United States Patent [19]

Kort et al.

[11] **3,780,473**

[45] **Dec. 25, 1973**

[54] **THERMAL BARRIER WINDOW**

[75] Inventors: **Walter A. Kort**, New Philadelphia; **Eugene L. Brand**, Clinton, both of Ohio

[73] Assignee: **Alsco Anaconda, Inc.**, Akron, Ohio

[22] Filed: **Aug. 13, 1969**

[21] Appl. No.: **849,856**

[52] **U.S. Cl.** **49/62**, 49/61

[51] **Int. Cl.** **E06b 3/28**

[58] **Field of Search** ..... 49/62, 161, 411–419, 49/440, 174, 176, DIG. 1, DIG. 2, 181, 65, 439; 52/208, 202, 203, 204; 160/91

[56] **References Cited**

UNITED STATES PATENTS

763,496	6/1904	Lunken	49/62
2,635,305	4/1953	Milone	49/62
2,785,444	3/1957	Bender	49/62
2,795,016	6/1957	Lava	49/62 X
2,883,716	4/1959	Kunkel	49/62 X
3,026,579	3/1962	Carter	49/62
205,825	7/1878	Barth	49/65
2,456,486	12/1948	Berghoff	52/202
2,667,245	1/1954	Shink	52/202
2,999,279	9/1961	Lauer	160/91 X
3,363,390	1/1968	Crane et al.	52/716

FOREIGN PATENTS OR APPLICATIONS

1,034,276	6/1966	Great Britain	52/202

Primary Examiner—Dennis L. Taylor

Attorney—McNenny, Farrington, Pearne and Gordon

[57] **ABSTRACT**

A window unit having a stationary window frame and an upper and lower sash slidably mounted within the frame is disclosed. The window frame includes interior and exterior metal portions and a thermal barrier element interspaced therebetween to minimize heat transfer from and moisture condensation on the interior metal portions. The metal portions are joined to the thermal barrier element by providing each metal portion with an elongated U-shaped female portion which receives an elongated male portion of the thermal barrier element. Longitudinally spaced portions of at least one leg of each U-shaped female portion are plastically deformed into longitudinally extending channels formed in the male portions to complete the connection. The upper and lower sashes are each provided with a nonmetallic thermal barrier sash guide providing the sole contact between the sashes and their tracks formed in the stationary frame to minimize heat transfer through the sash guide from the interior metal portions of the window frame. The upper and lower sashes are each provided with a storm window unit having a nonmetallic thermal barrier frame which covers substantially all interior exposed lateral surfaces of the window sash to prevent moisture condensation thereon.

4 Claims, 5 Drawing Figures

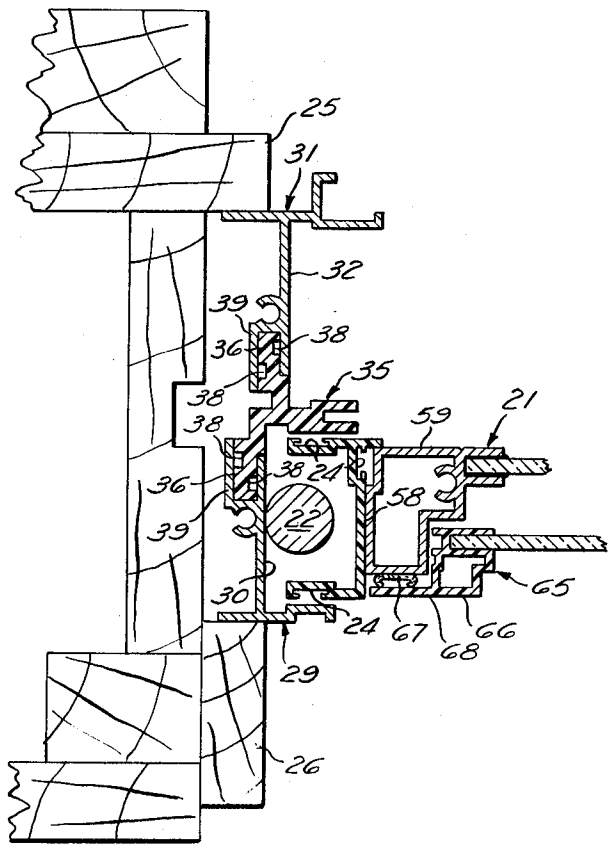
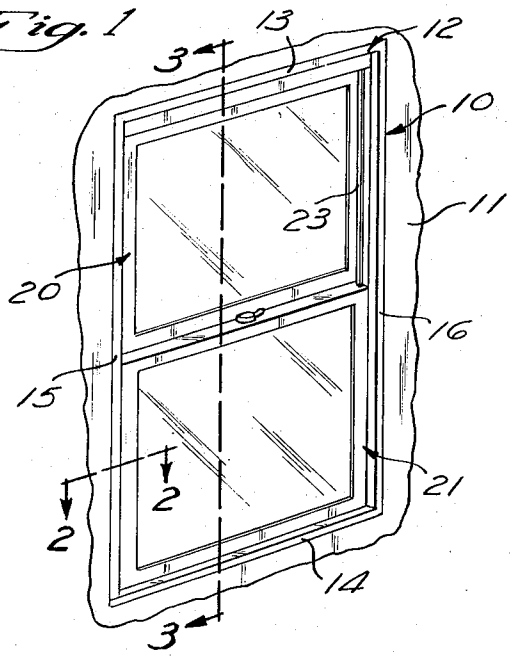


