March 13, 1962 G. B. HAAS 3,024,881

INSULATED METAL-FRAMED WINDOW SASH

Filed April 10, 1959 2 Sheets-Sheet 1

Fig. 1

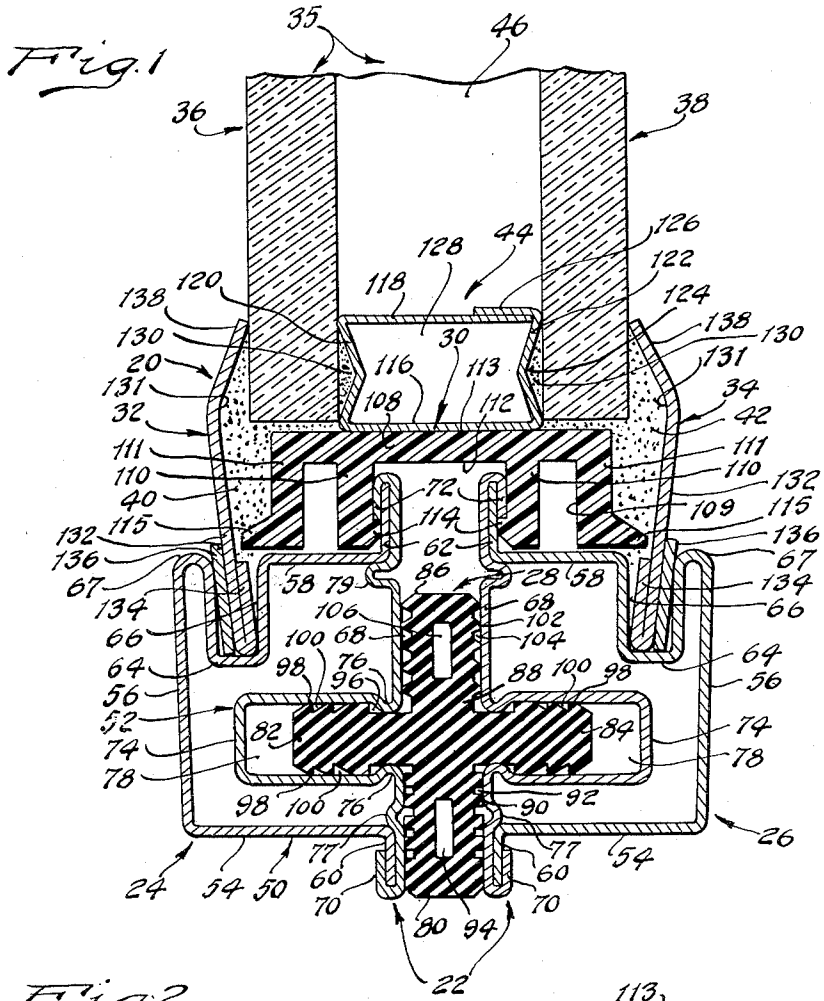
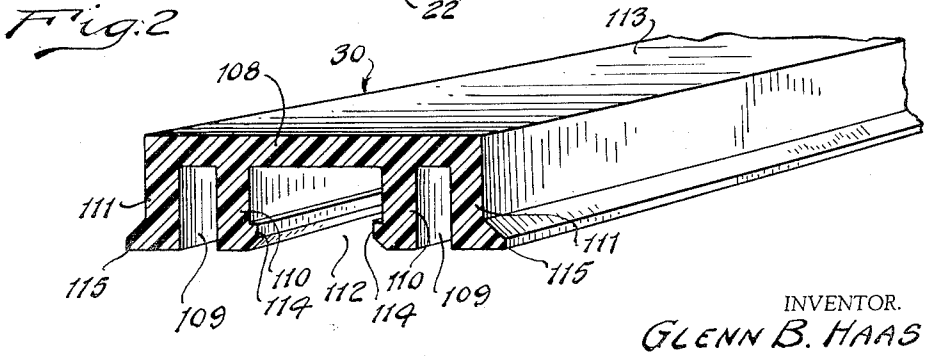


Fig. 2



INVENTOR.
GLENN B. HAAS
BY
Barthel & Bugbee
ATTY'S.

