March 5, 1963 H. P. ARMSTRONG 3,080,023

WINDOWS

Filed Feb. 15, 1960 3 Sheets-Sheet 1

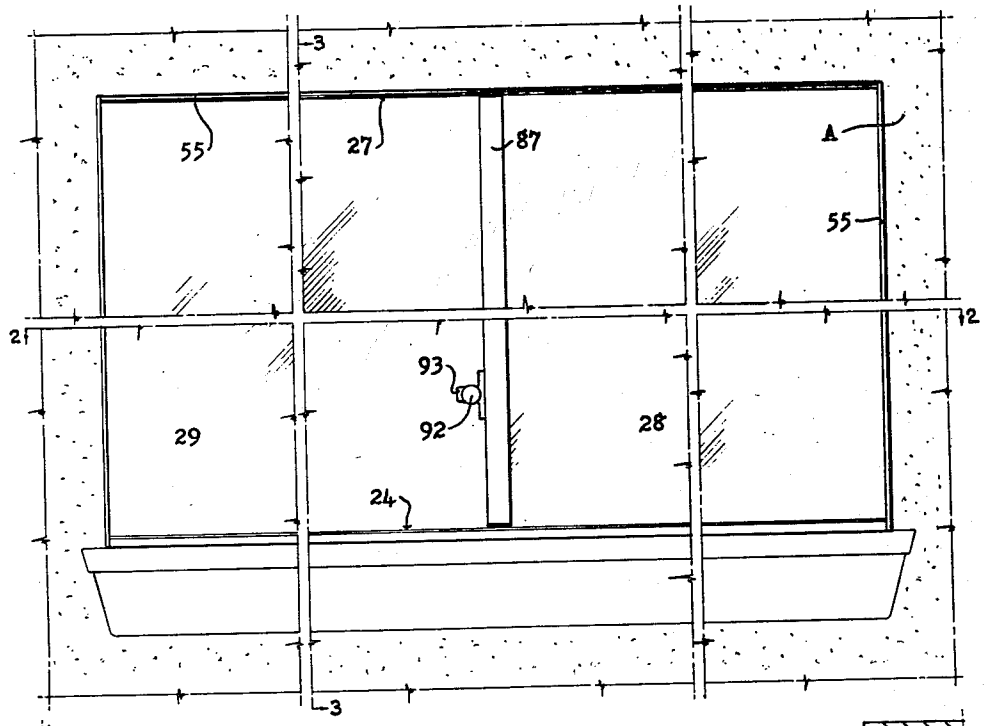


FIG. 1.

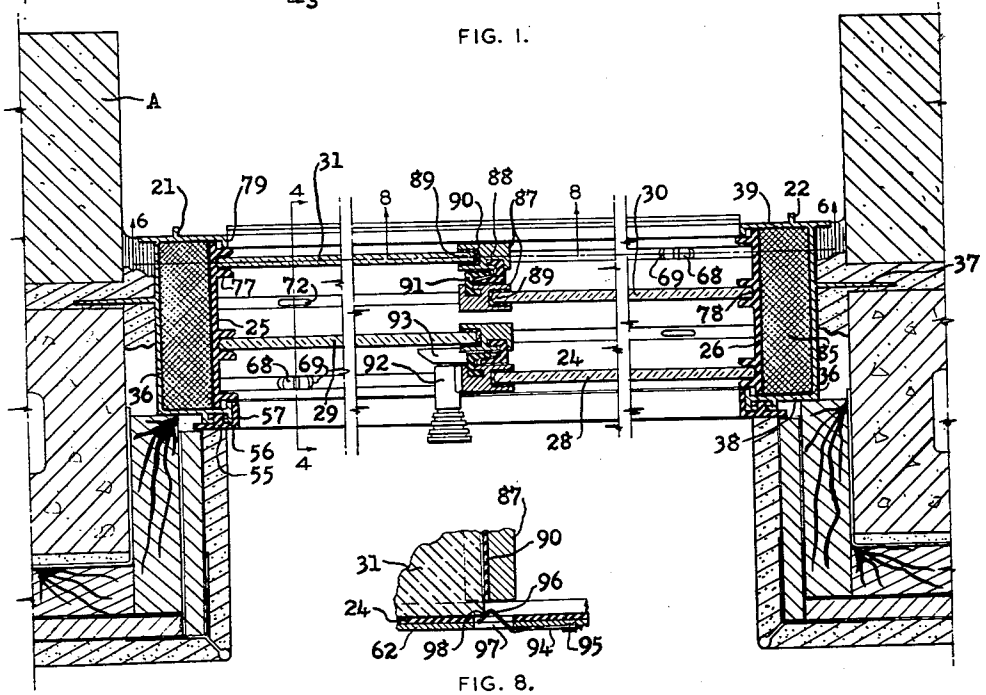


FIG. 2.

FIG. 8.