Fig. 1



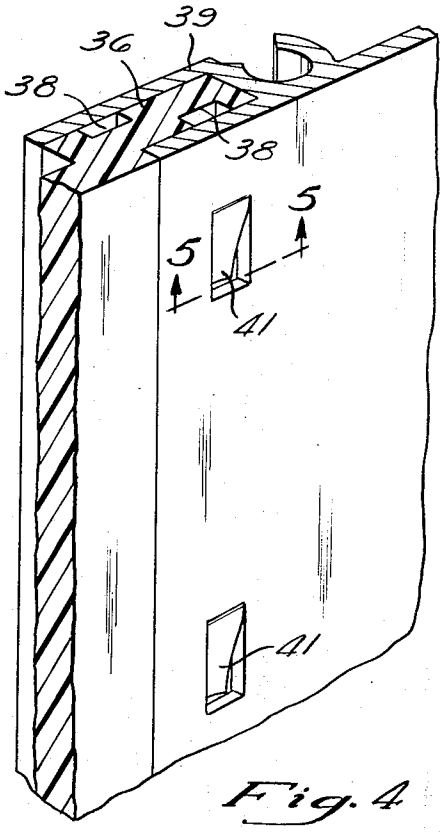


Fig. 4

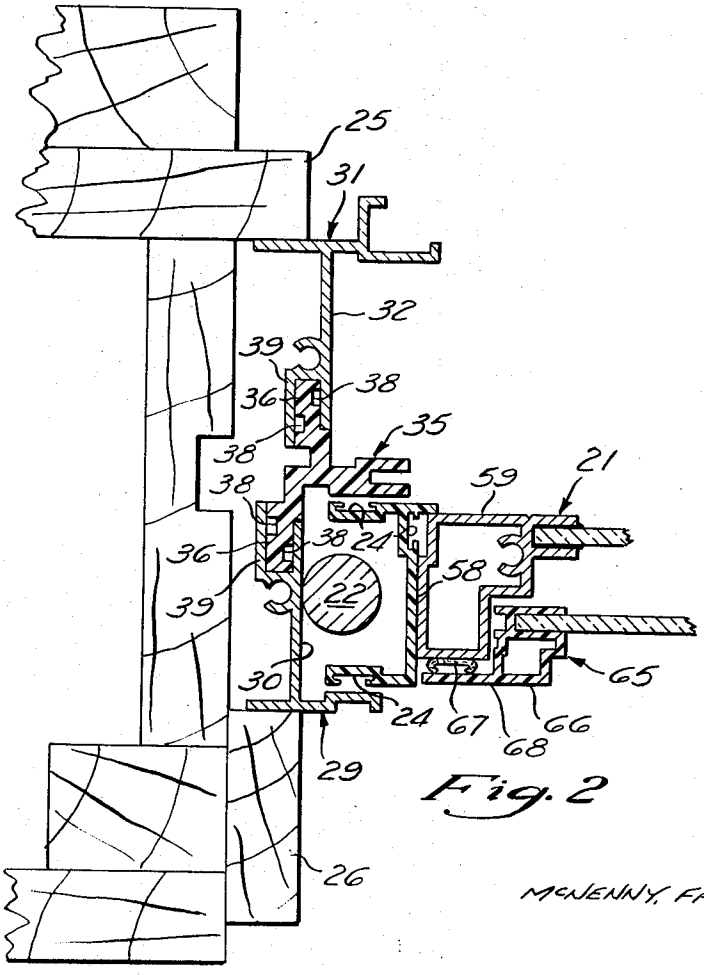


Fig. 2

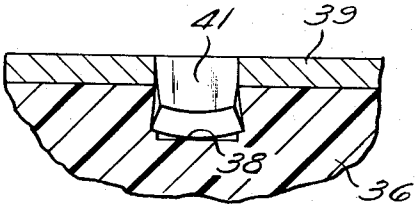


Fig. 5

INVENTORS
WALTER A. KORT
& EUGENE L. BRAND
BY
McNENNY, FARRINGTON, PEARNE & GORDON

ATTORNEYS

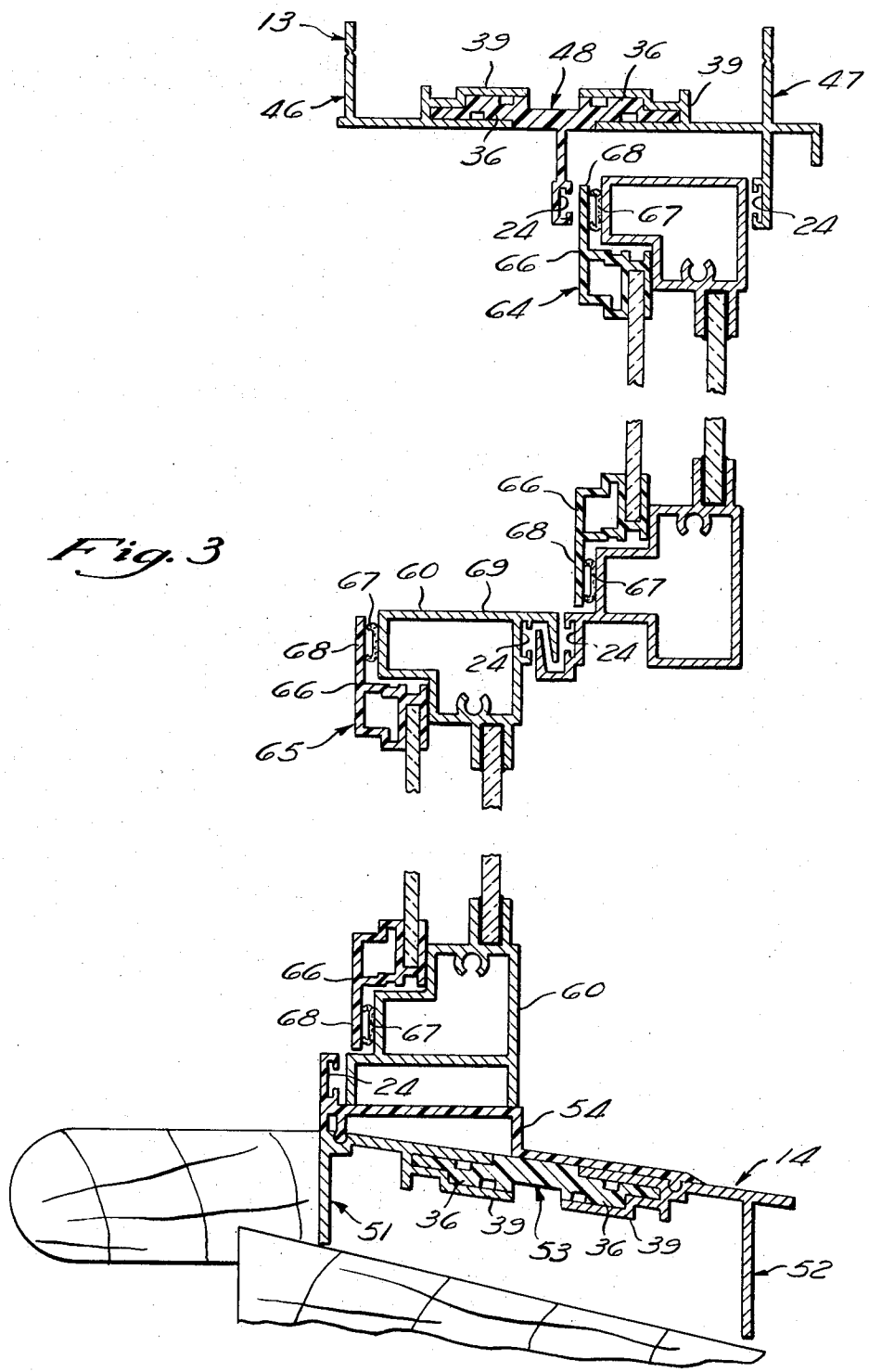


Fig. 3

INVENTORS
WALTER A. KORT
& EUGENE L. BRAND
BY
McNENNY, FARRINGTON, PEARNE & GORDON

ATTORNEYS

THERMAL BARRIER WINDOW

BACKGROUND OF THE INVENTION

This invention relates generally to metal window frames and metal window sashes, and more particularly to such frames and sashes which are provided with thermal barriers to minimize heat transfer from and moisture condensation on their inside surfaces.

When metal window frames and their associated metal window sashes are used in buildings and the like in which the temperature inside the building is greater than the temperature outside the building, heat transfer from the portions of the frame and sash inside the building may lower the temperature of those portions below the dew point of the air inside the building, thereby causing moisture condensation on those inner portions.

To minimize this objectionable heat transfer from the inside portions of metal window frames, nonmetallic thermal barrier elements having a relatively low coefficient of thermal conductivity are commonly interspaced between inside metallic portions of the window frame and the outside metallic portions of the window frame. (As used herein, the phrase coefficient of thermal conductivity or coefficient of heat conductivity