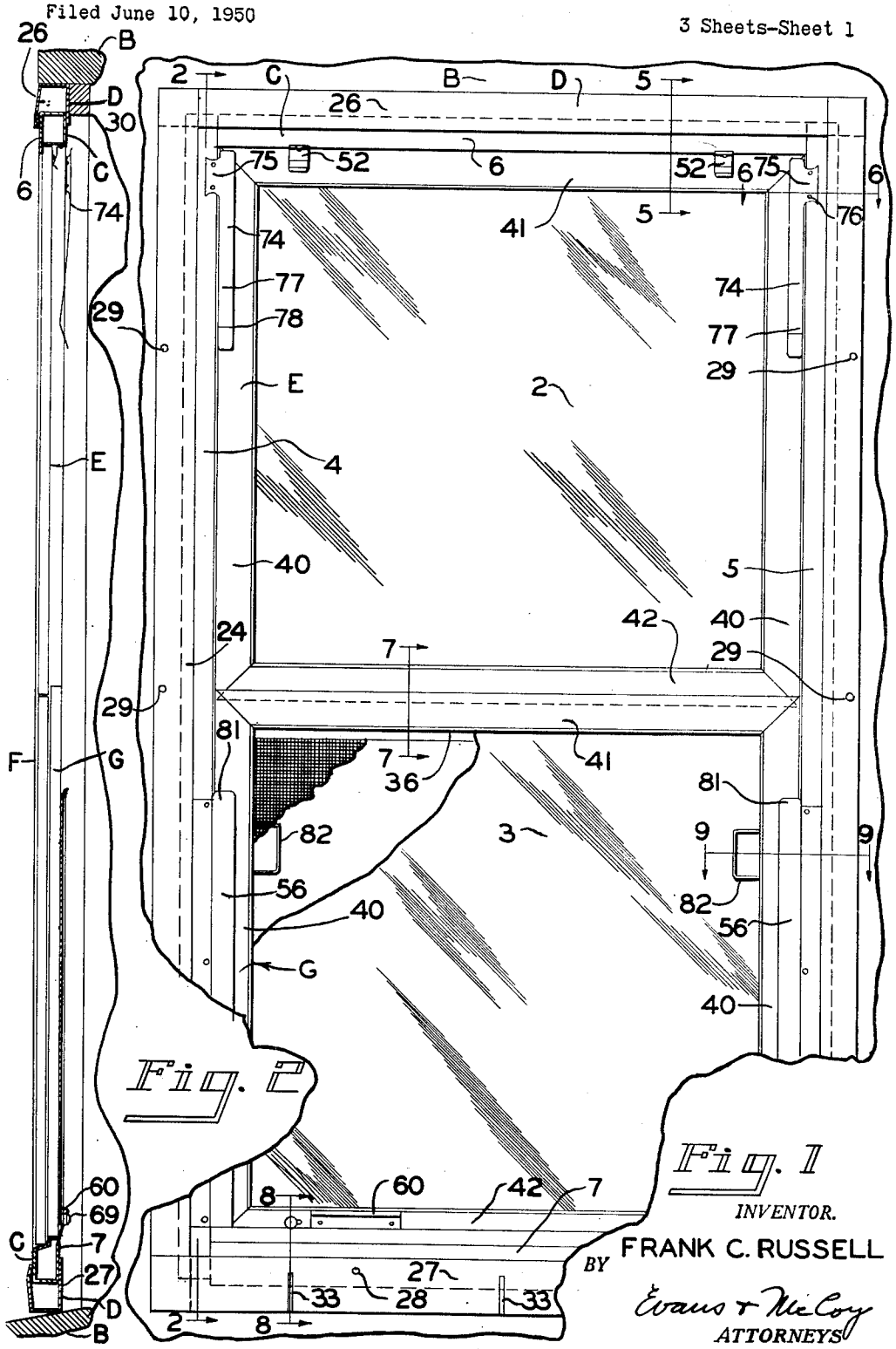
March 22, 1955 F. C. RUSSELL 2,704,573

COMBINATION WINDOW

Filed June 10, 1950 3 Sheets-Sheet 1



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COMBINATION WINDOW

Filed June 10, 1950 3 Sheets-Sheet 2

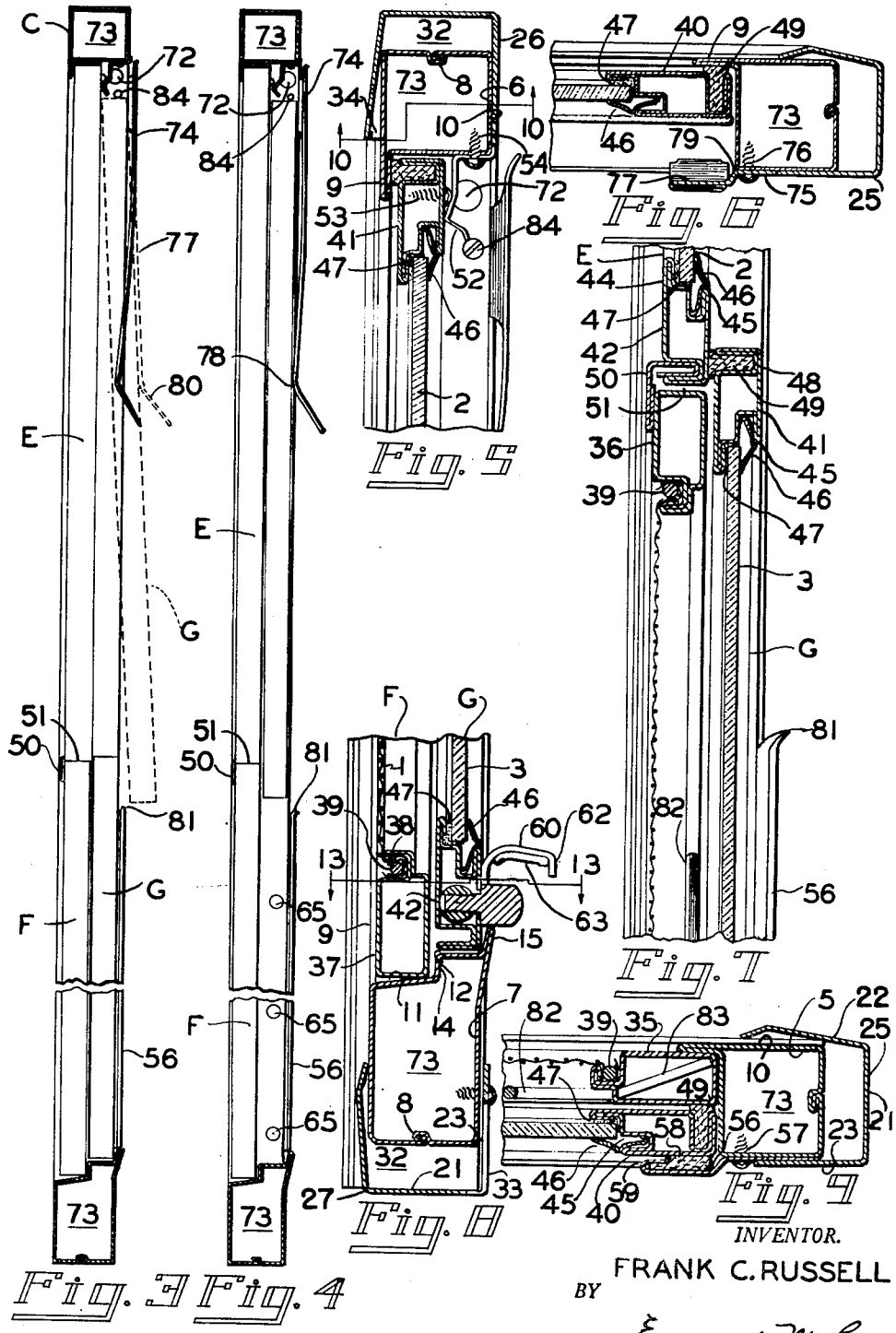


Fig. 3 Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

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COMBINATION WINDOW