March 13, 1962 G. B. HAAS 3,024,881

INSULATED METAL-FRAMED WINDOW SASH

Filed April 10, 1959 2 Sheets-Sheet 2

Fig. 3

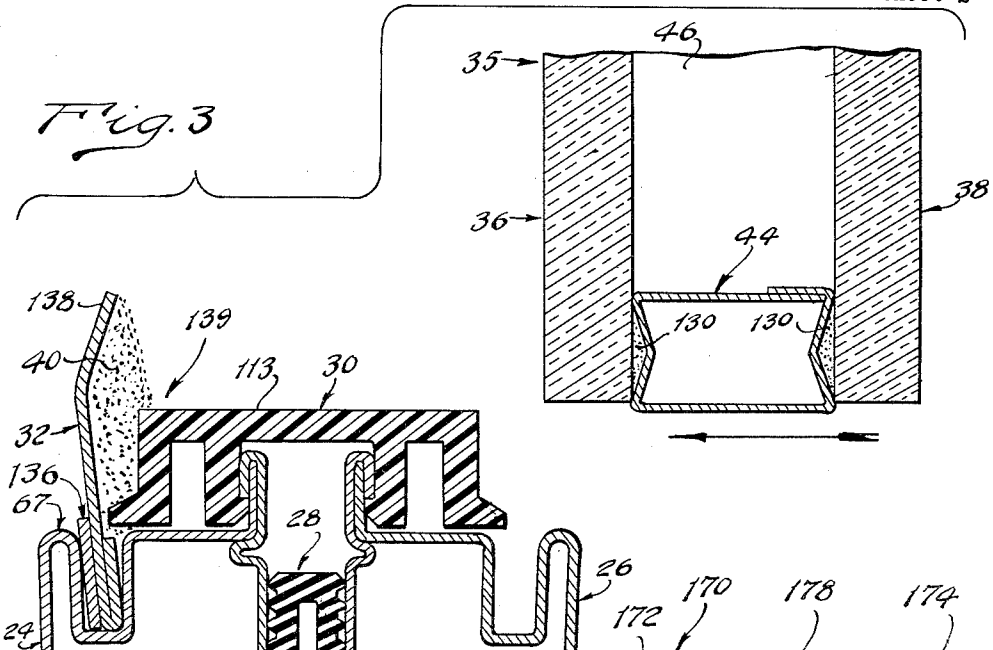
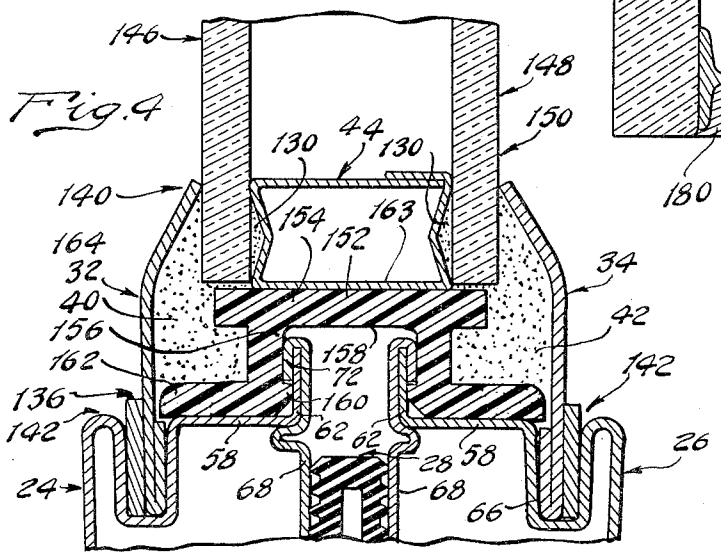


Fig. 4



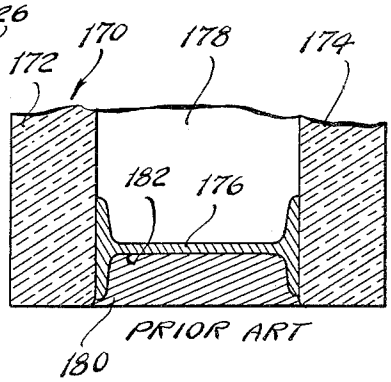


Fig. 5

INVENTOR.
GLENN B. HAAS
BY
Barthel & Bugbee
ATTY'S.