means any coefficient indicating the rate of heat transmission through a given material.) One particular problem associated with such thermal barrier window frames, however, is the difficulty of obtaining a structurally adequate and properly aligned connection between the inside and outside metallic portions and the nonmetallic thermal barrier interspaced therebetween. One suggested method of providing this connection includes heating a thermoplastic material to cause melting and plastic flow of the material into an associated groove means of the metallic frame, such as disclosed in U.S. Pat. No. 3,420,026 to Nolan. Although this method may form a satisfactory connection, it is rather complicated due to the necessity of forming the thermal barrier element by flow of the thermoplastic material into a die cavity defined by die segments and by the metallic frame members.

Even the use of such a thermal barrier element between the inside and outside frame members does not always sufficiently minimize the heat transfer from the inside frame portions to prevent moisture condensation thereon. One reason for this is that the metal window sash, which is slidably disposed in a track in the window frame, serves as an alternate and additional path for heat to flow from the inside portions of the window frame to the central or outside portions of the frame.

To minimize the heat transfer from and moisture condensation on the inside portions of metal window sashes, auxiliary storm windows are commonly provided. These storm windows are commonly positioned outside of the metal sash, and cooperate with the sash window glass to define a dead air space for insulation purposes. Such externally disposed storm windows are subject to the disadvantage of requiring installation and removal from the outside of the building, or requiring additional tracks in the window frame if they are to be slidably mounted therein to allow sliding installation and removal from the inside of the building. Still another type of storm window commonly used is mounted inside of the window sash to cover the window sash glass and minimize heat transfer therethrough. This latter type of storm window is commonly mounted on the

sash for sliding movement therewith relative to the frame. Although such inside storm windows minimize heat transfer through the window glass, they do not substantially effect the transfer of heat from the inside surface of the metal sash to prevent condensation thereon. Still another type of inside-mounted storm window is that which covers the entire window unit, such as disclosed in U.S. Pat. No. 2,456,486 to Berghoff. This type of storm window is generally not desirable, however, because it does not permit the window sash to be raised and lowered, and further because it necessitates an additional track in the window frame.

SUMMARY OF THE INVENTION

These and other difficulties and disadvantages of prior art metal window frames and metal window sashes are overcome by the present invention, which provides a novel thermal barrier window frame and sash for preventing condensation on the interior portions thereof.

