate 120 is maintained in position on the upright 84 until such time as moisture seeps into the space 23 from the outside, which condition will be evidenced by the inner surfaces of the panes G starting to cloud or frost over when the outer pane is subjected to a considerably cooler temperature than the inner pane. This condition may be rectified by removing the plate 120 and replacing it with one of my drying elements D until the moisture is removed from the space in the manner previously described. After this drying operation has been completed the drying element D is, of course, removed and replaced by one of the plates 120 in the same manner as shown in Figure 6.

The installation and operation of my invention is extremely simple. The device is installed in the desired structure in accordance with good building practice, and the movable panel M and fixed panel F are then glazed with two or more laterally spaced panes of transparent material G. Moisture is then removed from the space 23 between the panes G by use of the drying elements D. After the air drying operation is completed each of the drying elements D is removed, and replaced by a plate 120 to seal the opening 115 in which the drying element was inserted. After my device has been in use for a considerable length of time, sufficient moisture may enter the spaces 23 to cause coating of the surfaces of the panes G when there is a large differential in temperature between the outer and inner panes G. This condition is readily remedied by removing the plates 120 and inserting drying elements D in the openings 115 until the air in the spaces 23 is again dried.

It will be noted in Figure 2 that cold air from the outside is prevented from entering the interior of the structure in which my device is installed by longitudinally extending strips 150, 151 and 152. The strip 150 extends the length of flange 46, is formed of a resilient material, and slidably engages the exterior of the rail 12. Thus, when the panel M is in the closed position cold air cannot pass over the rail 12 to enter the building in which my combined door and window is installed.

Strips 151 and 152 are mounted on flanges 56 and 58 respectively, and slidably engage rail 35 in the same manner as strip 150 and serve the same function.

In locating the openings 115 it is essential that they be so positioned that they are not blocked by portions of the building structure in which my device is installed in order that the drying elements D may be inserted and removed as desired. Accordingly, I prefer to form the openings 115 in the interlocking stile 83 and interlocking mullion I. Access is had to the opening 115 in interlocking mullion I by removing the L-shaped member 95.

Although the described structure of my mul-

tiple pane window and door construction is fully capable of achieving the results and providing the advantages hereinbefore mentioned, it is to be understood that it is merely illustrative of the presently preferred form of my invention, and that I do not mean to be limited to the details of construction herein shown and described other than as defined in the appended claims.

I claim:

1. A multiple pane door and window structure which includes: a substantially rectangular frame having a head member, a sill, and jambs situated at the ends thereof; a fixed panel of two laterally spaced panes that terminates on its inner vertical edge in an interlocking mullion, said mullion comprising an upright member having an L-shaped element formed at its front portion and extending away from said upright member; a vertically positioned member of L-shaped cross section removably secured to said L-shaped element whereby its free leg extends parallel to said head member and said sill; a movable panel of two laterally spaced panes that terminates on its inner vertical end in an interlocking stile and on its outer vertical end in a closing stile, said interlocking stile comprising an upright element integrally formed at its front portion with a vertically extending U-shaped member adapted to receive the free leg of said member of L-shaped cross-section when the jambs are in a closed position whereby the forward leg element of said U-shaped member will sealingly abut said free leg; a vertically extending opening formed in the upright element of said mullion intermediate its upper and lower ends; a vertically extending opening formed in the upright element of said interlocking stile intermediate its upper and lower ends; two longitudinally extending rails, one of said rails being mounted upon said sill, and the other upon said head member; roller means mounted on said movable panel and engaging said rails to movably support said movable panel; two substantially rectangular drying elements, one of said drying elements being directly insertable into the lateral space between the panes in said fixed panel through the vertically extending opening formed in the upright element of said mullion, said member of L-shaped cross section being removed from said L-shaped element for such purpose, and the other drying element being directly insertable into the lateral space between the panes in said movable panel through the vertically extending opening formed in the upright element of said interlocking stile; and plates removably affixed to said upright element for sealing said opening after said drying elements have been removed therefrom.

2. A multiple pane door and window structure which includes: a substantially rectangular frame having a head member, a sill, and jambs situated at the ends thereof; a fixed panel of two laterally spaced panes that terminates on its inner vertical edge in an interlocking mullion, said mullion comprising an upright member having an L-shaped element formed at its front portion and extending away from said upright member; a vertically positioned member of L-shaped cross section removably secured to said L-shaped element whereby its free leg extends parallel to said head member and said sill; a movable panel of two laterally spaced panes that terminate on its inner vertical end in an interlocking stile and on its outer vertical end in a closing stile, said interlocking stile comprising an upright element integrally formed at its front portion with a vertically extending U-shaped member adapted to receive the free leg of said member of L-shaped cross section when the jambs are in a closed position whereby the forward leg element of said U-shaped member will sealingly abut said free leg; a vertically extending opening formed in the upright element of said mullion intermediate its upper and lower ends; a vertically extending opening formed in the upright elements of said interlocking stile intermediate its upper and lower ends; means mounted on said head member and said sill supporting said movable panel therebetween whereby it may be moved horizontally in said frame parallel to said head member and said sill; two substantially rectangular drying elements, one of said drying elements being directly insertable into the lateral space between the panes in said fixed panel through the vertically extending opening formed in the upright element of said mullion, said member of L-shaped cross section being removed from said L-shaped element for such purpose, and the other drying element being directly insertable into the lateral space between the panes in said movable panel through the vertically extending opening formed in the upright element of said interlocking stile; and plates removably affixed to said upright element for sealing said opening after said drying elements have been removed therefrom.

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