Feb. 10, 1959 G. B. HAAS 2,872,713

INSULATED METAL-FRAMED WINDOW SASH

Filed July 19, 1956 2 Sheets-Sheet 1

Fig. 1.

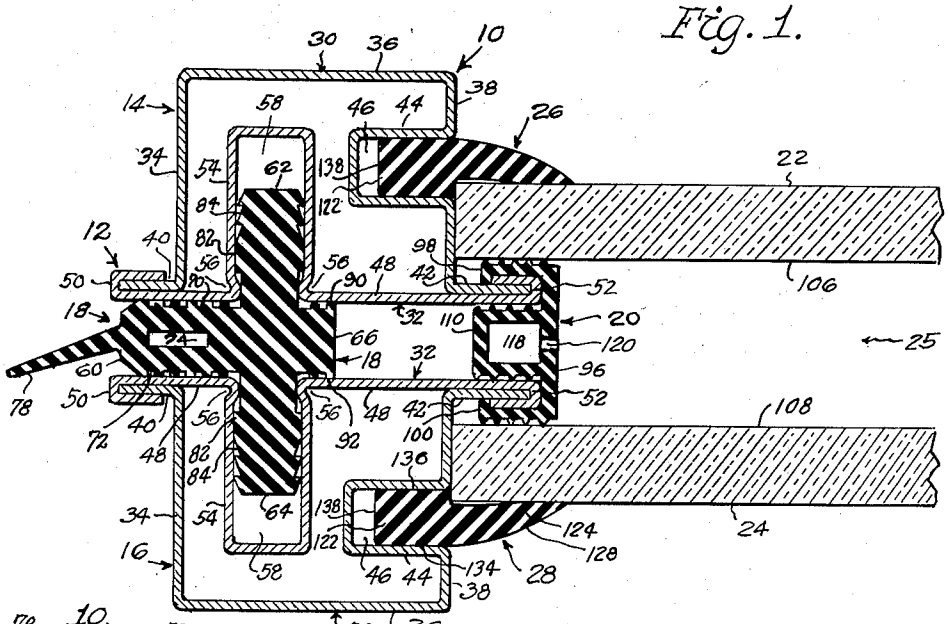
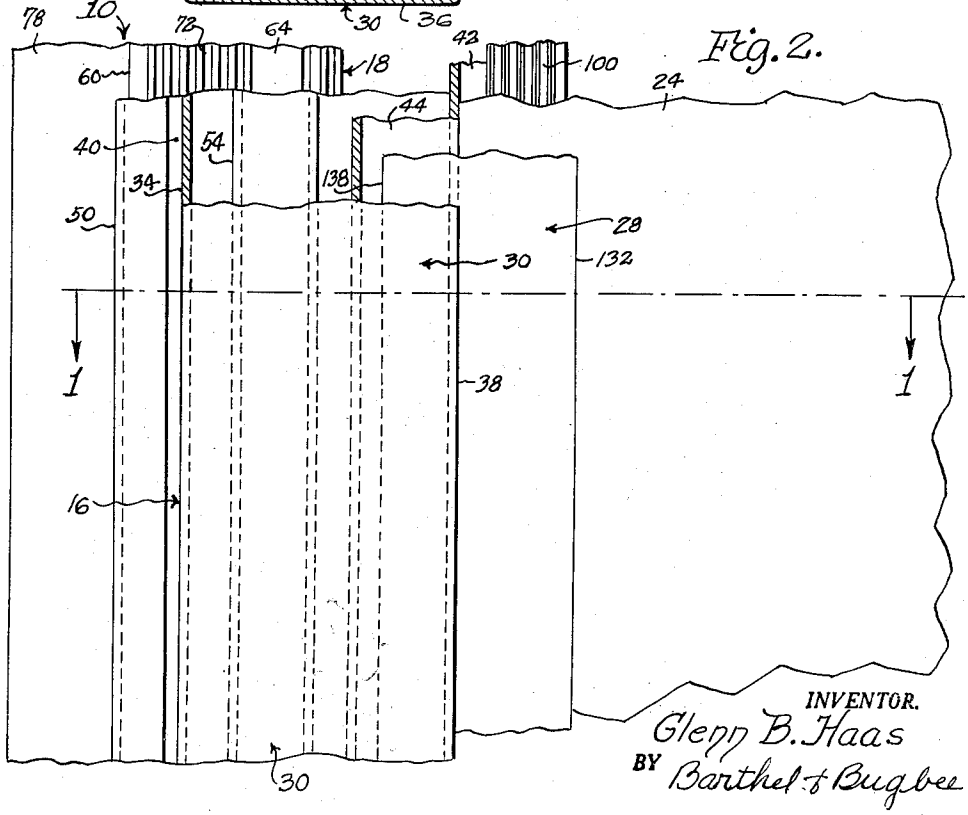


Fig. 2.