According to the principles of the invention, heat transfer from the interior portions of a metal window frame is minimized by interspacing a nonmetallic element having a relatively low coefficient of heat conductivity between metal inner portions and metal outer portions of the frame. To provide a structurally adequate and properly aligned connection between the thermal barrier element and the metal portions of the frame, the invention provides the thermal barrier element with a longitudinally extending groove or channel into which longitudinally spaced portions of metal portions of the frame are plastically deformed.

In a specific embodiment, the thermal barrier element is provided with an elongated male connector portion having a pair of offset channels extending from its opposed lateral surfaces. The metal frame portions are each provided with an elongated U-shaped female portion to receive the portion of the thermal barrier element having the offset channels. Longitudinally spaced portions of at least one leg of the U-shaped female portion are plastically deformed into the offset channels to complete the connection. In the preferred embodiment, the plastically deformed portions of the metal frame have a greater width than the width of the channels so that the plastically deformed portions grip the sidewalls of the channels to prevent relative longitudinal movement between the metal portions and the thermal barrier element. This aspect of the invention provides an extremely simple and highly effective connection between the metal portions of the frame and the thermal barrier element.

Heat transfer from and moisture condensation on the interior portions of the metal window frame and the metal window sash are minimized according to another aspect of the invention by providing a nonmetallic sash guide for guiding the metal sash in the track provided in the window frame. By making this portion of the window unit of a material having a relatively low coefficient of thermal conductivity, this aspect of the invention substantially eliminates what has heretofor been an alternate or additional heat transfer path from the interior portions of the window frame to the exterior portions of the window frame. Furthermore, this aspect of the invention effectively thermally isolates the metal sash from the metal frame to prevent heat transfer from the sash to the sash guide to the exterior portions of the

frame to still further minimize moisture condensation on the interior surfaces of the window sash.

To minimize moisture condensation on the interior portions of the metal sash, the invention provides a storm window frame which is mounted on the interior portion of the sash for sliding movement therewith. According to this aspect of the invention, a conventional nonmetallic interior storm window frame, such as has been used in the past to cooperate with the window sash to define a dead air space to prevent heat transfer through the window sash glass, is provided with a nonmetallic flange or lip portion extending laterally outwardly therefrom to cover the exposed interior surfaces of the metal window sash. In this manner, this aspect of the invention does not provide a thermal barrier element between internal portions of the sash and external portions of the sash, but instead provides a cover for the interior portions of the sash which prevents the warmer air inside the building from contacting the metal interior portions of the sash to preclude moisture condensation thereon. Since the flange or lip portion is of a material having a relatively low coefficient of heat conductivity, heat transfer from its inside surfaces is minimized to preclude moisture condensation thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects and advantages of the present invention will become more readily apparent to those skilled in the art upon a full understanding of the preferred embodiments of the invention shown in the accompanying drawings, wherein:

FIG. 1 is a perspective view of the window unit according to this invention mounted within a window opening;

FIG. 2 is an enlarged cross-sectional view taken along reference view line 2—2 in FIG. 1;

FIG. 3 is an enlarged cross-sectional view taken along reference line 3—3 in FIG. 1;

FIG. 4 is an enlarged fragmentary perspective view of a portion of the window frame shown in FIG. 1, showing a typical connection between a metal portion of the frame and a thermal barrier element; and,

FIG. 5 is a fragmentary cross-sectional view taken along reference view line 5—5 in FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings in greater detail, FIG. 1 shows a window unit 10 mounted within a window opening in a wall 11 of a building. The window unit 10 includes a window frame 12 having a top frame member 13, a bottom sill member 14, and side jams 15 and 16 which are connected at their ends to the top frame member 13 and the bottom sill member 14. Slidably mounted within the window frame 12 are a top window sash 20 and a bottom window sash 21. Conventional counter-balance members 22 and 23 are provided to bias the bottom window sash upwardly. Unless otherwise specified or required, all metal portions of the window unit 10 are extruded sections of a suitable aluminum and all nonmetal portions are extruded sections of a suitable low friction plastic material. The window unit 10 is also provided with a plurality of weather stripping grooves 24, which are arranged at locations of relative movement between adjacent members. Each groove 24 is adapted to receive a weather strip (not shown), which may be pile or the like, to provide an air, dust and water tight seal at these locations.