United States Patent Office

3,024,881

Patented Mar. 13, 1962

3,024,881

INSULATED METAL-FRAMED WINDOW SASH

Glenn B. Haas, Oak Harbor, Ohio, assignor to Window Products, Inc., Oak Harbor, Ohio, a corporation of Ohio

Filed Apr. 10, 1959, Ser. No. 805,398
6 Claims. (Cl. 189—64)

This invention relates to window sash structures and, in particular, to metal-framed double-pane window sash.

One object of this invention is to provide a metal-framed double-pane window sash construction wherein the frame structure has external and internal units of hollow sheet metal which are heat-insulated from one another by novel heat-insulating members and held in assembly with one another and with the window panes by novel spacing and insulating members, the double window panes and the air space between them being substantially sealed against the entrance of outside air, moisture, dust or other undesired foreign matter.

Another object is to provide an insulated metal-framed double-pane window sash construction of the foregoing character wherein the provision of an improved insulating arrangement enables the assembly of the metal-framed double-pane window sash to be carried out in two separate subassembly operations, followed by a simple final assembly operation uniting the two subassemblies, thereby not only enabling the cost of assembly to be greatly reduced by eliminating piecemeal final assembly, but also permitting the insulated metal sash frame to receive a standard double-pane unit by a similar final assembly operation.

Another object is to provide an insulated metal-framed double-pane window sash construction of the foregoing character having an insulating support for the double-pane unit which not only couples the metal frame parts to one another but also seals and insulates them from the double-pane unit as well as from each other.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawing, wherein:

FIGURE 1 is an enlarged fragmentary cross-section through a heat-insulated metal-framed double-pane window sash construction having a desiccating device for removing moisture from the space between the window panes;

FIGURE 2 is a fragmentary perspective view of a short length of the insulating coupling member used between the external and internal sash frame units shown in FIGURE 1;

FIGURE 3 is a view similar to FIGURE 1, but showing the same parts at an incomplete stage in final assembly following the two subassembly operations;

FIGURE 4 is a fragmentary cross-section through a modified heat-insulated metal-framed double-pane window sash construction adapted to receive thinner panes than the construction shown in FIGURES 1 to 3 inclusive; and

FIGURE 5 is a fragmentary cross-sectional view of an edge portion of a standard conventional double-pane unit adapted to be substituted for the unit shown in the upper right-hand corner of FIGURE 3 in the final assembly operation.

Referring to the drawings for general designation of the principal parts of the invention, FIGURES 1 to 3 inclusive show a portion of a heat-insulated sealed metal-framed double-pane window sash installation, generally designated 20, as consisting generally of a sash frame or molding assembly 22 having external and internal sash frame units 24 and 26 respectively separated from one another by outer and inner heat-insulating spacers, generally designated 28 and 30, and external and internal

pane-retaining members 32 and 34 of similar construction adapted to hold in assembly the insulated double-pane unit 35 including the external and internal window panes 36 and 38 respectively. The window panes 36 and 38 are also insulated from the external and internal frame units or moldings 24 and 26 by external and internal heat-insulating sealing compound layers 40 and 42 respectively of glazing mastic. Finally, a tubular desiccant holder, generally designated 44, is mounted in the air space 46 between the external and internal panes 36 and 38 and is adapted to hold a desiccant for removing moisture from the space 46. Additional sealing compound used in the installation 20 is described below at the locations where it is installed.

Referring to the drawings in detail, the external and internal sash frame units or moldings 24 and 26 of the frame structure 22 are of similar construction although oppositely-facing, hence to avoid duplication a single description of both, with the same reference numerals, should be sufficient. Each unit 24 or 26 consists of a generally channel-shaped external member, generally designated 50, and an internal closure member, generally designated 52, secured thereto as described below, in order to form the hollow box-section unit 24 or 26. The external member 50 has three sides 54, 56 and 58 arranged respectively at approximate right angles to one another and provided with oppositely-extending edge flanges 60 and 62 respectively at the free edges of the sides 54 and 58 (FIGURE 1). The side 58 is also provided with a channel portion 64 forming an elongated recess or groove 66 for receiving one of the pane-retaining members 32 or 34, as the case may be. The junction between the sides 56 and 58 is rounded as at 67.