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WINDOWS

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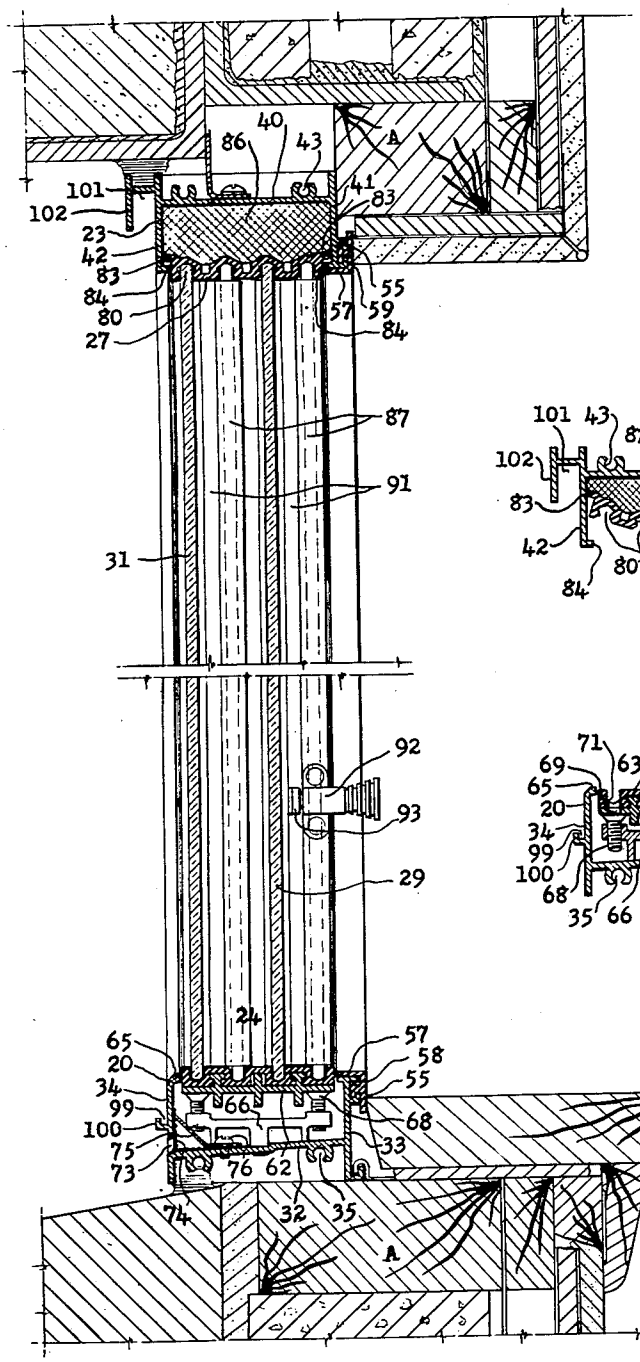


FIG. 3.

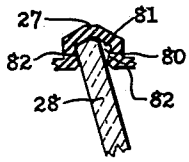


FIG. 9.

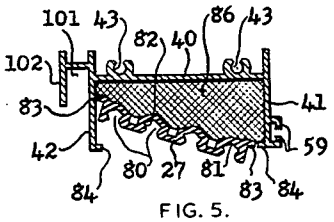


FIG. 5.

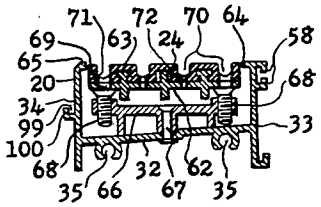


FIG. 4.

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WINDOWS

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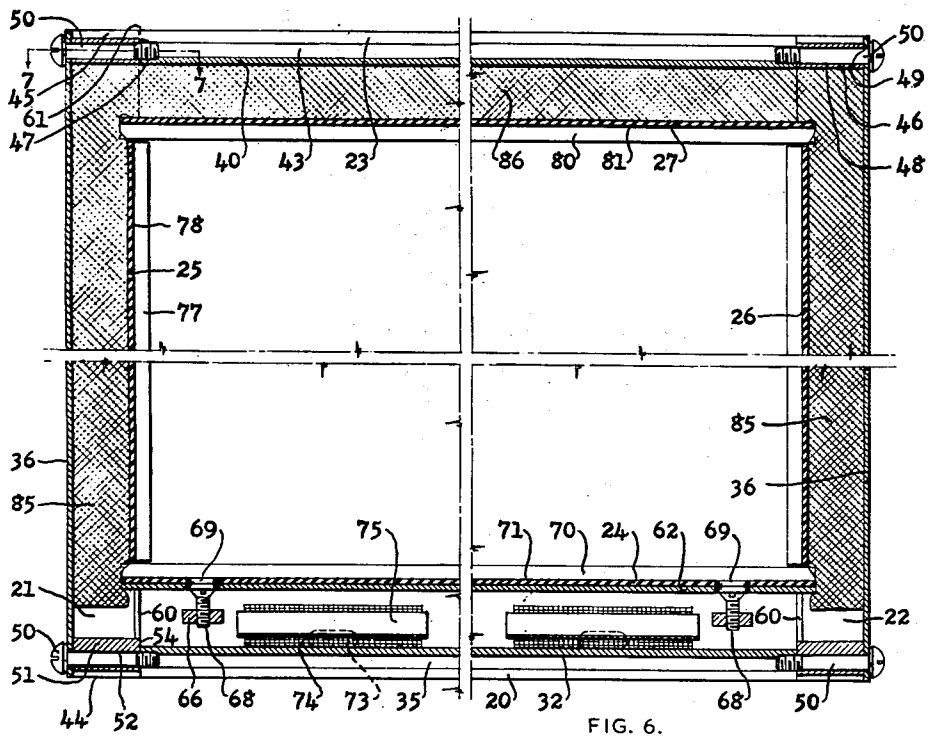


FIG. 6.

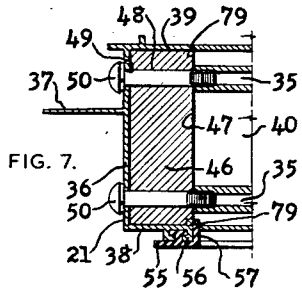


FIG. 7.

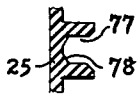


FIG. 10.

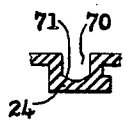


FIG. 11.