The structure of the side jam 15 is a mirror image of the side jam 16, and is shown in detail in FIG. 2. As seen in FIG. 2, the window unit 10 is mounted in the window opening in the wall 11 by an exterior wall member 25 and an interior molding strip 26 in a conventional manner. The side jam 15 includes an interior metal jam member 29 having a track 30 for slidably receiving the lower sash 21, and an exterior metal jam member 31 having a track 32 for slidably receiving the upper sash 20. Interspaced between the interior jam member 29 and the exterior jam member 31 is a thermal barrier element 35. The element 35 has a relatively low coefficient of thermal conductivity to minimize heat transfer from the interior member 29 to the exterior member 31 when the air inside the building of which the wall 11 forms a part is at a higher temperature than the air outside of the building. In this manner, the interior member 29 may be maintained at a temperature above the dew point of the air inside the building to preclude moisture condensation thereon.

Prior to the present invention, it has been difficult to form a structurally adequate and properly aligned connection between the jam members 29 and 31 and the thermal barrier element 35. According to the principles of the present invention, the thermal barrier element 35 is provided with elongated projecting connector portions 36, each having at least one longitudinally extending open channel 38 formed therein. In the preferred embodiment, each projecting connector portion is provided with a pair of offset channels which open to opposed lateral surfaces thereof. The jam members 29 and 31 are further provided with elongated U-shaped connector portions 39, which are arranged to receive the portions 36 of the element 35. In this manner, the invention provides a method of fastening metallic members to nonmetallic members, in which the members are accurately aligned without the use of an auxiliary positioning fixture, although such a fixture could be used if desired.

As best seen in FIGS. 4 & 5, each metallic U-shaped connector portion 39 is secured to its mating nonmetallic connector portion 36 by plastically deforming longitudinally spaced portions 41 of each leg of the U-shaped connector protion 39. The spaced portions 41 may be deformed simultaneously by a punch press or the like, or individually by passing the properly aligned portions 36 and 39 between spaced rollers having suitable projections for deforming the portions 41. As best seen in FIG. 5, the deformed portions 41 are slightly wider than the channel 38. In this manner, the portions 41 grip the opposed walls of the channel 38 to prevent relative longitudinal movement between the portions 36 and 39.

As seen in FIG. 3, the top frame member 13 is provided with an interior metal frame member 46 and an exterior metal frame member 47 interspaced by a thermal barrier element 48. In a similar manner, the bottom sill member 14 includes an interior metal sill member 51 and an exterior sill member 52 interspaced by a thermal barrier element 53. These metal portions and the thermal barrier element of both the top frame member 13 and the bottom sill 14 are provided with cooperating connector portions 36 and 39, and are secured together in the same manner as the side jam 15 described above. A nonmetallic bottom sill cover plate

54 is also provided to still further minimize heat transfer from the interior sill member 51.

Referring again to FIG. 2, the lower window sash 21 includes and carries a sash guide member 58, and the member 58 is slidably received within the track 30. The upper window sash 20 is slidably received in the track 32 in a similar manner. The lower sash 21 further includes a pair of vertical channel members 59 and a pair of horizontal channel members 60 joined together at their ends for receiving a window glass. The lower ends of the vertical channel members 59 may be pivotally secured to the sash guide members 58 to permit the channel members 59 and 60 of the lower sash 21 to be swung about a horizontal axis to permit washing of the exterior of the window glass from the inside of the building. In such an arrangement, the upper ends of the vertical members 59 are provided with an appropriate detent means acting between the upper ends of the members 59 and the sash guide members 58 to retain the window in the upright position shown in FIG. 1.

In the past, the sash guide member 58 has been formed of a metallic material having a relatively high coefficient of heat conductivity, and has provided an alternate or supplementary heat flow path allowing heat transfer from the internally exposed surfaces of the interior jam member 29 and from the interior portions of the sash members 59 and 60. To minimize the objectionable heat transfer, the present invention recognizes the existence of this sash guide member as an alternate or supplementary heat flow path, and forms the sash guide member 58 of a material having a relatively low coefficient of heat conductivity.