The internal closure member 52 consists of an elongated sheet metal strip 68 having reversely-bent opposite edge portions 70 and 72 respectively receiving the edge flanges 60 and 62 respectively of the external member 50 in tight clamping engagement. Each strip 68 is also provided with a channel portion 74 with indentations 76 at the opposite sides of the mouth thereof forming a channel or groove 78 for receiving one of the laterial portions of the heat-insulating cruciform spacer 28, as described below. The external and internal members 50 and 52 of each sash frame unit or molding 24 or 26 are conveniently formed from sheet metal by a metal rolling process on conventional metal rolling machinery, sheet aluminum being preferred because of its lightness and corrosion-resisting characteristics. The external and internal members 50 and 52 of the units 24 and 26 are securely united to one another and clamped together by rolling over the reversely-bent edge portions 70 and 72 of the internal member 52 upon the edge flanges 60 and 62 of the external member 50. In addition, each internal member 52 is provided with a pair of ribs 77 and 79 (FIGURE 1), the former located adjacent and engaging the junction corner of the side 54 with the edge flange 60 and the latter located adjacent the junction corner of the side 58 with the edge flange 62.

The heat-insulating outer spacer 28 which at the same time holds together and insulates from one another the external and internal sash frame units or moldings 24 or 26 is in the form of an elongated extrusion (FIGURE 1) of resilient material, such as natural or synthetic rubber or a resilient synthetic plastic, such as vinyl resin, and is of approximately cross-shaped or cruciform cross-section with an outer arm 80, lateral arms 82 and 84, and an inner arm 86, all projecting radially from a central elongated core 88 of approximately rectangular cross-section. The outer arm 80 is of approximately rectangular cross-section with parallel alternately-ridged and grooved opposite sides 90 and 92 respectively, and is provided with an internal hollow space or chamber 94 of elongated ap-

proximately rectangular cross-section. The alternately ribbed and grooved portions 90 and 92 resiliently engage and grip the inner walls or strips 68 of the closure members 52.

The lateral arms 82 and 84 of the heat-insulating spacer 28 are similarly provided outwardly from the core 83 with central channels 96 adapted to receive the indentations 76 of the closure members 52 and outer alternate saw-tooth ridges 98 and grooves 100. The saw-toothed ridges 98 are directed toward the core 83 in ratchet-tooth fashion so as to facilitate insertion into the grooves 78 in the channel portions 74 of the closure members 52 yet to resist withdrawal therefrom. In this manner, the external and internal hollow box-like frame units 24 and 26 are held in assembly with one another yet insulated against the free conduction of heat or cold therebetween. The word "cold" in this connection is used in its popular sense rather than in its scientifically accurate sense, which is of course the absence of heat.

The fourth or inner arm 86 of the insulating spacer 28 also has parallel ridges 102 of V-shaped cross-section and grooves 104 of truncated V-shaped cross-section, together with an internal hollow space or chamber 106 similar to the hollow space or chamber 94 in the arm 80. This arm 86 (FIGURE 1) fits between and engages the strips 68 of the closure members 52.

The inner heat-insulating spacer 30 (FIGURES 1, 2 and 3) is in the form of an elongated extrusion of channel-shaped cross-section, made from a relatively rigid insulating material, such as a rigid vinyl resin having a flat-topped central or web portion 108 and spaced parallel inner main and outer or supplementary flanges 110 and 111 respectively bounding inner and outer channels 112 and 109. The inner channel 112 is of a width sufficient to receive the inner central portion of the hollow sash frame or molding unit 22, namely the reversely-bent portions 72 of the external and internal sash frame units 24 and 26 respectively, and the inner edge flanges 62 gripped thereby. Integral internal ribs 114 on the inner flanges 110 extend beneath and grip the edges of the reversely-bent portions 72 and the metal flanges 62 of the sides 58 of the external sash frame units 24 in retaining, spacing and insulating engagement. The inner heat-insulating spacer 30 is also of the desired width for separating the external and internal panes 36 and 38 and is sufficiently rigid to prevent the external and internal sash frame units or moldings 24 and 26 from moving apart and in this respect serves as a coupling member. It has a substantially flat top surface 113. The sealing compound of the layers 40 and 42, known colloquially in the window sash industry as "gunk" is conventional, a number of such compounds being available on the open market and known to engineers skilled in building structures. Certain of such sealing compounds, for example, contain asphaltic materials, or rubber or synthetic rubber, and have the property of yieldingly deforming to compensate for expansion or contraction while maintaining a tight hermetical sealing of the joint in which they are located. The layers 40 and 42 engage outwardly-facing ribs 115 on the outer or supplementary flanges 111.