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Fig. 3.

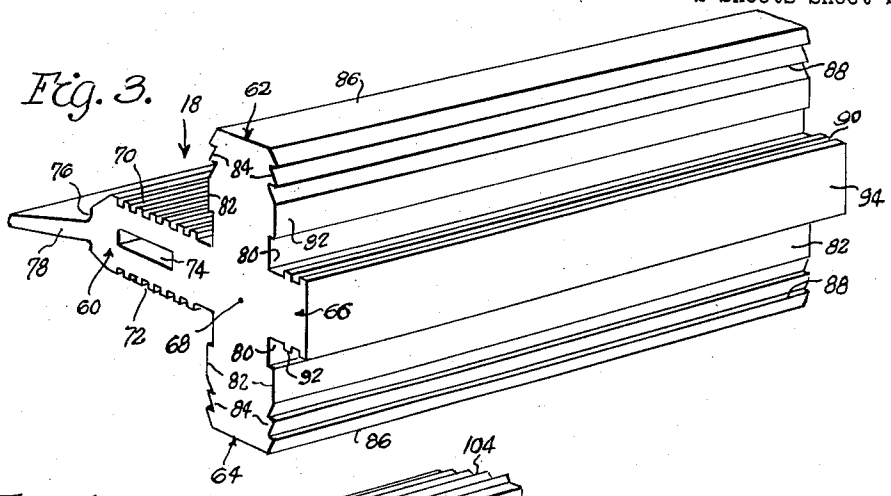
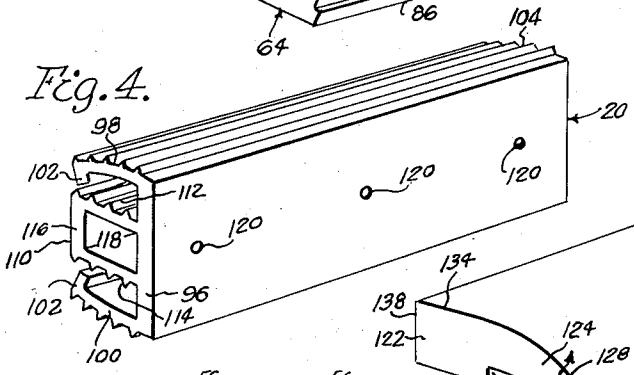


Fig. 4.



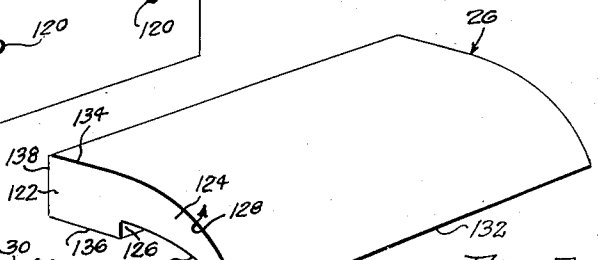
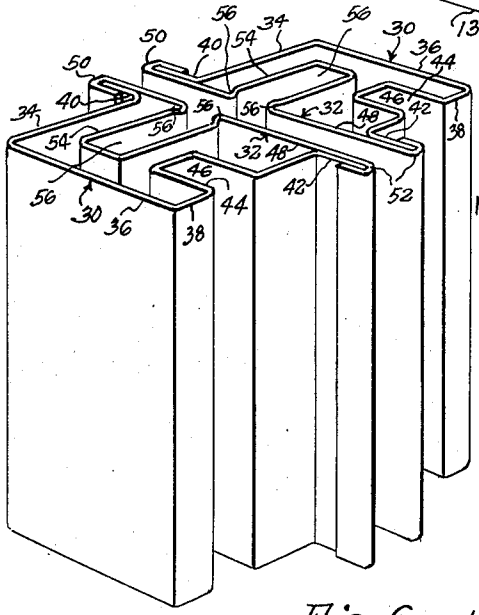


Fig. 5.



