Dec. 14, 1965 J. A. WAHLFELD ETAL 3,222,733

REMOVABLE SASH WINDOW

Filed June 2, 1964 4 Sheets-Sheet 1

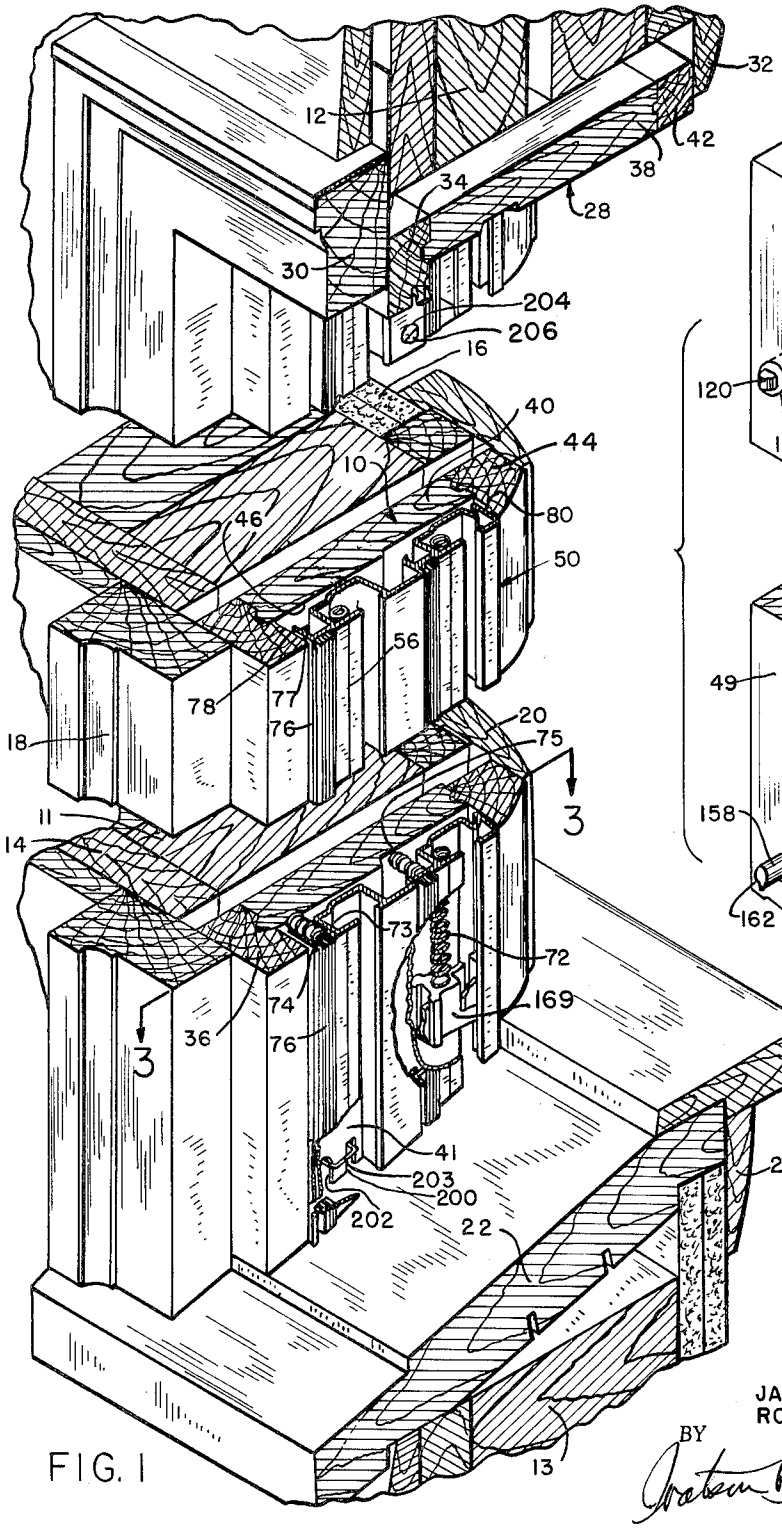



FIG. 1

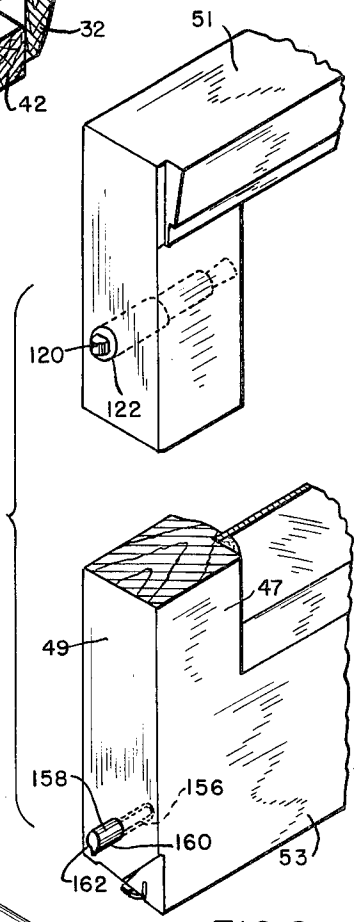



FIG. 2

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REMOVABLE SASH WINDOW

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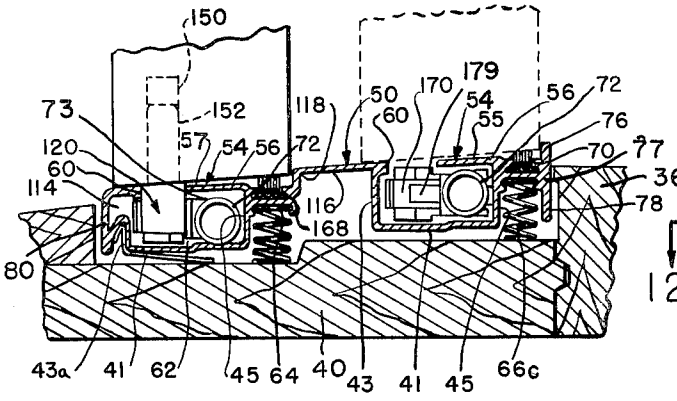