The tubular desiccant holder 44 is preferably rolled from sheet metal, such as sheet aluminum, and is of roughly rectangular cross-section with parallel main walls 116 and 118 (FIGURES 1 and 3) and opposite side walls 120 and 122 of shallow V-shaped cross-section providing shallow grooves 124 of similar cross-section. The side wall 122 has an approximately perpendicular flange 126 disposed in loosely overlapping relationship with the main wall 118 so as to permit the flow of air between the desiccant chamber 128 and the air space 46 between the external and internal panes 36 and 38. A layer 130 of yieldable sealing material similar to that of the layers 40 and 42 is inserted in the shallow grooves 124 in engagement with the inner sides of the panes 36 and 38 to effect a hermetical seal therebetween.

From FIGURE 1 it will be seen that the main walls 116 and 118 of the desiccant holder 44 have overall widths approximately the same as the overall width of the inner insulating spacer 30 for effective sealing purposes. The desiccant chamber 128, as its name indicates, contains a drying agent, preferably in powdered form, such as calcium chloride, silica gel or the like, the fit of the main wall 118 and the overlapping flange 126 being tight enough to prevent the escape of desiccant yet loose enough to permit "breathing," meaning the passage of air between the chambers 128 and 46 for removal of the water vapor from the air in the air space or chamber 46.

The pane-retaining members 32 and 34 hold in position the sealing compound layers 40 and 42 and the layers 40 and 42 further insulate the external and internal panes 36 and 38 from the metal moldings or sash frame units 24 and 26. The external and internal pane-retaining members 32 and 34 are of similar construction but oppositely-facing shape, hence one description is sufficient for both. Each such pane-retaining member 32 or 34 (FIGURES 1 to 3 inclusive) is of shallow V-shaped cross-section with an internal trough 131 therein. Each has a base portion 132 with a reversely-bent flange 134 thereon adapted to be wedged snugly into the recess 66 of the channel portion 64 of the external or internal sash frame member or molding 24 or 26 in the channel-shaped external member 50 thereof by an elongated wedging strip 136 of suitable material such as aluminum. Each pane-retaining member 32 or 34 also has a nose portion 138 which is inclined toward its respective pane 36 or 38 at an obtuse angle to the base portion 132.

In the assembly of the installation 20, two subassemblies are conveniently made. In the first subassembly operation, the hollow external and internal sash frame units or mouldings 24 and 26 are jointed to one another by pushing them upon the lateral arms 82 and 84 of the outer heat-insulating spacer 28 so that the latter are squeezed into the recesses 78 of the channel portions 74 where their ratchet-toothed ridges 98 hold them firmly in position against separation. At the same time, the walls 68 of the closure members 52 are forced firmly into engagement with the respective ribs 90 and 102 of the arms 80 and 86, while the indented or constricted portions 76 enter the undercut channels 96 in the arms 82 and 84. The inner spacer 30 is then squeezed into position over the reversely-bent portions 72 (FIGURE 1), firmly holding the inner edges of the units 24 and 26 in position against separation. This forms the partially-completed subassembly 139 down at the left-hand side of FIGURE 3. In the second subassembly operation, the desiccant holders 44 are filled with a suitable desiccant, and are provided with sealing compound layers 130 in the grooves 124 and the panes 36 and 38 are pressed into position against them. One of the pane-retaining members 32 is then pushed into position (FIGURE 1) with its base portion 132 entering its respective channel 66, locked in place by a wedging strip 136 and its trough 131 filled with sealing compound 40. It will be understood, of course, that the outer and inner sash frame units 24 and 26 are arranged in hollow or open-centered form, generally in a rectangular shape, with the panes 36 and 38 correspondingly rectangular and with the various spacing members 28, 30, 40, 42 and 32, 34 extending around the four sides of the open-centered rectangle.