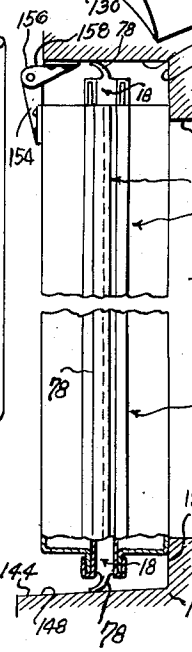


Fig. 7.

Fig. 6.

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INSULATED METAL-FRAMED WINDOW SASH

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

Application July 19, 1956, Serial No. 598,942

6 Claims. (Cl. 20—56.5)

This invention relates to building structures and, in particular, to window sash.

One object of this invention is to provide metal-framed window sash adapted for the reception of either single or double panes and wherein the external and internal units of the sash frame are of hollow sheet metal construction both insulated from one another and held in assembly with one another and with the window pane by resilient combined spacing and insulating members of novel constructin.

Another object is to provide an insulated metal-framed window sash of the foregoing character wherein the sash is provided with spaced double window panes and wherein one of the spacing members between the external and internal sash frame units is adapted to hold the frame units and panes in insulated spaced relationship and at the same time substantially seal the space between the panes against the entrance of outside air, moisture, dust or other undesired materials.

Another object is to provide an insulated metal-framed window sash of the foregoing character wherein the resilient combined spacing and holding components for the external and internal sash frame units and window panes are likewise provided with gripping surfaces preferably of a corrugated nature, whereby the external and internal sash frame units and their window pane or panes are held firmly in assembly with one another without danger of accidental and unintended separation.

Another object is to provide an insulated metal-framed window sash of the foregoing character wherein the inner combined holder and spacer, which holds the inner edges of the sash frame units in assembly and at the same time spaces and insulates these and their panes from one another, also contains a chamber adapted to receive a desiccant or drying agent, such as calcium chloride, silica gel or the like, the chamber having openings communicating with the space between the panes to absorb any moisture in that space and therefore prevent fogging of the inside surfaces of the window panes from such moisture.

Another object is to provide an insulated metal-framed window sash of the foregoing character which may be used either in a double-hung sliding sash installation or in a horizontally sliding "gliding window" installation, or in a pivoted swinging window of the so-called vent or awning type, or as an immovably installed window of the so-called picture type.

Another object is to provide an insulated metal-framed window sash of the foregoing character wherein the combined insulating and holding member which insulates and holds the external and internal sash frame units apart from one another at their outer edges is of approximately cross-shaped cross-section, with or without a sealing fin engageable with a stationary portion of the window frame in which the sash is installed.

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

Figure 1 is a horizontal section taken along the line 1—1 in Figure 2, through an edge portion of an insulated metal-framed window sash, according to one form of the invention, equipped with double panes;

Figure 2 is a framgentary side elevation of the insulated metal framed window sash shown in Figure 1;

Figure 3 is a perspective view of the outer frame-holding spacer used in the window sash of Figures 1 and 2;

Figure 4 is a perspective view of the inner frame-holding spacer used in the window sash of Figures 1 and 2;

Figure 5 is a perspective view of the resilient insulated pane holder used in the window sash of Figures 1 and 2;

Figure 6 is a perspective view of the external and internal metal sash frame units arranged in their relative positions but with the panes and insulating spacers and pane retainers omitted; and

Figure 7 is a side elevation, on a reduced scale and partly in vertical section, of a vent type window installation.

Referring to the drawings in detail, Figures 1 and 2 show a portion of an insulated metal-framed window sash, generally designated 10, of which a typical installation is shown in Figure 7. The window sash 10 consists generally of a frame structure 12 having external and internal frame units 14 and 16 respectively separated from one another by outer and inner insulating frame-holding spacers 18 and 20 respectively adapted to hold, insulate and space apart from one another the external and internal frame units 16 and also the external and internal window panes 22 and 24 respectively. In addition, the window sash 10 includes external and internal insulating pane retainers 26 and 28 respectively, as described in more detail below.