FIG. 3

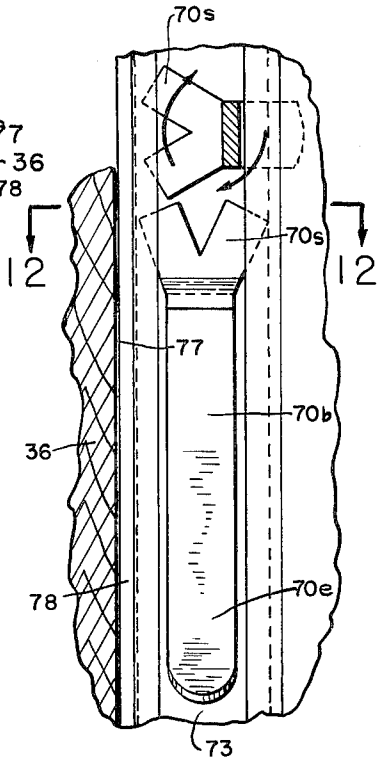



FIG. 11

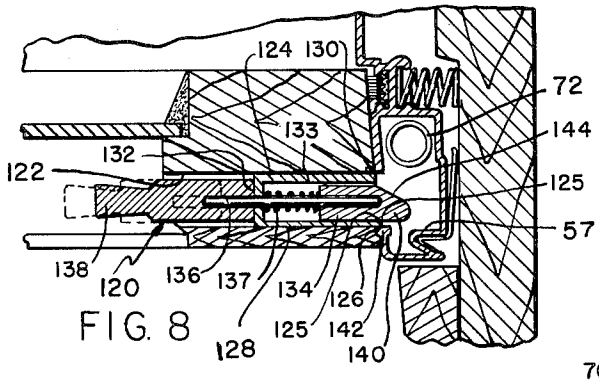



FIG. 8

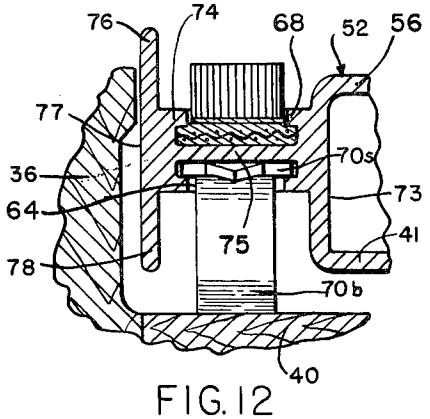



FIG. 12

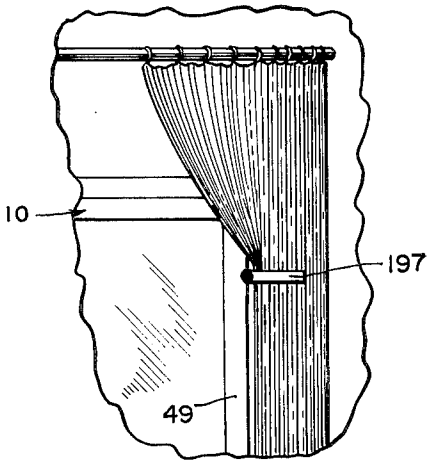



FIG. 10

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REMOVABLE SASH WINDOW

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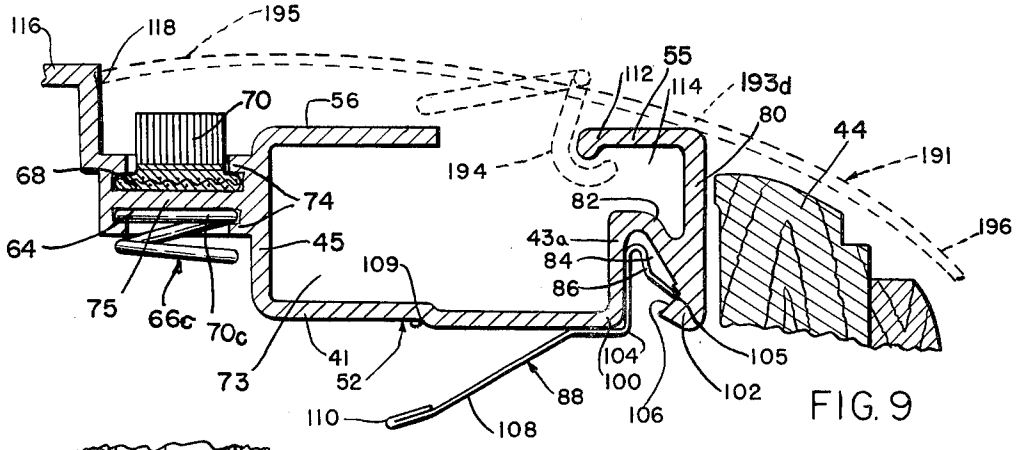