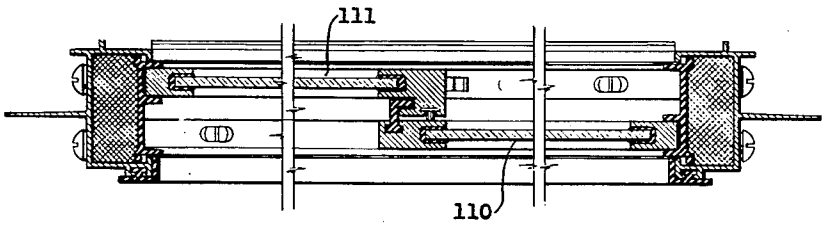


FIG. 12.

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3,080,023

Patented Mar. 5, 1963

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WINDOWS

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Filed Feb. 15, 1960, Ser. No. 8,686
15 Claims. (Cl. 189—64)

This invention relates specifically to windows embodying two or more closure panels, at least one of which is horizontally slidable.

In the interpretation of this specification and the appended claims, wherever the context so admits, the difinition "closure panel" is intended to generally identify a window sash, or a singel glass pane with or without perimeter or partial edge supporting means, or alternately, a multiple glass pane unit with suitable edging or perimeter supporting means. The closure panels may form part of a prime window, or a combination prime and storm window.

An object of my invention is to provide a horizontally slidable closure panel window wherein the closure panels are inter-related, and co-related with a frame supporting structure therefore, in such manner that leakage of wind and rain is substantially below the permissible infiltration standards defined in the architectural specifications of the Aluminum Window Manufacturers Association (United States of America), and wherein the use of any form of weatherstripping may be eliminated, wherefore the closure panels may be opened and closed with ease and facility.

An additional object of this invention is to provide a window of the character described, so designed that both prime and storm closure panels may be installed, removed and replaced with facility, from the room side of the window, without the necessity of adjusting, removing and replacing fastening or anchoring devices.

A still further object of the invention is to provide a window embodying horizontally slidable prime closure panels, or a combination of prime and storm closure panels, and a supporting metal and plastic frame structure therefor, so designed that room moisture vapour having a hygrometer reading in a relative humidity range of 40% and room temperature of 70%, will not accumulate on the room side of the frame structure and condense into water beads or a film of water or frost, when the outside atmospheric temperature is sub-zero, whereby the closure panels may be opened and closed at any time and under all normal conditions with ease and facility.

An additional object of the invention is to provide a window structure as above described, wherein parts of the closure panel edge supporting and sealing means will automatically accommodate, within practicable limitations, out-of-square installation of the window frame.

Another very important design aspect of the invention resides in the formation of the frame structure and co-related closure panel supporting track and jamb seal components together with resilient cushioning means for the header track and the jamb seals, whereby the said resilient cushioning means, tracks and jamb seals may be installed with facility after the window frame is built into a wall, and whereby any of said components may be easily and quickly removed and replaced for maintenance purposes, without the use of special tools, or removal and replacement of fastening devices such as screws.

The invention is further characterized by the cross-sectional formation of the closure panel supporting grooves in the header track, whereby the header track under expansive effort of a partially compressed resilient cushion extending longitudinally between same and the header frame, engages and retains the top ends or rails of the closure panels in tightly sealed relation, thus preventing

rattling of the top ends or rails of the closure panels when subject to variable wind pressures or vibration, and whereby the closure panels may be lifted clear of the sill track and tilted at an acute angle inwardly for easy removal of the said closure panels.

Supplementing the design features defined in the preceding paragraph, the cross-sectional formation of the closure panel edge or stile supporting groove in a jamb seal is so formed that it centralizes and retains the edge or stile of a closure panel in tightly sealed relationship under the expansive effort of a partially compressed resilient cushion extending longitudinally between the frame jamb and the jamb seal, thus preventing rattling of the stile edge of a closure panel when subject to variable wind pressures or vibration, and whereby the closure panel may be shifted by hand into and out of engagement with the said jamb seal with a minimum of resistance and application of very slight closure panel movement effort.

In addition to the design features of the closure panel supporting header track and jamb seals defined in the two preceding paragraphs, the sill track is provided with longitudinal closure panel grooves of such cross-sectional formation that a horizontally slidable closure panel is centralized in its guide groove in such manner that the closure panel may be shifted horizontally to open or closed position with facility and ease, and the closure panel is so retained that it will not rattle when subjected to variable wind pressures or vibration.

This invention is further characterized by the novel method of correlating an exterior rigid frame structure with rigid plastic components forming supporting means for slidable closure panels, whereby the said rigid plastic components may expand and contract longitudinally independently of one an other, yet maintain compact relation at the ends thereof in such a manner that air infiltration is substantially restricted.

It is a further object of this invention to provide a window of the horizontally slidable closure panel type comprising all of the design features above defined, which embodies desirable architectural proportion and sight line characteristics, and which may be manufactured and sold in a highly competitive low cost price range.

Other objects and features of novelty of the invention will be specifically defined or will become apparent when referring for a better understanding of the invention, to the following description taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a fragmental elevational view from the interior of a window, as it would appear when built into a wall structure, which window embodies features of this invention.

FIGURE 2 is an enlarged horizontal section of the window and a conventional form of supporting wall structure, as it would appear when viewed from the plane designated by the section line 2—2 appearing on FIGURE 1;

FIGURE 3 is an enlarged vertical section of the window shown in FIGURES 1 and 2, taken on the section line 3—3 of FIGURE 1;

FIGURE 4 is a transverse vertical section of the frame sill and sill track, as viewed from line 4—4 of FIGURE 2.