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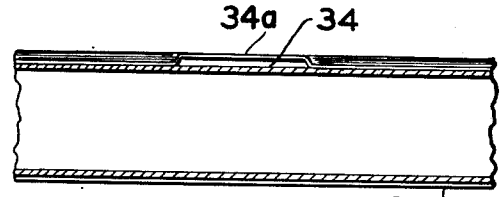


Fig. 10

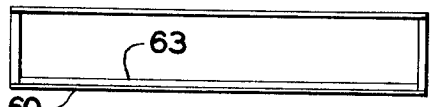


Fig. 11

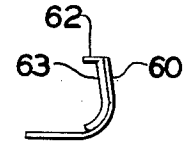


Fig. 12

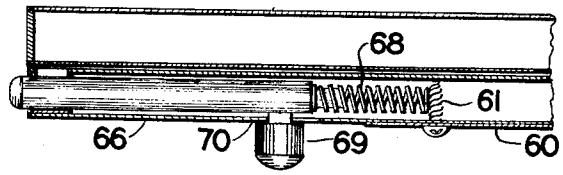


Fig 13

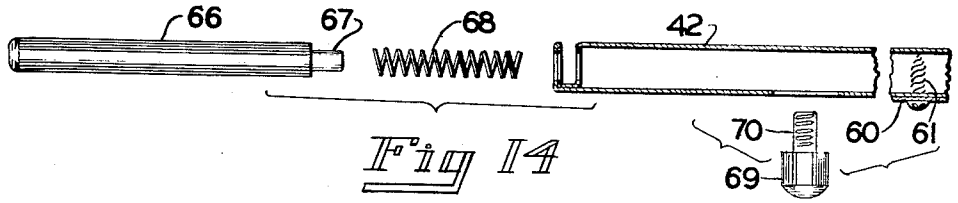


Fig 14

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United States Patent Office 2,704,573 Patented Mar. 22, 1955