FIG. 9

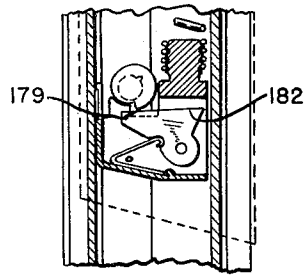



FIG. 4

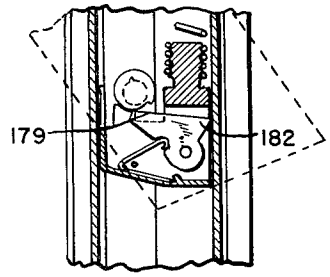



FIG. 5

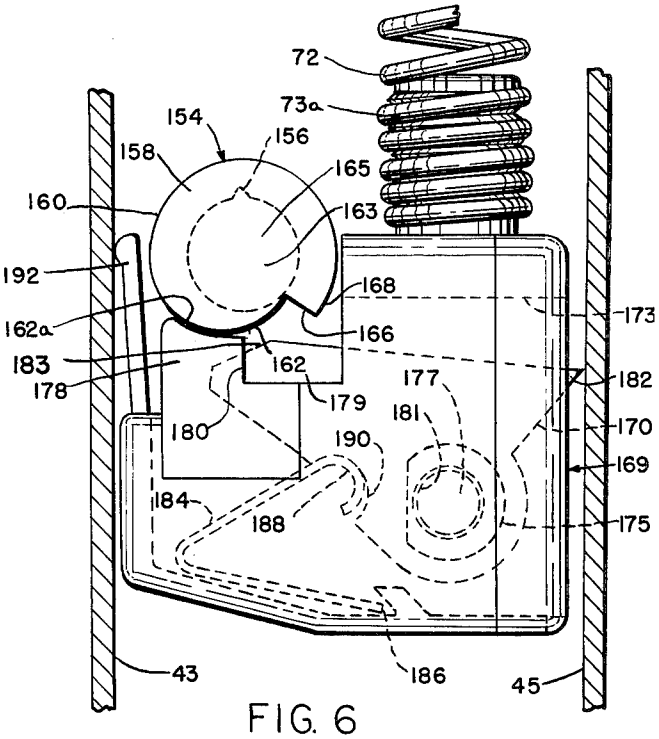



FIG. 6

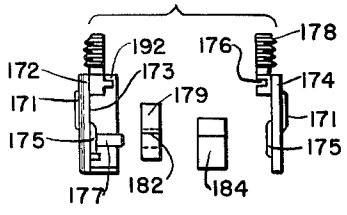



FIG. 7

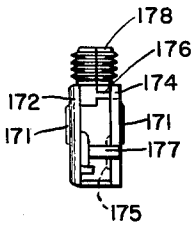



FIG. 7a

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REMOVABLE SASH WINDOW

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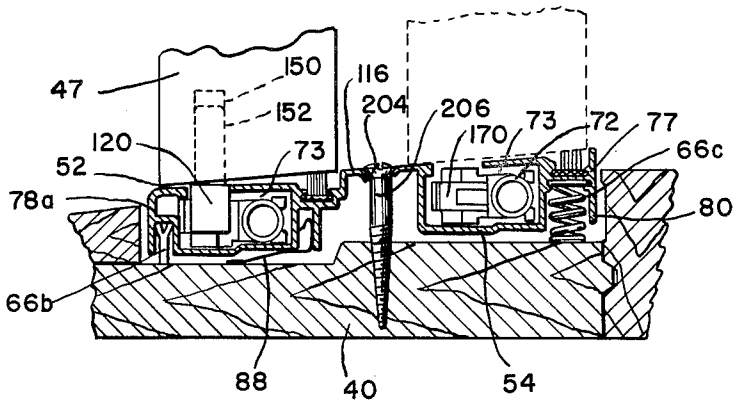



FIG. 13

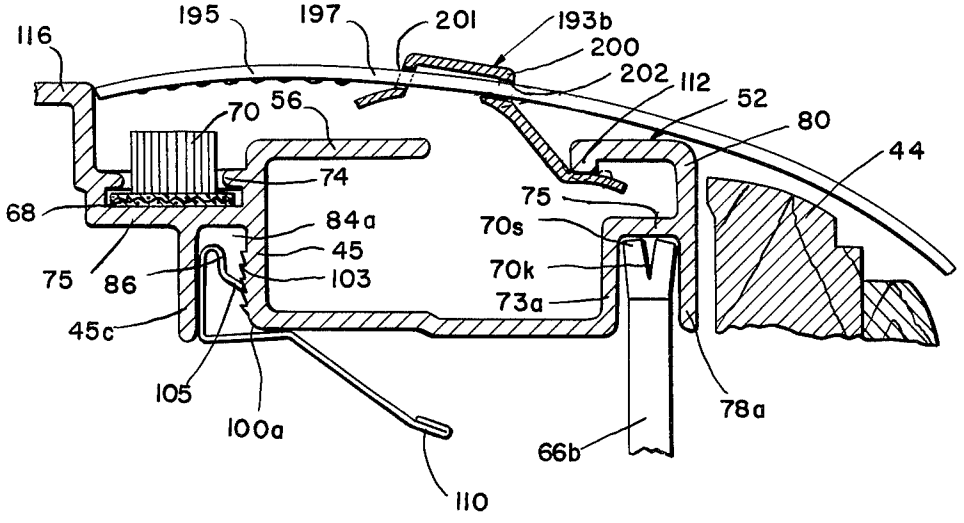



FIG. 14

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United States Patent Office 3,222,733 Patented Dec. 14, 1965



3,222,733

# REMOVABLE SASH WINDOW

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14 Claims. (Cl. 20—52.2)

This invention relates to a sash window assembly and more particularly to a double hung window unit in which the sash may at any height be pivoted inwardly from a normally vertical position to a horizontal position for washing and service, and can rest there or can be removed from the window frame entirely and quite easily if desired for any purpose.