FIGURE 5 is a vertical section, taken on the same plane as FIGURE 3, showing the frame header and the header track in the transversely tilted position it would occupy when the header track is being telescoped into the frame header;

FIGURE 6 is a vertical longitudinal section of the window frame and closure panel supporting structure as it would appear when viewed on the plane designated by the line 6—6 of FIGURE 2;

FIGURE 7 is a fragmentary horizontal section of one

corner of the window frame structure, taken on line 7—7 of FIGURE 6;

FIGURE 8 is a fragmentary vertical section through part of the sill track showing a part on one lower corner of a closure panel and a co-acting closure panel stop spring employed to arrest horizontal movement of a closure panel;

FIGURE 9 is a further magnified transverse vertical section showing a portion of the closure panel header track, the closure panel guide groove therein, and a portion of the top edge of a closure panel which is formed of a panel of glass having a ground pencil edge;

FIGURE 10 is a transverse horizontal section, on the same scale as FIGURE 9, showing a portion of a jamb seal and closure panel guide groove therein;

FIGURE 11 is a transverse vertical section, on the same scale as FIGURES 9 and 10, showing a portion of the sill track and a closure panel guide groove therein; and

FIGURE 12 is a transverse horizontal section of a modified form of window frame and closure panels, shown independent of a supporting wall structure.

Like reference characters designate similar parts in FIGURES 1 to 11 inclusive, and other reference numerals identify the components of the modified form of window structure shown in FIGURE 12.

The types of windows illustrated in the accompanying drawings may be incorporated in any form of wall structure or curtain wall panel, and it is to be understood that the disclosure application to a solid masonry wall, generally indicated at A, is for illustrative and reference purposes only.

Referring to FIGURES 1 to 11 inclusive of the accompanying drawings, the window frame structure generally comprises a frame sill **20**, frame jambs **21** and **22**, and a frame header **23**. A sill track **24** is supported by the frame sill **21**; jamb inserts or seals **25** and **26** are supported by the frame jambs **21** and **22** respectively; and a header track **27** is supported by the frame header **23**. Two prime closure panels **28** and **29** are supported by the aforesaid structure adjacent to the room side of the window, and two storm closure panels **30** and **31** are likewise supported outwardly of the said prime closure panels. For sake of brevity the aforesaid definition jamb inserts or seals shall hereinafter be in the form of jamb seals or jamb inserts.

The frame sill **20** is preferably formed of extruded aluminum, substantially channel-shaped in transverse section, comprising a web **32** and two perpendicular flanges **33** and **34**. Two screw receiving grooves **35** extend longitudinally of the web **32**. The frame jambs **21** and **22** are similar in channel-shaped transverse section and are preferably formed of extruded aluminum, and each includes a channel base web **36**, with an outwardly extending wind stop **37**, and two inwardly extending flanges **38** and **39**. The frame header **23** may also be of extruded aluminum, channel-shaped in cross-section, and may comprise a web **40** and two downwardly extending perpendicular flanges **41** and **42**. Two screw receiving grooves **43** extend longitudinally of the web **40**.

Referring now to FIGURE 6, the frame jambs **21** and **22** extend the full height of the frame structure, and the lower ends **44** thereof are preferably flush with the bottom edges of the flanges **38** and **39** of the said frame sill. The upper ends **45** of the frame jambs **21** and **22** are preferably flush with the top edges of the frame header flanges **41** and **42**. A filler member **46**, also preferably of extruded aluminum, is positioned in the upper end **45** of each frame jamb **21** and **22**. The cross-sectional contour of each filler member **46** corresponds with the internal shape of each said frame jamb, as is clearly shown in FIGURE 7, and includes an end face **47** aligned with the inside edges of the frame jamb flanges **38** and **39**. Two holes **48** extend through each filler member **46**, in alignment with the two holes **49** in the webs **36** of the frame jambs **21** and **22**, and through which screws **50** extend into pre-tapped ends of the frame header grooves **43**. A filler member **51**, similar in cross-sectional shape to each filler member **46**, is located in each lower end of each said frame jamb. Two holes **52** extend through each filler member **51**, in alignment with the two holes **53** in the webs **36** of the frame jambs **21** and **22**, and through which screws **50** extend into pre-tapped ends of the frame sill grooves **35**. Each filler member **51** includes an end face **54** aligned with the inside edges of the frame jamb flanges **38** and **39**. If desired, self-tapping screws may be substituted for the standard type screws **50**.

Before insertion of the filler members **46** and **51** in the ends of the frame jambs **21** and **22**, edge surfaces of the said filler members may be coated with a sealing compound so that waterproof joints may be established. A permanently resilient synthetic rubber base compound of polysulphide formulation may be used. In addition, after insertion, supplemental sealing compound may be applied to the joint edges.

A non-metallic thermal insulation member **55**, preferably of extruded rigid plastic such as vinyl, interlocks with the two ribs **56** integral with each inside flange **38** of each of the frame jambs **21** and **22** and extends longitudinally substantially the full length of each of said frame jamb. Each member **55** includes a flange **57** which overlies the inside edge of each frame jamb flange **38**. A similar thermal insulation member **55** extends longitudinally of the frame sill flange **33** and interlocks with the ribs **58** integral therewith, and the flange **57** of the member **55** overlies the top edge of the flange **33**. Likewise, a similar member **55** extends longitudinally of the frame header **23** and interlocks with the ribs **59** integral with the header frame flange **41**, and the flange **57** of the said member **55** overlies the lower edge of the header frame flange **41**. The ends of the members **55** interlocked to the frame sill **20** and frame header **23** respectively terminate in close proximity to or abut the flanges **57** of the member **55** interlocked to the said frame jambs, wherefore thermal insulation is provided by the four members **55** around the inside of the metal frame, and provides a stop for a window stool, wall plaster return or jamb extension.