2,704,573

COMBINATION WINDOW

Frank C. Russell, Cleveland, Ohio, assignor to The F. C. Russell Company, Cleveland, Ohio, a corporation of Ohio

Application June 10, 1950, Serial No. 167,399

5 Claims. (Cl. 160—90)

This invention relates to windows of the type having a rigid frame and a plurality of panels or sash frames removably mounted in the rigid frame. The invention is directed particularly to combination storm and screen panel windows in which removable panels are mounted one above another and are slidable or movable vertically in the rigid frame for insertion and removal.

Combination windows of the character referred to are shown in United States Patents 2,321,554 and 2,463,432. In the windows of the patents a pair of removable panel sashes are mounted one above the other and a third removable panel sash is carried in the rigid frame for vertical sliding movement over the inside faces of the pair. Control over the vertically sliding inner panel in manipulating it for insertion and removable and for holding it in various positions of vertical adjustment has been effected in different ways.

The present invention is concerned, among other things, with control of the panels, particularly the inner or vertically sliding panel. The invention is also concerned with the provision of means for facilitating the insertion and removal of the outer pair of panels to the end that such outer panels can be easily inserted in the rigid frame and readily removed therefrom. As a particular object and feature of this aspect of the invention there is provided a resilient element or pair of resilient elements which project across or overlie a portion or portions of the upper part of the opening in the rigid frame. These projecting resilient elements are positioned for yielding engagement with the upper of the outer pair of sash panels during insertion and removal to guide such panel and to hold the upper end of the latter against the outer stops or retaining flanges of the rigid frame. The resilient element or elements are also positioned for yielding engagement with the inner or vertically slidable panel in raised positions of the latter to hold the vertically slidable panel in the frame yieldingly against the upper of the outer pair of panels.

Another object of the invention particularly concerned with the vertical adjustment of the inner or vertically sliding panel of a multiple removable panel window is the provision of an improved slide bolt construction which is simple and inexpensive and facilitates both original assembly and field service and repair.

Another object of the invention is concerned with the provision, in a combination window, of a rigid rectangular frame or surround and a plurality of panels, more than two in number but with two superposed, which are all of the same size and width so as to be interchangeable with one another for insertion in the frame in different relative positions and which in at least one arrangement are so interlocked with the frame as to provide a burglar proof closure for the building opening resistant to forcing or opening from the outside. This objective is accomplished in a window having flat or unstepped inner faces on the vertical side members of the rigid frame in combination with a stepped sill piece; the lower portion of the rigid frame includes flanges which project into overlying relation with the sash panels to retain the latter in the runway of the rigid frame when the panels are in lowered position, the aforesaid flanges extending substantially to the line of abutment between the superposed panels.

A further object is to provide in combination in a window structure employing a projecting resilient element for engaging and retaining a raised sash panel, an improved arrangement of interlocking parts on the

removable panels and retaining flanges or components on the rigid frame of the window for holding the panels against inward displacement from outside the building in which the window is installed.

A still further object of the invention is the provision of an improved combination of panel retaining means and sealing means or strips for winter-proofing the joints between the several removable panels and between the panels and the rigid frame.

Other objects and advantages relate to certain novel combinations and arrangements of parts affording simplicity in design and economy of manufacture. These and other objects and advantages will become apparent in the course of the following description of the invention made in connection with the accompanying drawings forming a part of the specification. Like parts throughout the several views are indicated by the same letters and numerals of reference.

In the drawings:

Figure 1 is an elevational view with parts broken away and removed, of a combination window embodying features and improvements of the present invention installed in a building opening, this view being taken from the inside of the building;

Fig. 2 is a vertical transverse sectional view, partly diagrammatic, through the building and window of Fig. 1;

Figs. 3 and 4 are foreshortened sectional views, partly diagrammatic and similar to Fig. 2, but on an enlarged scale, showing different positions of the panels for storage and during insertion or removal;

Fig. 5 is a fragmentary vertical sectional detail, with parts removed, through the top of the window, taken substantially along the line indicated at **5—5** of Fig. 1 and enlarged with respect to that figure;

Fig. 6 is a fragmentary horizontal sectional detail with parts removed, taken through the side frame of the window substantially along the line indicated at **6—6** of Fig. 1 and enlarged with respect to that figure;

Fig. 7 is a vertical sectional detail with parts removed, taken through the meeting rails of the removable sash panels substantially along the line indicated at **7—7** of Fig. 1 and enlarged with respect to that figure;

Fig. 8 is a vertical sectional detail, with parts removed, taken through the sill of the window, this view being taken substantially along the line indicated at **8—8** of Fig. 1 and enlarged with respect to that figure;