The external and internal frame units 14 and 16 of the frame structure 12 are of similar but oppositely-facing construction, hence a single description, with the same reference numerals, will suffice for both. Each consists of a channel-shaped external member, generally designated 30, and an internal closure member, generally designated 32, united therewith to form the box-section unit 14 or 16. The external member 30 has three sides 34, 36 and 38 respectively arranged substantially at right angles to one another and provided with oppositely-extending edge flanges 40 and 42 respectively at the free edges of the sides 34 and 38 (Figure 1). The side 38 is also provided with a channel portion 44 forming an elongated recess or groove 46 for receiving one of the pane retainers 26 or 28, as the case may be.

The internal closure member 32 consists of a sheet metal strip 48 having spaced opposite overturned or reversely-bent edge portions 50 and 52 respectively bent over and receiving the flanges 40 and 42 respectively of the external member 30. The strip 48 is also provided with a channel portion 54 with indentations 56 at the opposite sides of the mouth thereof forming a recess or groove 58 for receiving a portion of the outer insulating frame-holding spacer 18, as described below. The external and internal members 30 and 32 of each frame unit 14 or 16 are preferably formed by a metal rolling process on conventional metal-rolling machinery from any suitable material preferably sheet metal, sheet aluminum being preferred because of its lightness and corrosion-resisting characteristics. The external and internal members 30 and 32 are united to one another by rolling over the reversely-bent edge portions 50 and 52 of the inner member 32 upon the flanges 40 and 42 of the outer member 30. As previously stated, the frame structure 12 may be used to receive either a single pane 22 or spaced double panes 22 and 24 separated from one another by a space

or void 25, the latter construction being shown for purposes of illustration and example.

The outer insulating frame-holding spacer 18 which holds together and insulates from one another the external and internal frame units 14 and 16 of the sash frame structure 12 is shown in detail in Figure 3, and is in the shape of an elongated extrusion of a resilient material such as natural or synthetic rubber or a resilient synthetic plastic, such as a vinyl resin. The spacer 18 is of approximately cross-shaped or cruciform cross-section (Figures 1 and 3) with an outer arm 60, lateral arms 62 and 64, and an inner arm 66, all projecting outward from an elongated core 68 of rectangular cross-section.

The outer arm 60 which extends between the retaining members 32 of the external and internal frame units 14 and 16 to space these apart from one another and insulate them against heat conduction, preferably is of approximately rectangular cross-section with parallel ridged and grooved opposite sides 70 and 72 and is provided with an internal chamber 74 of elongated approximately rectangular cross-section. Integral with and projecting outwardly from the outer end 76 of the arm 60 is an elongated fin 78 preferably disposed at a slight angle to the central plane of the arm 60 itself and adapted to engage the window frame or sash guide or other stationary member or structure in which the sash 10 is mounted, in order to seal the latter around the edges of the sash frame structure 12. The ribbed and grooved surfaces 70 and 72 engage and resiliently grip the strips 48 of the closure members 32.

The lateral arms 62 and 64, like the outer arm 60 (Figures 1 and 3) are of similar construction and similarly are integral with and extend outward in opposite directions from the core 68. Adjacent their connections with the core 68, they are provided successively with grooves 80, enlarged ribs 82 and multiple saw-toothed ridges 84 between the ribs 82 and the outer end 86 of the lateral arms 62 or 64. The saw-toothed ridges 84 are directed toward the core 68 so as to be easy of insertion into the recesses or grooves 58 in the channels 54 of the closure members 32 of the external and internal frame units 14 and 16 respectively. Their saw-toothed construction gives them a gripping action which resists separation of the external and internal frame units 14 and 16 from one another and the sharp edges 88 thereof firmly but resiliently engage the adjacent surfaces of the channels 64 to enhance the gripping action and further impede such separation.

The fourth or inner arm 66, like the outer arm 60 of the outer spacer 18 (Figures 1 and 3) is of rectangular cross-section but projects a much shorter distance inward from the core 68. It has substantially parallel grooved and ridged opposite sides 90 and 92 respectively and an end surface 94. This arm 66 (Figure 1) fits between the strips 48 on the inner side of the channel portion 54, the indented portions 56 fitting into the grooves 80 of the lateral arms 62 and 64.

The inner insulating frame holding spacer 20 (Figures 1 and 4) is also in the form of an elongated extrusion of the same resilient material as the outer insulating frame-holding spacer 18 and consists of a main or base wall 96 from the opposite edges of which externally-ridged flanges 98 and 100 project, bending toward one another at their outer edges, where they terminate in transverse flanges 102 which bear against the reversely-bent edge portions 52. The ridged or corrugated surface 104 of each flange 98 and 100 are sharp-edged so as to engage and grip the inner surfaces 106 and 108 of the external and internal window panes 22 and 24 respectively.