Each end **60** of the frame sill **20** is square cut to align with the face **54** of the adjacent filler member **51** and the inside edge of the related frame jamb flange **39**, and the frame sill flange **33** is notched at each end to accommodate the flange **57** of each frame jamb thermal insulation member **55**. Each end **61** of the frame header **23** is square cut to align with the face **47** of the adjacent filler member **46** and the inside edge of the related frame jamb flange **39**, and the frame header flange **41** is notched at each end to accommodate the flange **57** of each frame jamb member **55**. The ends **60** of the said frame sill and the ends **61** of the said frame header shall be coated with a suitable sealing compound, such as hereinbefore specified, to provide a waterproof joint between the said frame jambs, the ends of the said filler members **46** and **51** therein, and the ends **60** and **61** of the said frame sill and frame header, respectively.

The sill track **24**, jamb seals **25** and **26**, and the header track **27**, which engage and support the closure panels **28** to **31** inclusive, are preferably formed of non-metallic material, for windows used in "North Temperate Zone" climates. The members **24** to **27** inclusive may be formed of any suitable plastic compatible with prevailing atmospheric conditions, and the wear usage to which such members may be subjected. For use in the "North Temperate Zone," where winter temperatures do not drop below —40° F., extruded rigid vinyl may be advantageously used. This material is characterized by flexibility in extruded strip form, ductility which permits each machining, and unusually high resistance to wear. However, it possesses a high expansion-contraction co-efficient, and the window design must be established to accommodate

this characteristic in order to avoid distortion of the members 24 to 27 inclusive and also maintain weather-tight sealing about the perimeter of the closure panels, as is hereinafter defined.

To compensate for the inherent flexibility characteristics of the plastic sill track 24, particularly if extruded rigid vinyl is used, the cross-sectional formation thereof is such that it is splined to the track supporting member 62, which may be extruded aluminum, by interlocking engagement with the T-shaped ribs 63 extending longitudinally of members 62. This form of spline-interlocking engagement of the sill track 24 and its supporting member 62 permits independent expansion and contraction of these parts and avoids buckling or distortion of either part. The sill track 24 extends longitudinally of the frame sill 20, between the rib 64 extending inwardly from the frame sill flange 33, and the ribb 65 extending inwardly from the frame sill flange 34. Clearance between the outside edges of the sill track 24 and the ribs 64 and 65 should be restricted to the lowest practicable production tolerance and use limitation.

A plurality of supports 66, arranged in spaced relation longitudinally within the frame sill 20, at suitable intervals, such as between ten and twenty inches, are provided to support the member 62. Each support 66 may be secured to the web 32 of the frame sill 20 by a rivet 67, best shown in FIGURE 4. Two screws 68 are threaded into each support 66 and the member 62 rests upon and is supported by the heads of the said screws, which may be adjusted vertically to provide alignment of the sill track 24. Elongated apertures 69 are provided in registering alignment in the sill track 24 and its supporting member 62, shown in FIGURES 2, 4 and 6, through which the end of a screw-driver may be inserted for engagement with and vertical adjustment of the said screws.

The sill track 24 is formed with a plurality of grooves 70 extending in parallel relation longitudinally thereof to receive, support and guide the lower edges of a plurality of closure panels, herein shown as combination prime and storm closure panels, and indicated by the numerals 28 to 31 inclusive. Alternately, many of the essential characteristics of this window may be incorporated in a unit embodying prime closure panels only, as is shown in FIGURE 12, and the particular type of closure panels shown in the accompanying drawings is not to be construed as a limiting factor as regards design and use application of the novel aspects of this invention.

In FIGURES 1 to 3 inclusive, closure panels of the type known in the window industry as sashless window panels, are illustrated. The bottom, jamb and header contact edges of these glass panels are convex or pencil edge ground and are preferably polished in the grinding operation to provide very smooth edge surfaces to ensure free sliding characteristics. The bottom surface of 71 of each groove 70 is of shallow V-shape in cross-section, best shown in FIGURE 11, and acts to centralize the lower convex edge of each said closure panel in each said groove. Obviously there must be clearance between the lower edge of each said closure panel and the sides of the grooves 70 to permit free sliding action of the said closure panels, wherefore some rain-water will enter the said grooves. Such rain-water will drain through the slots 69 in the two outer grooves 70, and at least one additional drain aperture 72 should be provided in each of the intermediate grooves 70, shown in FIGURES 2 and 4, which apertures extend through the sill track 24 and its supporting member 62.

Rain-water which drains into the frame sill 20 egresses through the drainage slots 73 punched through the frame sill flange 34, shown in FIGURES 3 and 4. The said slots are preferably covered with insect screening 74, retained by wind baffle plates 75 secured to the frame sill web 32 by one or more screws 76. The said baffle plates are open at the ends thereof to permit drainage of rain-water through the screening 74 and the drainage slots 73.

Referring now to FIGURES 2 and 10, two grooves 77 extend longitudinally of each of the jamb seals 25 and 26, to receive and support the outside perpendicular edges of the prime and storm closure panels indicated by the numerals 28 to 31 inclusive. The bottom surface 78 of each groove 77 is of shallow V-shape in cross-section, best shown in FIGURE 10, and acts to centralize the convex outside edge of the interfitting closure panel. Each said jamb seal embodies an edge flange and the transverse width of each said jamb seal is slightly less than internal space between the inside faces of the flanges 38 and 39 of the frame jambs 21 and 22, whereby the said jamb seals are free to telescope within the said frame jambs. The flanges 38 and 39 of the said frame jambs embody integral inwardly extending ribs 79 which extend longitudinally of each of said frame jambs, and act to limit outward movement of the said jamb seals when the said closure panels are shifted horizontally for opening purposes.