Fig. 9 is a horizontal sectional detail with parts removed, through the lower portion of the side frame of the window, this view being taken substantially along the line indicated at **9—9** of Fig. 1 and enlarged with respect to that figure;

Fig. 10 is a fragmentary detail, with the panels and other parts removed, taken substantially along the line **10—10** of Fig. 5 to show the breather vents or openings in the closure frame;

Figure 11 is a bottom view of one of the sash lifts carried by the bottom frame member or rail of the vertically slidable panel;

Fig. 12 is an end view of the sash lift shown in Fig. 11;

Fig. 13 is a fragmentary sectional detail, with parts removed, taken substantially along the line indicated at **13—13** of Fig. 8 to show the construction of the slide bolt assembly; and

Fig. 14 is an expanded view of the slide bolt parts and related panel parts of Fig. 13.

The combination window of the present invention is of the type adapted for use in an aperture of a building such, for example, as in the framed window opening of a residential building B. The window comprises a rigid frame C, an adjustable closure frame D, and a plurality of sash panels E, F and G mounted in the frame C for facile removal and replacement. The sashes or panels E and F constitute a pair mounted one above the other to fill the frame C while the third sash or panel G is vertically slidable in the frame over the inside faces of the superposed panels. The lower sash F of the pair carries screening material **1** while the upper sash E of the pair and the third sash G carry glass lights **2** and **3**, respectively.

The rigid frame C comprises spaced generally parallel side members **4** and **5** vertically disposed in the building

aperture and top and bottom cross members 6 and 7 rigidly connected to the side members. The members of the rigid frame are of sheet metal of about eighteen to about twenty-four gauge thickness, preferably of about twenty-two gauge (.032 inch), and are formed as by bending or rolling to the desired hollow shape. The longitudinally extending joints of the formed sheet metal strips comprising the frame members are made as by rolling or folding as indicated at 8 and the cross and side members are welded or brazed together at the corners of the frame to form the desired rigid joints.

The side members 4 and 5 and the top cross member 6 each have or is formed with integral flange elements 9 which project over the side margins of the panels E and F and the top margin of the upper panel E to retain the pair of panels against outward displacement from the rigid frame. The flange elements 9 may be sheet metal strips secured to the rigid frame members or they may be formed integrally with the members of the frame by reversely bent portions of the sheet metal of which such frame members are made.

Although the side and top members of the rigid frame C have substantially flat faces 10 generally normal to the planes of the removable panels, such faces being continuous across substantially the entire thickness of the rigid frame, the bottom cross member or sill piece 7 is of stepped formation. As shown in Fig. 8 the sill has an outer ledge 11 adjacent the side frame flanges 9 for supportingly engaging the bottom of the screen panel or sash F. The inner or vertically slidable panel G is supportable on a raised portion 12 of the sill piece 7, the portion 12 being above the level of the portion 11 so that, as will later appear, the upper edge of the inner or slidable panel is above the line of abutment between the pair of superposed panels. The panel supporting portions 11 and 12 are connected by a vertical portion 14 and a flange 15 similar to the flanges 9 of the side and top members of the frame is formed along the sill piece 7. The flange 15, however, is formed as an extension of the inside face of the sill piece whereas the flanges 9 of the side and top members of the frame are formed as continuations of the outer faces of their respective frame members. Thus any water such as rain or condensation running or moving downwardly onto the sill piece from the panels or side members of the frame, is directed to flow outwardly or away from the interior of the building. To insure that such water or condensation is properly intercepted, the flange 15 is canted or inclined inwardly or away from the plane of the window as shown in Fig. 8. Additionally, the outer supporting portion 11 of the sill piece is inclined downwardly to provide the desired water shed and so that the bottom of the panel F makes substantially line contact therewith.

The closure frame D which surrounds the rigid frame C comprises relatively movable channel shaped elements or three-sided seals which embrace corresponding components of the rigid frame. Thus side elements 24 and 25 of the closure frame slidably embrace side members 4 and 5 of the rigid frame and top cross element 26 of the closure frame embraces the top cross member 6 of the rigid frame. The sill piece or bottom cross member 7 of the rigid frame is embraced by bottom cross member 27 of the closure frame, a self-tapping screw 28 securing the parts together after installation to prevent dropping or downward movement of the rigid frame.

At the corners of the combination window the ends of the side elements 24 and 25 overlap the ends of the cross elements 26 and 27, whereby the upper and lower ends of the hollow side elements open into the clearance spaces, described below, between the rigid frame C and closure frame D. In practice these closure frame elements are supplied in lengths longer than required for maximum size adjustment and are cut to precise length required at the time of installation. Screws 29 pass through aligned openings in the outer 22 and inner 23 side flanges of each of the side elements of the closure frame, these screws being threaded into wooden blind stops 30 of the framed opening against which the window abuts. When these attaching screws are tightened, the flanges 22 and 23 of the sealing members or elements are drawn together, clamping the corresponding members of the rigid frame. Base or web portions 21 of the closure pieces are seated against the opening frame to provide weather-tight joints.