The inner spacer 20 also includes a hollow intermediate rib 110 (Figures 1 and 4) also integral with the base 96 and likewise having sharply-ridged or corrugated opposite sides 112 and 114 respectively adapted to engage and grip the facing surfaces of the sheet metal strips 48 (Figure 1). The remaining side 116 and the opposite portion of the base 96 serve to enclose a chamber 118 adapted to contain a desiccant or drying agent, such as calcium chloride or silica gel, and holes 120 pierce the base 96 at intervals in order to connect the chamber 118 with the space or void 25 between the window panes 22 and 24. In this manner the drying agent (not shown) within the chamber 118 maintains the air in the void 25 in a dry state and thus prevents fogging or steaming of the inner surfaces 106 and 108 of the panes 22 and 24.

The pane retainers 26 and 28 are of similar construction but of oppositely-facing shape, hence a single description will suffice for both. Each retainer 26 or 28 (Figure 5) in cross-section resembles the side elevation of a claw hammer without the hammer head. In other words, each retainer 26 or 28 is preferably made of the same resilient material as the outer and inner spacers 18 and 20, and, like them, is preferably formed as an extrusion. Each retainer 26 or 28 consists of a base portion 122 of approximately rectangular cross-section adapted to fit into the recess 46 of the channel 44 of the external or internal frame member 14 or 16 on the inner side 38 thereof and, like the arms 62 and 64 of the outer spacer 18, are of lesser depth than the depth of the channel 44 which they are seated in. Each retainer 26 or 28 is also provided with an elongated claw-shaped portion 124 of lesser thickness at its inner edge than the base portion 122 so as to form a shoulder 126 therewith adapted to engage the edge of the window pane 22 or 24. The portion 124 of the retainer 26 or 28 is provided with curved outer and inner surfaces 128 and 130 struck from spaced centers but meeting at a common edge 132 which engages the outer surface of the window pane 22 or 24. The opposite surfaces 134 and 136 of the base portion 122 are substantially parallel, but the surface 134 merges into the arcuate surface 128. The base end surface 138 is of greater width or thickness than the thickness of the claw-shaped portion 124, the difference in thickness being measured by the height of the shoulder 126.

As previously stated above, the insulated metal-framed window sash 10 may be used in any desired type of installation, such as a double-hung sliding sash, or horizontally-sliding gliding window or pivoted vent window or stationary picture window. Figure 7 shows diagrammatically the installation of the window sash 10 of the present invention as a vent type or awning type window. In this type of window, the sash is pivoted adjacent its upper edge and swings outward from its lower edge, usually by the use of a mechanical window operator or by a bar pivotally attached to the sash 10 near the edge remote from its pivoted edge. In the vent-type window installation, generally designated 140, shown in Figure 7, the building wall 142 has stepped outer and inner openings 144 and 146 with an inclined ledge 148 at the bottom thereof and a straight side surface 150 at the top, and a shoulder or face 152 therebetween. Secured to the frame structure 12 along the upper edge thereof are the arms 154 of hinges 156, the opposite arms 158 being secured to the building wall 142 in any suitable manner such as by bolts or screws. The sash 10 is thus arranged to swing into and out of the outer window opening 144 into and out of engagement with the shoulder or face 152 bordering the inner window opening 146. When the sash 10 is in its closed position, as shown in Figure 7, the fins 78 bend and yieldingly engage the respective surfaces 148 or 150 to seal the joint or crack otherwise occurring between these surfaces and the sash 10.

The assembly of the insulated metal-framed window sash 10 has already been described in part in connection with the description of the construction thereof.

The external and internal frame units **14** and **16** are made in the desired outline according to the outline of the window opening which is generally of rectangular shape, the sides of this hollow rectangle being joined at their corners, usually at diagonal edges or joints. The chamber **118** of the inner spacer **20** is then filled with the desiccant or drying agent.