The header track 27 embodies four grooves extending longitudinally thereof, adapted to receive and support the top edges of the four closure panels 28 to 31 inclusive. As is best shown in FIGURE 9, the bottom surface 81 of each said groove is of shallow V-shape in cross-section and acts to centralize the top convex edge of each said closure panel. The sides 82 of each said groove are inclined to permit tilting of each said closure panel to an acute angle when it is removed or installed. A flange 83 extends from each edge of the header track 27. The transverse width of the header track 27 is slightly less than the space between the inside faces of the flanges 41 and 42 of the frame header 23, whereby the said header track is free to telescope within the frame header 23, which embodies integral ribs 84 extending inwardly from the flanges 41 and 42 thereof. The said ribs act to limit downward movement of the said header track, when the closure panels 29 to 31 inclusive are removed from the window frame.

Referring to FIGURES 2 to 5 inclusive, a strip 85 of resilient elastic cushioning material is positioned inside of each frame jamb indicated by the numerals 21 and 22 respectively, and each said strip extends from the underside of each top filler member 46 and terminates in close proximity to the top surface of each lower filler member 51. A strip 86 of similar cushioning material extends longitudinally within the frame header 23 and the ends of the said strip abut the top ends of the strips 85. The aforesaid cushioning material may be selected from that group of synthetic foams which possess substantially permanent resiliency and elasticity and are compressible to 25% approximately of cross-sectional area. The material selected shall remain resilient in sub-zero temperatures and withstand elevated temperatures in the range of 160° F. Synthetic foam rubber, polyurethane foam or other materials embodying the aforesaid characteristics may be used. To compensate for expansion and contraction the sill track 24 is preferably made slightly longer than the frame sill 20; the header track 27 is also slightly longer than the frame header 23; and the jamb seals 25 and 26 are located between the overlying ends of the said tracks, as is clearly shown in FIGURE 6. The thickness of the strips 85 and 86 of resilient cushioning material should be of such dimension that, when the jamb seals 25 and 26 and the header track 27 are inserted, the said strips of resilient cushioning material are compressed at least 7%, and the cushioning material at the ends of the said tracks is further compressed to form and maintain a tight closure windbreak.

Although this invention may embody any suitable form of window sash, for reasons of desirable architectural fenestration, simplicity of design and economy of production, the type of closure panels generally designated by the numerals 28 to 31 inclusive may be used to advantage. When the said closure panels are closed, the bottom, outer and top edges thereof are supported in the aforesaid grooves in the components 24 to 27 inclusive,

and the inner edges are supported by check stiles generally indicated at 87. Each check stile may include an extruded aluminum member 88, the cross-section of which is clearly shown in FIGURE 2. A vertical edge 89 of each said closure panel extends into one side of each member 88 and may be bonded thereto by a permanently resilient synthetic rubber base adhesive compound which may be of polysulphide formulation. This adhesive compound is designated by the numeral 90. A check flange 91, preferably of non-metallic material, for example extruded rigid vinyl, is interlocked in each member 88, and the said check flanges 91 co-relate as shown in FIGURE 2 when the closure panels are closed. The object in forming the check flanges 91 of non-metallic material is to avoid scratching and abrasion of the check flanges, which would occur if the said check flanges were formed integral with the members 88.

Any suitable type of lock may be employed for the prime sash 28 and 29, as exemplified by the slidable pin type lock 92, which is secured to the member 88 of closure panel 28, and the lock-keeper 93 which is secured to the member 88 of closure panel 29. If this type of lock is used, the lock-keeper 93 may be interlocked in the related member 88 in the groove which receives the said check flange, and the latter shall be formed of two lengths to accommodate the said lock-keeper. Likewise, the check flange 91 is the member 88 forming part of the closure panel 28 shall also be formed in two sections, to permit the said lock-keeper to pass between the adjacent ends of the said two check flange sections, when the closure panel 28 is opened and closed. Usually, locks are not provided on storm sash, wherefore, the check flanges 91 interconnected to the members 88 of the storm closure panels 30 and 31 may be in one piece, and shall extend from end to end of the members 88. The check stiles above described shall be of such overall length that the ends thereof terminate in close proximity to the top and bottom faces of the tracks 24 and 27 respectively, and sliding clearance shall be established to minimize air infiltration.

The overall width of the said prime and storm closure panels is such that, when the said closure panels are in the closed position shown in FIGURE 2, the jamb seals 25 and 26 are pressed inwardly and the edge flanges thereof clear the flanges 79 of the frame jambs 21 and 22, and the strips 85 of resilient cushioning material are compressed accordingly. The expansive effort of the said cushioning material acts to urge the said closure panels one towards the other in the horizontal plane indicated by the arrows B to E. To arrest horizontal displacement of the closure panels 29, 30 and 31 by the said cushioning material, a stop device is co-related with each said closure, panel. one of which is shown in FIGURE 8, which is a vertical sectional detail on line 8—8 of FIGURE 2. This stop device consists of a spring 94, secured by a rivet 95 to the sill member 62, and having an inverted V-shaped end 96 which extends upwardly through the aperture 97 extending through the sill member 62 and the sill track 24. The corner 98 of the closure panel 31 abuts the V-shaped end of the spring 94, which acts as a stop. To open the closure panel 31 for cleaning or removal of same from the window frame, retractile effort is provided by the hand of the operator and pressure against the V-shaped end 96 of the spring causes same to depress into the aperture 97 and thus permit horizontal sliding of the closure panel 31. A similar stop shall be provided to arrest movement of closure panel 29 in the direction of arrow C, and a like stop, reversed end to end, shall be provided to arrest movement of closure panel 30 in the direction of arrow D. A stop is not required for closure panel 28, since opening movement is limited by the lock 92 co-acting with the lock-keeper 93, until the said lock is released by hand.