The advantages of providing a sash type window that can be easily tilted from its normally vertical working position, or quickly removed, or both, have been considered for many, many years and many structures have been proposed. However, they have fallen short of expectations with regard to a combination of many important factors, particularly with respect to cost, ease of operation, maintenance, appearance, property protection, ruggedness, and also freedom from user frustrations and complication of parts in their disengagement and restoration. This type of window has been highly desirable for many reasons but particularly for convenience and safety sake and where outside storm windows are present.

Although the problem has persisted for a long time the increasing production costs and labor involved in building and maintaining constructions requiring outside painting and glazing, and the frequency with which handling of windows is required in urban areas, interest has been stimulated for a sash type window of conventional appearance which without any change in either its appearance or manner of its normally expected operation can be readily tilted to a horizontal position and, if desired, can be at any level quickly removed from its surrounding frame and become instantly an unattached unit without disturbing any trim or window elements, yet have all the beauty and advantages inherent in a sash window as such.

The overall advantages are well known for either tilting the sash or removing it, or both. The exterior face of the glass becomes easily accessible from inside the building and therefore more easily washed without danger to personnel even if it is not removed, and if the sash can be removed easily without disturbing the frame and its cooperating components, it becomes a habitually detached mobile unit, most easy to maintain and repeatedly scrub, repair or refinish on the premises or in a shop for greater longevity and cleanliness of appearance. This is particularly desirable in homes where window trim such as muttons, etc., are part of the architectural beauty thereof. Such windows when removed can be moved around and positioned for the comfort and safety of a serviceman instead of imposing awkward positions and tedious efforts upon a serviceman working upon the same window if it were not removable, etc. This is particularly true regarding windows in apartments, military residences, schools, office buildings and hospitals.

The most commonly used sash type window construction utilizes two sliding sash mounted within a frame in two closely spaced parallel tracks of equal depth to permit an opening and closing of the window sash that is protected against tampering while providing a seal against weather between the sash and the frame and also between the sash where they overlap in closed position.

In order to facilitate manual movement of the sash vertically, a balance spring or a counter weight and pulley arrangement is conventionally attached to the sash to



counter balance the weight thereof and hold the window stationary when left in any position. However, when a sash is tilted or removed that is equipped with conventional devices, it is a mechanical task to locate or to retrieve the counter balance devices and reattach them properly to the sash. Frictional retainers for this purpose are not only an added expense but even hinder retrivement and reattachment and loosen with wear. Other devices distort or damage cooperating elements.

It is an object of the present invention to provide a sliding double sash type window of the general appearance just described in which both sash can be tilted to a horizontal position where convenient to work on them and also removed without disturbing any relationship regarding the ready reinsertion thereof for instant restoration of the sash to its fully operative relationship in its vertical position.

The invention is further characterized by an arrangement in which the lower sash can be tilted to and supported in a horizontal position to rest partly upon the window sill and the upper sash tilted to rest on the lower sash. Furthermore the sash can be laterally tilted thereafter and removed inwardly from their superposed position, individually in sequence or simutlaneously as a group.

It is a further object of this invention to provide a removable sliding type window sash which when in a vertical position at any level, except closed, is as secure within the frame as the conventional non-tilt sash window in a like position, yet can be easily pulled inwardly at the top for tilting and, when in its closed position is as burglar or tamper proof as the standard sliding sash.

Further objects of the invention include the provision of a window and double hung sash unit construction in which the sash cannot be sprung or inadvertently pushed outwardly from any position at any level; the window track is resiliently pressed into frictional contact with the sash stiles with a pressure variable for any window frame size either to accommodate a sash counterbalance such as a spring, or to constitute the sole means for holding the sash in any position in economical installations; the sash tracks are centered in the frame opening to eliminate the need for any deep off-sets at one side that are conventionally provided at one side of window frames to enable removal of the sash with an initial lateral movement; substantially standard window frames and sash elements can be easily adapted as original or replacement equipment as where standard double track window frames had been made to receive non-removable sash; the sash in the present invention do not have to be positioned at a designated level in order to be tilted, removed or reinserted and are released only by intentional manpulation of more than one lock bolt, yet, can be easily restored to full operation merely by a reinsertion and outward movement of the sash alone; the pivotal support for the sash locks in its relinquished position at any elevation when pivoting of the sash is started and thereafter permits the sash to be removed or left in tilted position without continuing manual support; and, the channel tracks are easily assembled and installed in standard window frames either with factory techniques including power tools, or by mechanics having only journeyman hand tools. Such is accomplished essentially by finger manipulation with minimum time and effort and without any special machining of jambs for fastening springs or attachment of counter springs.