The outer and inner frame units **14** and **16** are then joined to one another by inserting the outer and inner spacers **18** and **20** with the arms **62** and **64** of the former squeezed into the spaces **58** of the channels **54** thereof, where their ratchet toothed sharp-edged sawtooth ridges **84** hold them firmly in position against separation, and with the strips **48** of the closures **32** firmly engaging the grooved surfaces **70** and **72**, or **90** and **92** of the arms **60** and **66** respectively. The inner spacer **20** is squeezed into position with the intermediate portion **110** inserted between the closure member **32** of the external and internal frame units **14** and **16** (Figure 1) and with the externally-ridged flanges **98** and **100** slipping over the reversely-bent edge portions **52** of the closure members **32**, with the transverse flanges **102** snapping into place behind the edge of the reversely-bent portion **52**. The ribbed or corrugated sides **112** and **114** of the intermediate portion **110** engage the facing surfaces of the closure member **32** to grip them yieldingly and frictionally so as to resist withdrawal of the inner spacer **20**.

The panes **22** and **24** (or the single pane if only a single pane installation is contemplated) are then slipped into position against the respective corrugated flanges **98** and **100**, which have been straightened out into approximate parallelism with one another during their insertion around the reversely-bent portions **52** on the closure members **32**. The edges of the panes **22** and **24** rest against the inner side walls **38** of the external member **30**, the construction being such that the corner edges of the pane **22** project slightly over the edges of the channel portions **44** so as to slightly overhang the recesses **46** therein. The retainers **26** and **28** are then inserted by pushing their bases **122** through the gap between the corner edge of the window pane **22** or **24** and the opposite corner edge of the channel **44**, the base portion **122** being of sufficient resilience, because of the resilience of the material of which it is composed, to enter and pass through this space. Once behind this space and within the recess **46**, the base portion **122** expands to fill and engage the opposite side walls of the channel **44**, whereas the arcuately-curved or claw-shaped portion **124** snaps into place against the outer or exposed surface of the pane **22** or **24**, flattening into engagement therewith adjacent the edge **132** of the retainer **26** or **28**.

In operation, the sash **10**, according to its particular installation, is either fixed in position, as in a picture window, or slides as in a double hung sash or gliding window installation, or swings as in the event type window installation **140** of Figure 7. The desiccant within the chamber **118** of the inner spacer **20** maintains the space or void **25** between the window panes **24** in a constantly dry condition, preventing any fogging or clouding of the inner surfaces **106** and **108** thereof. The spacers **18** and **20**, by reason of their tenacious grips upon their respective external and internal frame units **14** and **16**, maintain the latter in assembly and at the same time prevent, or at least greatly retard transmission of heat between these units as would otherwise occur in summer or winter because of the high conductivity of metal. The spacers **18** and **20** and the retainers **26** and **28** also possess the additional feature of cushioning the installation so as to prevent or reduce breakage or chipping of the window panes **22** and **24** during installation or use.

In the foregoing specification and in the following claims, it will be understood that the terms "heat" and "heat-insulating" cover not only heat but the condition of absence of heat commonly termed "cold." Scientists and engineers are in agreement that "cold" has no physical existence, but is merely a term designating the reduction or absence of heat, hence in the scientific sense the terms "cold-insulating," "conduction of cold" or "transmission of cold" would be technically and scientifically inaccurate, even though popularly employed by laymen in everyday conversation or writing.

What I claim is:

1. An insulated metal-framed window sash comprising a pair of open-centered metal window frame structures disposed in spaced parallel relationship with one another, each of said frame structures including a channel-shaped external member of sheet material and an internal closure member of sheet material secured thereto across the channel thereof in closing relationship therewith, each internal member having an elongated channel portion disposed in the channel of said external member in spaced relationship therewith, said internal closure members in each pair of frame structures being disposed in spaced parallel relationship with the mouths of their channel portions facing one another, an elongated insulating spacing member of heat-insulating material having a central rib disposed in the space between said frame structures and having oppositely-directed side ribs disposed substantially perpendicular to said central rib and seated in said channel portions, and a window pane mounted in the open center of each of said frame structures in sealed engagement therewith and in spaced parallel relationship with each other.