Between the members of the rigid frame C and the members or elements of the adjustable closure frame D are clearance spaces 32 which are continuous about the entire periphery of the rigid frame. Ventilation of these spaces is provided by flow of air through vertical slots 33 in the inner flange 23 of the sill piece closure element 27 and apertures or vents 34 between the top cross member 6 of the rigid frame and the top closure element 26. The vent openings 34 are provided by outwardly displaced or bent portions 34*a* formed at spaced intervals along the length of the outer flange 22 of the top closure element 26. The vents 34 open downwardly to minimize the admission or inflow of water running down the outside of the window and frame. On windy days, of course, the difference in pressure on opposite sides of the combination window induces a flow of air through the slot 33, the vents 34 and the interconnected spaces 32. On calm days, temperature differentials result in convection currents which induce the desired ventilating air flow. In this manner the accumulation of condensate in the spaces 32 is minimized and deterioration of the window and associated parts of the building by oxidizing and rusting is reduced.

The lower or screen sash F has tubular sheet metal stiles 35 and tubular sheet metal top and bottom rails 36 and 37, respectively, that are of substantially identical form. The stiles and rails are formed to provide outwardly opening channels 38 adjacent their inner edges and the wire cloth or screen 1 has marginal edges depressed or extending into such channels, being held therein as by means of retaining strips or splines 39 that wedge the wire fabric in place.

The sashes or panels E, F and G are of substantially the same size or dimension and the inner or vertically sliding sash G and the upper sash E may be of substantially identical construction. These identical sashes or panels have tubular sheet metal stiles 40 and tubular sheet metal top and bottom rails 41 and 42, respectively, of identical form. The stile and rail elements of the sashes are formed as by bending sheet metal to the configurations shown to provide longitudinally extending stop flanges 44 and grooves or rabbets 45 spaced from and parallel to the stop flanges. The glass panels 2 and 3 are received against the retaining flanges of the panels and are held in place by spring metal retaining strips or splines 46 which project into the channels 45. The retaining splines are deformed in assembly and resiliently press the glass panels against the stop flanges. Desirably a quantity of putty or caulking compound 47 is deposited along the retaining flanges of the panel frames prior to the assembly of the glass lights therein to seal the joints between the glass lights and the panel frames.

The stiles and rails of the several sash panels are formed along their edges with outwardly facing channels 48 that receive deformable weather stripping 49 of felt, sponge rubber, or other suitable material having sealing and vibration absorbing properties. This weather stripping is continuous across the top and both sides of the glass panels. The lower meeting rail of the upper glass panel is fitted with an angle sectioned drip strip 50 formed of resilient sheet metal bent to the shape illustrated. One leg of this drip strip is reversely bent and pressed into the channel of the meeting rail so as to be frictionally held therein. The other leg of the drip strip projects downwardly across the plane or line of abutment indicated at 51 between the upper panel and lower panel to seal the joint between the superposed panels.

The stop of sash retaining flanges 9 of the jambs or side frame members 4 and 5 of the rigid frame extend the full length of the frame and the two superposed sashes E and F are of a size substantially to fill the frame opening inwardly of such stop flanges. Clearance is provided between the top rail of the upper sash E and the downwardly directed face 10 of the top frame member 6 to permit slight raising of the upper panel E so that the screen frame F may be then readily tilted inwardly for removal. This inward tilting of the screen frame clears its top edge from the bottom of the upper sash E so that the screen sash may be lifted out of the rigid frame, the third or sliding panel G having previously been withdrawn from the rigid frame.

Although the upper panel E of the superposed pair of panels normally rests by gravity on the bottom or lower screen panel F of the pair, means is provided for retaining the panel E in its raised position when the lower panel is withdrawn. This retaining or panel suspension

means takes the form of a pair of spring metal clips **52** welded or fastened by screws **54** to the top cross member **6** of the frame. These spring clips are positioned to bear against the inside faces of the top rail **41** of the upper sash panel, being deformed or deflected inwardly by the panel rail when the panel is inserted in the frame opening. Thus the spring clips, acting against spaced points of the top rail of the upper panel, hold such rail yieldingly against the stop flange **9** of the top member **6** of the rigid frame. The yielding or deformable weather stripping **49** carried by the sash panel is compressed between the parts to provide the desired weather seal. By reason of the rigidity of the upper panel E the pressure of the spring clips **52** is effective to compress the packing or weather stripping **49** in the stiles **40** of the upper panel E against the retaining flanges **9** on the frame side members **4** and **5**. A positive interlock is provided between each of the retaining clips **52** and the upper panel as by self-tapping sheet metal screws **53** secured in the top rail **41** of the panel. The heads of these screws are received behind offset portions of the spring clips **52** so that a snap action results that is positive in locating the upper panel in the desired position in assembly of the window frame.