For convenience of manufacture and warehousing, and economy of packaging and shipping, it is desirable that the frame structure and related components is assembled into five sub-assemblies. The frame sill sub-assembly comprises the frame sill extrusion to which are applied the members 66 with the screws 68, the screening 74 and the baffle plates 75, and the interlocked thermal insulating edging 55. The closure panel track structure sub-assembly comprises the member 62, the sill track 24 interlocked thereto, and the stop springs 94. One frame jamb sub-assembly comprises the frame jamb extrusion 21, the end filler members 46 and 52, the strip 85 of cushioning material, the jamb seal 25, and the edging 55 interlocked to the said frame jamb extrusion. The other frame jamb sub-assembly comprises the frame jamb extrusion 22, the end filler members 46 and 52, the strip 85 of cushioning material, the jamb seal 26, and the edging 55 interlocked to the said frame jamb extrusion. The frame header sub-assembly comprises the frame header extrusion 23, the edging 55 interlocked thereto, the strip 86 of cushioning material, and the header track 27. Before final assembly in the factory or at a construction site, the ends of the said frame sill and header extrusions shall be coated with a suitable elastomeric sealant, following which the screws 50 shall be applied to complete the assembly, and the closure panel track sub-assembly is then set into the said frame sill sub-assembly. The check stiles 87 and related parts are preferably factory sub-assembled with the glass panes of the closure panels 29 to 31 inclusive.

After the aforesaid assembled frame structure is applied to or built into the wall of a building or other supporting structure, the aforesaid closure panels may be installed or removed with facility. To install a closure panel, it is extended into the frame opening and held at an angle of from 10° to 15° with respect to the perpendicular, the top edge of the closure panel is inserted in a groove 80 in the header track 27, and the closure panel is lifted slightly whereby its lower edge clears the sill track 24, following which the closure panel is tilted inwardly and lowered, and the bottom edge thereof is inserted in a sill groove 70. The closure panel may then be moved horizontally whereby the edge thereof seats in a groove 77 in a jamb seal. To remove a closure panel, after disengagement from a jamb seal, the closure panel is lifted vertically so that its lower edge clears the top face of the sill track 24. The unit is then slightly tilted towards the operator to clear the sill structure, and is subsequently lowered until the top edge thereof disengages from a groove 80 in the header track 27. The cross-sectional shape of the grooves 80 in the said header track, best shown in FIGURE 9, permit tilting of the said closure panels during installation and removal, and this novel design characteristic greatly facilitates such operations. Both storm and prime closure panels may be installed or removed with equal facility.

Out of square installation of a window frame, or bowing of a frame sill or header, frequently becomes a serious problem of the window manufacturer or the building contractor. One of the novel design features of this invention resides in the construction of the sill track structure and the manually adjustable supporting means therefor. After the closure panels are installed, by shifting the same laterally, the apertures 69 in the sill track grooves 70 may be exposed. The end of a screw-driver may be inserted through the said apertures into engagement with the heads of the screws 68, and the sill track may be levelled, or otherwise adjusted to bring the closure panel check stiles 87 into proper co-relation. The jamb seals 25 and 26, and the header track 27, telescope into the frame jambs 21 and 22, and the frame header 23 respectively, and the strips 85 and 86 of resilient cushioning material permit adjustment of the parts 25, 26 and 27 to accommodate out of square installation of the frame structure or bowing of the frame header, within practicable limitations.

A primary function of the strips 85 and 86 of resilient cushioning material is to provide pressure lengthwise of the jamb seals 25 and 26, and the header track, whereby the said jamb seals and header track are urged into contact with the related edges of the closure panels 28 to

31 inclusive. If the jamb seals 25 and 26, and the header track 27, are formed of extruded rigid vinyl, the said parts will be sufficiently flexible through their length to conform to the shape of the edges of the said closure panels, and wind and rain-water impervious seals will be provided.

The bottom or contact faces of the grooves 70, 77 and 80 in the sill track 24, jambs 25 and 26, and header track 27 respectively, are of shallow V-shape formation in cross-section, and the edges of the aforesaid closure panels which seat in the said grooves are convex or pencil edge ground, whereby such edges are centralized in the said grooves and will be so retained under the expansive effort of the strips 85 and 86 of resilient cushioning material, which also acts to resist lateral movement of parts 25, 26 and 27, when the said closure panels are subjected to variable wind pressures or vibration. Accordingly, rattling of the said closure panels is, under normal conditions, virtually eliminated.

In the manufacture of window structures, production tolerances and working clearances must be provided. Accordingly, clearances shall exist between the metal frame structure and the interfitting closure panel supporting components 25, 26 and 27. The strips 85 and 86 of resilient cushioning material, under compression within the frame structure and in contact with components 25, 26 and 27, act as a pressure seal and prevent passage of high velocity winds through the aforesaid clearances.

If, after a period of several years, the strips 85 and 86 of resilient cushioning material degrade and lose resiliency, such strips may be replaced with facility. As is shown in FIGURE 5, the header track 27 may be removed be exerting pressure on one side thereof and tilting same transversely in such manner that one flange 83 thereof clears the adjacent rib 84 of the frame header 23, following which the said header track may be removed from the said frame header. In the same way, the jamb seals 25 and 26 may be released from their supporting frame jambs. The sill track 24 may be lifted from the frame sill without disturbing the setting of the supporting screws 68. The order of dismantling of the aforesaid components is preferably removal of the jamb seals 25 and 26, the header track 27, and then the sill track 24. The strips 85 and 86 of resilient cushioning material may then be removed and replaced with facility. The still track 24 may then be replaced, and the header track 27 may be tilted transversely and snapped into position. The jamb seals 25 and 26 may then be installed by tilting transversely and snapping same into place.