In the final assembly operation (FIGURE 3) following the two previously-described subassembly operations, the operator or assembler slides the subassembly 35 consisting of the window panes 36 and 38 and the desiccant holders 44 into the opening of the partially completed subassembly 139 framed by the four supports 30 across the flat exposed top surfaces 113 thereof in the direction of the arrow shown in FIGURE 3, until the outer

surface of the pane 36 engages the sealing compound layer 40 and the nose portion 138 of the external pane-retaining member 32, with the desiccant holders 44 resting upon the support 30 as shown in FIGURE 1. Having then applied the sealing compound layer 42 against the exposed flanges 111 of the supports 30 (FIGURE 1), he inserts the reversely-bent portion 134 of the base portion 132 of each internal pane-retaining member 34 into its respective channel 66 with its nose portion 138 engaging the inner pane 38, and wedges it into position by means of the wedging strips 136. Under these conditions, the insulating material of the insulating layers 40 and 42 flow into the peripheral gap around the edge of each pane 36 or 38 between it and the support 30, thereby providing a further insulating layer between the edges of the panes 36 and 38 and the supports 30.

The modification, generally designated 140, shown in FIGURE 4 as regards the sash frame or molding assembly 142 is substantially identical with the sash frame or molding assembly 22, hence similar parts are designated with the same reference numerals. The modification 140 also employs similar pane-retaining members 32 or 34 and similar but thicker wedging strips 144, than the wedging strips 136 mentioned above. The modified heat-insulated sealed metal-framed double-pane window sash installation 140, however, is particularly adapted for use with thinner panes 146 and 148 respectively than the panes 36 and 38 described above and consequently with their respective tubular desiccant holders 44 form a thinner double-pane window unit, generally designated 150, than the thicker double-pane unit 35 described above. Accordingly, instead of the quadruple-flanged supports 30 of FIGURES 1 to 3 inclusive, the modification 140 makes use of double-flanged supports 152 for the same double purpose of coupling the external and internal sash frame units 24 and 26 to one another as well as insulating them from one another and from the double-pane unit 150.

Each double-pane unit support 152 (FIGURE 4) is also in the form of an elongated extrusion of channel-shaped cross-section, made from a relatively rigid insulating material, such as a rigid vinyl resin having a flat topped central or web portion 154 and spaced parallel flanges 156 bounding a channel 158 therebetween. The channel 158 is of a width sufficient to receive the inner central portion of the hollow sash frame or molding unit 22, namely the reversely-bent portions 72 of the external and internal sash frame units 24 and 26 respectively, and the inner edge flanges 62 gripped thereby. Integral internal ribs 160 on the flanges 156 extend beneath and grip the edges of the reversely-bent portions 72 and the flanges 62 of the sides 58 of the external sash frame units 24 in retaining, spacing and insulating engagement, whereas external ribs 162 form feet resting upon the sides 58 and also are engaged by the insulating compound layers 40 and 42 as described above. The top 152 extends beyond and overhangs the upper ends of the flanges 156 so as to lie adjacent but spaced apart from the edges of the panes 146 and 148, and has a substantially flat top surface 163. The narrow spaces 164 therebetween receive insulating compound entering from the insulating layers 40 and 42. This insulating compound is the same as that described above under the same reference numerals 40 and 42.

The final assembly operation of the modified sash installation 140 of FIGURE 4 is preceded by the two subassembly operations made in the same manner as that described above in connection with FIGURES 1 to 3 inclusive and hence require no repetition. The double-pane subassembly 150 is slid into the opening framed by the supports 152 across the flat top surfaces 163 thereof in the same manner as the subassembly 35 of the sash installation 20, as shown in FIGURE 3, after which the insulating layers 42 and internal pane-retaining members 34 are applied as described above.

Thus, the present invention eliminates the piecemeal final assembly operations required in the invention disclosed and claimed in my application Serial No. 693,964, filed November 1, 1957 for Insulated Metal-Framed Window Sash, patented on March 17, 1959 as Patent No. 2,877,515.