The third or inner panel G is received in the rigid frame for vertical sliding movement, being confined between the inner faces of the superposed panels E and F and retaining elements or flanges **56** carried by the side frame members **4** and **5**. These flange elements, formed of sheet metal, are disposed flatwise against the inwardly directed side faces of the side frame members, being secured to the latter as by self-tapping sheet metal screws **57**. These screws are spaced along the length of the flange elements and prevent shifting of the flange elements relative to the frame members in assembly. The flange elements are received between the faces of the frame members and the inner flanges **23** of the seals **26** so as to be clamped against the frame members by the latter. Portions of the flange elements **56** which project over the stiles **40** of the sliding panel G in confining relation to such panel are desirably offset to provide space for deformable packing material **58**. This packing material is clamped in and retained by reversely bent edge portions **59** of the flanges. Weather-tight seals are thus provided between the frame and the sliding panel, quiet operation of the window results when the panel is raised and lowered, and rattling is eliminated.

For convenience in raising and lowering the sliding sash panel G the bottom rail **42** of such panel is fitted with bent metal lifts **60**. These lifts are formed of relatively thick sheet metal or plate metal bent to angle section. One portion of each lift is disposed flatwise against the panel rail **42**, being secured thereto as by self-tapping sheet metal screws **61**; the other portion of the lift projects substantially horizontally, as shown in Fig. 8, and is formed with a depending lip **62**. The underside of the lift projection is thus recessed or concaved to receive a felt or other cushion pad **63**. This pad reduces the rate of heat transfer between the fingers of the person manipulating the panel in cold weather and the lift and also increases the friction between the lift and the users' fingers to facilitate manipulation of the panel.

To retain the movable panel G in different positions of vertical adjustment, the confronting faces **10** of the side frame members **4** and **5** are formed with apertures **65** that receive a locking bolt or bolts **66** carried within the hollow bottom rail **42** of such sliding panel. Although the drawings show but a single slide bolt **66** located adjacent the left hand end of the panel rail **42**, as viewed in Fig. 1, a second bolt of similar construction may be used in the right hand end of such panel rail. As shown in Figs. 13 and 14, the bolt is closely confined by the metal walls of the rail **42** so as to be in direct contact with such walls and guided thereby for longitudinal sliding movement. An opening in the stile **40** of the panel frame adjacent the bottom of the latter is aligned with the bolt **66** so that the bolt may be projected through such opening into one of the apertures **65** of the rigid frame C, thereby interlocking the panel and the frame. The inside end of the slide bolt **66** is formed with a reduced diameter portion **67** that is received within one end of a helical coil compression spring **68**. This spring, in assembly, is compressed between the slide bolt and a stop projected through one of the side walls of the bottom rail of the panel or sash frame. A convenient arrangement is to position one of the lifts **60** so that one of the self-tapping screws **61** securing such lift to the panel rail also projects through the interior space of the rail and serves as a stop or seat for the compression spring. The bolt **66** thus normally projected through the side edge of the panel frame by the compressed spring, is limited in its movement and is actuated by a knob or button **69** which projects through an elongated slot **70** formed in the inside wall of the sash frame rail. The knob **69** may have a reduced end **70** that is threaded into a hole tapped into the side of the bolt.

The holes or apertures **65** formed in the side members **4** and **5** of the rigid frame are supplemented by similar holes **72** adjacent the top of the frame so that air circulates through the spaces **73** within the rigid side frame members, thereby minimizing the objectionable effects of condensation on the inside surfaces of the metal.

When the sliding panel G is raised or adjusted to positions in which it continues to overlie as much as about one-half of the lower or screen panel F, the retaining flanges **56** serve to hold the panel G against the superposed pair. In raising the panel G to higher positions such, for example, as a position in which the screen panel F is substantially completely uncovered, it is desirable to provide auxiliary means for holding the upper portion of the raised panel in the assembly. Such auxiliary or supplemental holding of the sliding panel is provided by leaf springs **74** formed of resilient spring metal. Each of these springs is rigidly secured to the frame at or adjacent the top of the latter and is positioned so as to extend in cantilever fashion over the path of the slidable panel. Each spring is wholly above the parting line or line of abutment **51** between the superposed sash panels and is also wholly above the top rail **41** of the sliding panel G when the latter is in its lowermost position. Each of the springs is of substantially L-shape, having a short leg **75** extending in overlying relation to the inside face of the adjacent frame side member and being secured to the latter as by self-tapping sheet metal screws **76**. The cantilever components or long legs **77** of the leaf springs are vertically disposed and parallel the side frame members **4** and **5**. Adjacent their lower ends, the springs **74** are formed with obtuse angled bends that provide contact points **78** for sliding engagement with the stiles of the panels.

As shown in Fig. 6, the short leg or attaching portion **75** of each of the retaining springs is offset from the adjacent portion of the vertical cantilever leg **77**, these parts of each spring being joined by an integral angularly disposed connecting portion **79**. Between the connection portion **79** and the contact point **78** each of the springs is arched or bowed so that the pressure of the spring against a panel in the frame is concentrated or localized at the pressure point **78**, there being a clearance between the spring and the upper portion of a panel by reason of the offset afforded by the angularly disposed connecting portion **79** of the spring.