It has been ascertained by construction and testing of full scale window units, that the closure panels of a window embodying the aforesaid design characteristics may be shifted from closed to open position, and vice versa, with unusual ease and facility, primarily because stabilizing pressure is exerted upon the top edges of the said closure panels resulting from the expansive effort of the strip 86 of cushioning material and in turn pressure of the header track 27 against the top edges of the said closure panels. The aforesaid stabilizing pressure overcomes the tendency of a closure panel to tilt, when opening or closing pressure is applied against the finger grip knob of the lock 92. Even slender closure panels as narrow as 20" in width and up to 60" in height may be opened and closed with ease and facility.

This invention is further characterized in that the window unit may be installed with prime sash only, and storm sash may be installed later, without supplemental supporting means. When the window disclosed is installed as a prime window, the prime closure panels 28 and 29 are preferably located in the position occupied by the storm closure panels 30 and 31. To apply the storm closure panels 30 and 31 at a later date, the aforesaid prime closure panels are removed from the exterior side of the window frame, and are replaced with storm closure panels 30 and 31, and the said prime closure panels may then be installed on the interior side of the window frame, in the position shown in the annexed drawings. Self-storing insect screens may be interlocked on the exterior side of the window, in the channel 99 defined by the flange 100 integral with the frame sill 20, and in the channel 101 defined by the flanges 102 integral with the frame header 23.

FIGURE 12 illustrates a modified form of the invention which embodies prime sash only. Generally, the design characteristics of the invention exemplified in the other views and the foregoing specification may apply in part or in whole to this form of window, wherein closure panels 110 and 111 embodying glass panes supported in metal sash frames are depicted. This illustration is made for the purpose of exemplifying an additional adaptation of the invention, which resides within the scope of the appended claims.

What is claimed as new is:

1. In a window of the character described, two horizontally slidable closure panels and a supporting structure therefor comprising a hollow metal frame embodying two jambs, a sill and a header; a non-metallic sill track supported by and extending transversely and longitudinally of the said sill; a non-metallic header track detachably supported by and extending transversely and longitudinally of the said header; a non-metallic jamb seal detachably supported by each said jamb and extending transversely and longitudinally thereof; and resilient seals compressed within the said frame jambs and the said frame header, forming windstops between the said frame members and resiliently supporting the said header track and the said jamb seals.

2. A window as defined in claim 1 wherein the said hollow metal frame jambs and header embody flanges overlying the said header track and the said jamb seals and limit outward movement thereof effected by the said resilient compressed seals.

3. A window as defined in claim 1 wherein the ends of the said header track contact portions of the said resilient seals.

4. A window as defined in claim 1 wherein the ends of the said sill track contact portions of the said resilient seals.

5. A window as defined in claim 1 wherein the said header track is telescoped within the said frame header and is free to expand and contract longitudinally with respect thereto and with respect to the resilient seal within the said header.

6. A window as defined in claim 1 wherein a said jamb seal is telescoped within a said frame jamb and is free to expand and contract longitudinally with respect thereto and with respect to the said resilient seal in the said jamb.

7. In a window of the character described, two closure panels, at least one of which is horizontally slidable, and a supporting structure therefor including a sill, a header and two jambs; a rigid plastic header track supported partially within and extending longitudinally of the said frame header; a rigid plastic jamb seal supported partially within and extending longitudinally of one said frame jamb; compressed expandable resilient material within the said frame header forming a windstop extending longitudinally thereof and urging the said rigid plastic header track against the said slidable closure panel; and compressed expandable resilient material within one said frame jamb, forming a windstop extending longitudinally thereof and urging the said rigid plastic jamb seal against the said slidable closure panel.

8. A window as defined in claim 7 wherein ends of the said rigid plastic header track contact portions of the said resilient material.

9. A window as defined in claim 7 wherein the said rigid plastic header track is telescoped within the said frame header and is free to expand and contract longitudinally with respect thereto and with respect to the said resilient material within the said header.

10. A window as defined in claim 7 wherein one said

rigid plastic jamb seal is telescoped within one said frame jamb and is free to expand and contract longitudinally with respect thereto and with respect to the said resilient material.

11. In a window of the character described, a frame including a sill, two jambs and a header; two closure panels, one at least of which is horizontally sldiable; and supporting means for the said closure panels including a rigid plastic sill track supported by the said frame sill, a rigid plastic jamb seal supported by each said frame jamb, and a rigid plastic header track movably supported by the said frame header, the ends of the said rigid plastic header track overlying upper ends of the said rigid plastic jamb seals and being movable with respect thereto.

12. A window as defined in claim 11 wherein the lower ends of the said rigid plastic jamb seals overlie ends of the said rigid plastic sill track.

13. In a window of the character described, a frame including a sill, two jambs and a header; two closure panels one at least of which is horizontally slidable, and supporting means for the said closure panels including a rigid plastic sill supported by the said frame sill, a rigid plastic jamb seal supported by each said frame jamb, and a rigid plastic header track supported by the said frame header, at least one end of the said rigid plastic header track being movably supported with respect to the upper end of one said rigid plastic jamb seal.

14. In a window of the character described, a frame including a sill, two jambs and a header; two closure panels, one at least of which is horizontally slidable; and supporting means for the said closure panels including a rigid plastic track supported by the said sill, a rigid plastic jamb insert supported by each said frame jamb, a rigid plastic header track supported by the said frame header with ends of the said header track overlying respective upper ends of the said rigid plastic jamb inserts, and expandable means supported between the said frame header and the said rigid plastic header track urging ends of the latter downwardly towards the respective upper ends of the said rigid plastic jamb inserts.

15. In a window of the character described two closure panels, at least one of which is horizontally slidable, and a supporting structure for the said closure panels including an exterior frame embodying a sill, two jambs and a header, a rigid plastic track extending longitudinally of the said frame sill, a rigid plastic track extending longitudinally of the said frame header, and a rigid plastic jamb insert supported by each said frame jamb between ends of the said rigid plastic tracks.

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