In operation, the sash installation 20, according to the particular building structure, is fixed in position, as in a picture window, slides vertically, as in a double-hung sash, slides horizontally, as in a gliding window structure, or swings upon pivots, as in the awning-type or casement type windows. The desiccant within the chambers 128 of the desiccant holders 44 absorbs moisture from the air in the space 46 between the window panes 36 and 38, keeping it in a constantly dry condition so as to prevent any fogging or clouding thereof. The layers 130 of sealing compound assist in maintaining a tight sealing engagement, preventing any outward or inward passage of air into the space 46, regardless of changes in temperature. Under actual tests, alternating between periods of eight to twenty-four hours at a water-saturated atmosphere of 120° F., and a rigid atmosphere of 0° to minus 5° F. and back into the heated humid atmosphere again, the installation 20 of the present invention was found to prevent fogging completely, notwithstanding these sudden and large changes of temperature and humidity.

The operation of the modified double-pane sash installation 140 is similar to that of the sash installation 20 and hence requires no repetition. As stated above, it accommodates the thinner panes 146 and 148 of the unit 150 rather than the thicker panes 36 and 38 of the unit 35 of FIGURES 1 to 3 inclusive.

The standard or conventional double-pane assembled sash unit of the prior art, generally designated 170, shown in FIGURE 5 is available on the open market and has been manufactured and sold for several years by different companies, hence it is beyond the scope of the present invention. It is shown in FIGURE 5 as being adapted to be substituted for the double-pane insulated sash unit 35 of FIGURES 1 to 3 inclusive, and inserted in the partially completed subassembly 139 in the final assembly operation shown in progress in FIGURE 3. In other words, another advantage of the present invention is that it will accommodate a standard double-pane sash unit 170 as well as the sash units 35 and 150 described above. The conventional prior art sash unit 170 consists of panes 172 and 174 of glass or other suitable material separated from one another by a separator 176 of I-cross-section spanning the space 178 therebetween. A sealing compound 180 is inserted in the external channel 182 of the separator 176 and seals the space 178 against the entry of moisture.

In the form of the invention shown in FIGURE 1, the ribs 115 of the spacer 30 overhang the edges of the reversely-bent flanges 134 of each pane-retaining member 32 or 34 after the wedging strips 136 are wedged into position in their respective recesses 66, thereby preventing the pane-retaining members from becoming dislodged.

What I claim is:

1. An insulated metal window sash frame construction adapted to receive and hold a conventional sealed double pane unit comprising open-centered external and internal metal sash frame structures having facing surfaces disposed in spaced substantially parallel relationship and having outer and inner peripheries, the inner periphery of each frame structure having an insulating spacing member seat thereon, an elongated outer insulating spacing member of heat-insulating material disposed in the space between said facing surfaces near the outer peripheries of said frame structures in abutting relationship therewith, said frame structures at their inner peripheries having inwardly-projecting spaced parallel extension portions, and an elongated substantially

flat-topped inner insulating spacing member of heat-insulating material disposed in the space between said facing surfaces near the inner peripheries of said frame structures in supporting relationship with said double pane unit and having an outwardly-facing recess therein receiving said extension portions of said frame structures, the flat top of said inner insulating spacing member being wider than the space between the double panes and overlapping the edges thereof whereby to slidably receive the double pane unit during mounting thereof in said sash frame construction.

2. An insulated metal window sash frame construction, according to claim 1, wherein the inner spacing member is of channel cross-section with its channel constituting said recess and has spaced main flanges engaging said extension portions of said frame structures.

3. An insulated metal window sash frame construction, according to claim 2, wherein said inner insulating spacing member also has spaced supplementary flanges disposed laterally of said main flanges in laterally-spaced relationship therewith.

4. An insulated metal window sash frame construction, according to claim 2, wherein said main flanges have inwardly-extending lateral projections engaging said frame structure extension portions.

5. An insulated metal window sash frame construction, according to claim 3, wherein said supplementary flanges have outwardly-extending lateral projections thereon.

6. An insulated metal window sash frame construction, according to claim 2, wherein said main flanges have inwardly and outwardly extending lateral projections on opposite sides thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,830,504	Carmen et al.	Nov. 3, 1931
2,239,517	Cox et al.	Apr. 22, 1941
2,877,515	Haas	Mar. 17, 1959