To insert the panels in the rigid frame, the upper panel E is first moved into position, the panel being held manually adjacent its bottom and the top rail **41** thereof being angled toward the frame C and passed beneath the lower out-turned ends **80** of the cantilever springs **74**. The upper end of the panel, thus angled into the frame by the operator, is directed against the panel retaining flanges **9** of the side members **4** and **5** and slides upwardly along such flanges as the panel is raised into position. During this movement the pressure points **78** of the cantilever springs **74** bear against intermediate portions of the panel stiles **40**, the lever action pressing the upper end of the panel against the frame flanges. This action of the springs **74** insures that the upper end of the panel E enters the space between the retaining flange **9** of the top cross member **6** and the spring clips **52**. This is a particularly convenient control feature of the present invention since the top of the window frame is customarily at a considerable height above the operator's line of vision and is frequently somewhat concealed behind a blind, curtain, or valance. The arrangement insures correct location and easy insertion of the upper end of the panel so that it is properly received behind and clamped in place by the spring clips **52**. With the upper end of the panel E thus in place, the operator swings the lower end into the frame so that the packing or weather stripping **49** carried by the panel stiles **40** sealingly engages the retaining flanges **9** of the side

frame members. In this swinging of the upper panel E into the frame, the bottom of the lower rail of such panel **42** just clears upper ends **81** of the inside flange elements **56**.

After the upper panel E has been inserted in the frame in the manner described above and snapped into place under the clips **52**, it is temporarily supported by being clamped between the spring clips and the retaining flange **9** of the top cross member while the lower or screen panel F is inserted into the frame, bottom end foremost. In this manipulation of the screen panel it is held manually by means of rigidly attached handles **82** that are positioned flatwise against the screening material **1**. These handles may take the form of metal strips or wires bent to U form, their ends **83** being received through holes in the stiles **35** and angled diagonally into opposite inside corners in wedging relation. The handles are secured as by brazing to the screen frame stiles **35**.

When the screen panel has been lowered so as to rest upon the sill or bottom cross member **7**, the upper end of the panel is moved outwardly so that the top rail **36** thereof underlies the bottom rail **42** of the top or upper panel E (Fig. 7). In this arrangement of the panels the metal weather strip **50**, carried by the bottom rail of the upper panel, spans the parting line **51** to prevent water running down the upper panel from entering the joint. In this positioning of the screen panel beneath the upper glass panel a slight raising of the latter may occur, the clearance between the upper rail **41** of the glass panel and the inner face **10** of the top cross member **6** permitting slight vertical movement. In assembled relation, however, the upper glass panel normally rests by gravity on the lower panel and the weight of the upper panel prevents shaking and rattling of the lower panel.

After the pair of superposed panels E and F have been positioned, as described above, the third or sliding panel G is angled, upper end foremost, into the runway provided by the side frame members **4** and **5**, the top rail **41** being received under the springs **77** as shown in Fig. 3 by the broken lines. Screws **84** in the side frame members limit the upward movement of the panel, the screw heads engaging the upper edge corners of the panel. The bottom of the panel G is then swung into the frame and lowered into position, the bottom rail **42** clearing the upper ends **81** of the retainers **56** and the detent bolt or bolts **66** being retracted. The third panel is thus received in the space between the screen panel F and the flange elements or retainers **56**. The manual lowering of the panel G is facilitated by use of the hand lifts **60**, one finger of the operator being used to hold the bolt **66** in retracted position by engaging the control knob **69** which, as shown in Fig. 1, is positioned closely adjacent the lift. In constructions employing a pair of the slide bolts **66** in the lower rail of the panel, the operator uses one finger on each hand to retract the slide bolts and to hold them in retracted positions during the positioning or adjustment of the sliding panel.

The third panel G is located in whatever position of vertical adjustment is desired and held in such position by engagement of the slide bolt or bolts **66** in certain of the frame apertures **65**. When the third panel G is raised to or adjacent its upper limit of movement it is engaged by the retaining springs **74** which hold the upper end of the weatherstripped panel snugly against the inside face of the panel E, the deformable packing **49** having sound and vibration deadening properties which prevent rattling of the panels.

To remove the panels the procedure described above is reversed, the sliding panel G being first removed, followed by the lower or screen panel F, and finally by the upper panel E.

During cold weather seasons the screen panel F can be removed and replaced by the panel G or, if desired, the positions of the panels F and G may be reversed. It is also feasible to reverse the positions of the panels E and F to locate the screen panel on top and the glass panel below. In such an arrangement the weather strip **50** of the glass panel E laps over the sill member **7**.