While the thermal barrier elements 35, 48 and 53, acting in cooperation with ther thermal barrier sash guide member 58, significantly reduce heat transfer from the interior window frame members 29, 46 and 51 to substantially preclude moisture condensation thereon, the invention further provides a means for preventing moisture condensation on the interior metallic portions of the sashes 20 and 21. The present invention provides a means for preventing such condensation on the interior portions of the sashes 20 and 21, which obviates the necessity for providing thermal barrier elements interspaced between interior and exterior portions of the sash channel members. The present invention further provides such a means which does not require substantial additional structural elements other than those conventionally used on inside storm windows.

According to this aspect of the invention an upper sash storm window unit 64 and a lower sash storm window unit 65 are provided as shown in FIGS. 2 and 3. The storm units 64 and 65 each include thermal barrier channel members 66, which are joined at their ends to form storm unit frames for receiving a storm unit glass. The channel sections 66 are further provided with a sealing element 67 to prevent the warmer air inside the building from contacting the internal surfaces of the channel members of the sashes 20 and 21.

The storm window units 64 and 65 are removably secured to the upper and lower sashes 20 and 21, respectively. In the preferred embodiment, this is accomplished in a well known manner by providing each unit 64 and 65 with storm window unit retaining clips (not shown). Each clip may be generally flat and pivotally arranged on a channel section 66. Rotation of the retaining clip about its pivotal axis advances and retracts a locking portion of the clip with respect to an aperture (not shown) in the adjacent portion of the sash 20 or 21 to lock or release the storm unit.

Each channel section 66 is formed with a laterally extending flange or lip portion 68. When the air temperature outside the building is lower than that inside the building and the storm units 64 and 65 are positioned as shown in FIGS. 2 and 3, this laterally projecting flange portion covers the lateral surfaces of the upper and lower sashes 20 and 21. In this manner, the flange portion 68 prevents circulating contact of the warmer air inside the building with the sashes to prevent moisture condensation thereon. This aspect of the invention is to be distinguished from other types of condensation-preventing means, since it does not maintain the sashes 20 and 21 at a higher temperature to prevent condensation, but, in contradistinction, maintains the sashes 20 and 21 at a lower temeperature but prevents moisture condensation by preventing circulating contact of the air inside the building with the exposed lateral surfaces of the sashes 20 and 21. If desired, the top horizontal storm unit channel section 66 of the lower storm unit 65 may also be provided with a second flange (not shown) extending perpendicular to its flange portion 68 to cover the top surface 69 of the lower window sash. Since the flange portion 68 is of a material having a relatively low coefficient of heat conductivity, heat transfer from its interior surfaces is minimized to preclude moisture condensation thereon.

Although a prefrred embodiment of the invention has been shown and described in detail, various modifications and rearrangements may be made without departing from the scope of the invention. For example, the invention could also be applied to large stationary window units or to horizontally sliding window units as well as the vertically sliding unit shown in the preferred embodiment.

What is claimed is:

1. In combination, a metallic window sash slidably mounted in a track of a window frame, and a substantially nonmetallic storm frame detachably mounted on said window sash and slidably carried therewith in said window frame, said nonmetallic storm frame including means covering substantially all interior lateral surfaces of said metallic window sash for preventing moisture condensation thereon.

2. A combination as defined in claim 1 wherein said nonmetallic storm frame carries a glass for cooperating with a glass carried by said window sash to define a dead air space, and said means includes a flange portion covering said interior lateral surfaces.

3. A combination as defined in claim 1 wherein said nonmetallic storm frame includes a first portion carrying a glass, and said means includes a second portion extending laterally outwardly from said first portion covering said interior lateral surfaces and a sealing means extending between said second portion and said interior lateral surfaces for preventing circulating contact of air with said interior lateral surfaces.

4. A combination as defined in claim 1 wherein said metallic window sash includes an indented portion, said indented portion receiving a first portion of said storm frame, said first portion of said storm frame carrying a glass, and said first mentioned means including lip means extending laterally from said first portion and covering said interior lateral surfaces for preventing circulating contact of air with said interior lateral surfaces.

* * * * *