2. An insulated metal-framed window sash comprising a pair of open-centered metal window frame structures disposed in spaced parallel relationship with one another, each of said frame structures including a channel-shaped external member of sheet material and an internal closure member of sheet material secured thereto across the channel thereof in closing relationship therewith, each internal member having an elongated channel portion disposed in the channel of said external member in spaced relationship therewith, said internal closure members in each pair of frame structures being disposed in spaced parallel relationship with the mouths of their channel portions facing one another, an elongated outer insulating spacing member of heat-insulating material having a central rib disposed in the space between said frame structures and having oppositely-directed side ribs disposed substantially perpendicular to said central rib and seated in said channel portions, a window pane mounted in the open center of each of said frame structures in sealed engagement therewith and in spaced parallel relationship with each other, and an elongated inner insulating spacing member of heat-insulating material disposed between said frame structures near the edges of the panes.

3. An insulated metal-framed window sash comprising a pair of open-centered metal window frame structures disposed in spaced parallel relationship with one another, each of said frame structures including a channel-shaped external member of sheet material and an internal closure member of sheet material secured thereto across the channel thereof in closing relationship therewith, each internal member having an elongated channel portion disposed in the channel of said external member in spaced relationship therewith, said internal closure members in each pair of frame structures being disposed in spaced parallel relationship with the mouths of their channel portions facing one another, an elongated outer insulating spacing member of heat-insulating material having a central rib disposed in the space between said frame structures and having oppositely-directed side ribs disposed substantially perpendicular to said central rib and seated in said channel portions, a window pane mounted in the open center of each of said frame structures in sealed engagement therewith and in spaced parallel relationship with each other, and an elongated inner insulating spacing member of heat-insulating material disposed between said frame struc-

tures near the edges of the panes, said inner spacing member having side portions engaging the inner sides of the panes.

4. An insulated metal-framed window sash comprising a pair of open-centered metal window frame structures disposed in spaced parallel relationship with one another, each of said frame structures including a channel-shaped external member of sheet material and an internal closure member of sheet material secured thereto across the channel thereof in closing relationship therewith, each internal member having an elongated channel portion disposed in the channel of said external member in spaced relationship therewith, said internal closure members in each pair of frame structures being disposed in spaced parallel relationship with the mouths of their channel portions facing one another, an elongated outer insulating spacing member of heat-insulating material having a central rib disposed in the space between said frame structures and having oppositely-directed side ribs disposed substantially perpendicular to said central rib and seated in said channel portions, a window pane mounted in the open center of each of said frame structures in sealed engagement therewith and in spaced parallel relationship with each other, and an elongated inner insulating spacing member of heat-insulating material disposed between said frame structures near the edges of the panes, said frame structures having fins along their inner edges and said inner spacing members having elongated recesses therein receiving said fins.

5. An insulated metal-framed window sash comprising a pair of open-centered metal window frame structures disposed in spaced parallel relationship with one another, each of said frame structures including a channel-shaped external member of sheet material and an internal closure member of sheet material secured thereto across the channel thereof in closing relationship therewith, each internal member having an elongated channel portion disposed in the channel of said external member in spaced relationship therewith, said internal closure members in each pair of frame structures being disposed in spaced parallel relationship with the mouths of their channel portions facing one another, an elongated outer insulating spacing member of heating-insulating material having a central rib disposed in the space between said frame structures and having oppositely-directed side ribs disposed substantially perpendicular to said central rib and seated in said channel portions, a window pane mounted in the open center of each of said frame structures in sealed engagement therewith and in spaced parallel relationship with each other, and an elongated inner insulating spacing member of heat-insulating material disposed between said frame structures near the edges of the panes, said inner spacing member having a desiccant-receiving chamber therein communicating with the space between the panes.

6. An insulated metal-framed window sash comprising a pair of open-centered metal window frame structures disposed in spaced parallel relationship with one another, each of said frame structures including a channel-shaped external member of sheet material and an internal closure member of sheet material secured thereto across the channel thereof in closing relationship therewith, each internal member having an elongated channel portion disposed in the channel of said external member in spaced relationship therewith, said internal closure members in each pair of frame structures being disposed in spaced parallel relationship with the mouths of their channel portions facing one another and with elongated spaced troughs in the inner edges of said frame structures, an elongated outer insulating spacing member of heat-insulating material having a central rib disposed in the space between said frame structures and having oppositely-directed side ribs disposed substantially perpendicular to said central rib and seated in said channel portions, a window pane mounted in the open center of each of said frame structures in sealed engagement therewith and in spaced parallel relationship with each other, an elongated inner insulating spacing member of heat-insulating material disposed between said frame structures near the edges of the panes, and an elongated pane-retaining element seated in each trough, the pane-retaining elements engaging the outer sides of the panes.

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