In accordance with the patent statutes the principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, substitution of parts and changes in construction being resorted to as desired, it being understood that the article shown in the drawings and described above is given merely for purposes of explanation and illustration without intending to limit the scope of the claims to the specific details disclosed.

What I claim and desire to secure by Letters Patent of the United States is:

1. In a combination window structure of the type comprising a frame and a plurality of sash panels mounted in the frame for facile removal and replacement, the frame having spaced vertical side members and top and bottom cross members rigidly connected to the side members, a pair of the panels being mounted one above the other and a third panel being received in the frame and guided thereby for vertical sliding movement over the panels of the pair, the improvement which comprises a substantially L-shaped metal leaf spring carried by the upper portion of the frame, the leaf spring having a short generally horizontal leg rigidly secured to one of the side members substantially at the top of the rigid frame and having a long leg extending downwardly from said short leg in overlying relation to the path of the slidable panel from substantially the top of said path, the lower end of said long leg terminating above the parting line between said pair of panels at a point for yieldably engaging said slidable panel during its upward movement and while the upper edge of the slidable panel is still substantially below its uppermost position.

2. In a combination window structure of the type comprising a frame and a plurality of sash panels mounted in the frame for facile removal and replacement, the frame having spaced vertical side members and top and bottom cross members rigidly connected to the side members, the improvement which comprises flange elements carried by the lower portions of the side members and elongated spring elements carried by the upper portion of the frame in generally parallel relation to the side members, a pair of the sash panels being mounted one above the other and a third sash panel being received in the frame between the panels of said pair and the flange elements for vertical sliding movement, said flange elements being disposed entirely below the parting line between said pair of panels the spring elements being wholly above a horizontal line substantially equidistant from the top and bottom edges of the upper panel of the pair and wholly above the third panel when the latter is in its lowermost position, said spring elements being mounted on said frame substantially at the top thereof and extending downwardly in cantilever fashion in overlying relation to the path of said third panel for engaging and guiding said third panel in different positions of vertical adjustment, the lower end of said spring engaging said third panel for yieldingly pressing it against the panels of the pair when the third panel is raised above said lowermost position and while the lower part of said third panel is confined between the lower of the pair of panels and the flange elements.

3. In a combination window structure of the type comprising a rigid panel receiving frame having hollow metal side members vertically disposed and hollow top and bottom cross members, said frame also including adjustable three-sided closures embracing and having portions spaced from the frame members for adjusting the rigid frame to fit building openings of different shapes and sizes and providing insulating air spaces enclosed by the closures and the frame members, the improvement which comprises vent means placing the interiors of said hollow side members in communication with the atmosphere at vertically spaced points located closely adjacent the upper and lower extremities thereof, openings from the interiors of said hollow side members into said insulating air spaces adjacent the tops and bottoms thereof, and other vent means placing vertically spaced portions of the insulating air spaces between the closures and the top and bottom cross members in communication with the atmosphere, to provide for circulation of atmospheric air into and out of the interiors of the hollow side members and also through the said insulating air spaces between the side members and the closures.

4. In combination in a window structure of the type comprising a rigid panel receiving frame having spaced vertical side members each in the form of a hollow tube and top and bottom cross members each rigidly connected to the side members, channel shaped closure strips embracing the members of the frame and adjustable thereon for fitting the frame into a window open-

ing in a building, the members of the frame being spaced from the bottoms of the channel closure strips to provide insulating air spaces within the closure strips, the hollow interiors of the side members of the frame being in communication with the insulating air spaces within the closure strips, said side members being formed with openings placing the hollow interiors thereof in communication with the atmosphere, and the channel closure strips being formed to provide passages placing said insulating air spaces in communication with the atmosphere whereby to permit serial flow of atmospheric air through the hollow tube side members of the frame and the insulating air spaces within the channel closure strips.

5. In combination in a window structure of the type comprising a rigid panel receiving frame having spaced vertical side members of hollow tubular form and top and bottom cross members each rigidly connected to the side members, channel shaped closure strips embracing the members of the frame and adjustable thereon for fitting the frame into a window opening in a building, the members of the frame being spaced from the bottoms of the channel closure strips to provide continuous insulating air spaces within the closure strips about the entire periphery of the frame, at least one of the closure strips having a side flange disposed in overlying relation to the member of the frame embraced thereby, said side flange being formed to effect a seal with the member of the frame embraced thereby along the major portion of the length of the latter, and said side flange also having an outwardly offset portion providing a passage between itself and the member of the frame embraced thereby in communication with the atmosphere on the outdoor side of said window structure and with the insulating air space within said one closure strip for the circulation of atmospheric air into and out of such air space, and openings from said air spaces into the interiors of the vertical side

members of said frame adjacent the upper and lower extremities thereof and from the interiors of said vertical side members to the atmosphere on the indoor side of said window structure to provide continuous serial communication for flow of air through said air spaces and said vertical side members between the indoor and and outdoor sides of said window structure under varying conditions of exterior and interior temperatures and pressures.

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