These being among the objects, advantages and novel structural characteristics of the invention, other and further objects and advantages will become apparent to those skilled in the art from the drawings, the description relating thereto and the appended claims.

With reference to the drawings:

FIG. 1 is a front elevational view of a portion of a window embodying the invention;

FIG. 2 is a view similar to FIG. 1 showing the upper and lower corner sections of a bottom sash stile as embodying the invention;

FIG. 3 is a sectional view in plan of the window assembly taken along line 3—3 of FIG. 1;

FIGS. 4 and 5 are side elevational views partly in section, of the pivotal unit and attached spring balance embodying the invention as positioned in regular operation and tilted position, respectively;

FIG. 6 is an enlarged side elevational view of the pivotal unit assembly as it appears with the window in tilted position;

FIGS. 7 and 7*a* are views of the elements of the pivotal unit shown in FIG. 6 in exploded elements and housing assembly, respectively;

FIG. 8 is a sectional view showing the construction of the sash retaining bolt;

FIG. 9 is an enlarged cross-sectional plan view of a portion of the track structure with which a curtain holder is used to keep the curtain from being contacted by the sash when tilted;

FIG. 10 is a perspective view, partially in section, showing the curtain holder in operation;

FIG. 11 is an elevational view of the extrusion embodying the invention taken from the back thereof showing a spring modification of the invention;

FIG. 12 is a section taken upon line 12—12 of FIG. 11;

FIG. 13 is a sectional view similar to FIG. 3 showing another embodiment of the invention; and

FIG. 14 is an enlarged cross-sectional view of a portion of FIG. 13.

The window of the present invention essentially comprises a double hung frame and sash arrangement quite similar to standard units but with no part of the window frame at the sides of the sash overlapping the sash on the inside thereof. The standard vertical divider stops are eliminated and an upper sash is provided that is horizontally narrower in its overall width than the lower sash. A side jamb extrusion is received resiliently between the blind stop and side stop of the window frame and provides inner and outer sash tracks correspondingly offset to slidably engage the stiles of the sash in substantially a flat face-to-face relationship. Channels in the tracks receive in vertically guided relationship releasable horizontally interlocking snap latch bolts carried at the upper end of the stiles and rigid pivot pins carried at the lower end of the stiles. Release of the latch bolts permits the upper ends of the sash to be moved inwardly to a horizontal position and thereafter raising one stile higher than the other disengages the pivot pins from the channel for full inward release of the sash from the window frame.

The sash preferably is weight supported at the pivot pins on spring locks carried by counterbalance springs. With a light frictional engagement provided between track and stile where counterbalance springs are used but where the sash is without a counterbalance spring, the sash is supported by a heavier frictional engagement between the track and stile.

The left side and right side of the window frame and sash stiles are mirror images of one another. The two extrusion members are cut to length from the same extrusion stock and are therefore identical except one is turned end for end with the lower ends mitered to match the pitch of the frame sill. Moreover, the two track and channel portions of each extrusion member are substantially identical in cross section although integrally unitized in side by side in an appreciably offset relationship. Accordingly, the description which follows can be confined to one side of the window and stile portion of the sash assembly. Furthermore, for purposes of illustration, a coiled spring counterbalance is shown, it being a structural element in most use currently, but it will be understood that a sash cord and counterweight with pulley can still be used with a full compatibility embodying the invention.



Referring now to the drawings in further detail a double hung sash arrangement is shown in FIG. 1 in which a window frame **10** is shown disposed within a building wall opening that is framed laterally by wall studs **11**, and vertically by head and sill members **12** and **13** respectively. Exterior sheathing **14** and inside lath and plaster **16** finish the edges of the opening and the window frame **10** is held in place therein between exterior casing members **18** and interior casing elements **20**. The bottom of the window frame **10** includes an outwardly and downwardly inclined sill **22** to shed water, and a stool **24** and an apron **26** secured thereto. The head jamb **28** is supported between exterior and interior head casings **30** and **32**, respectively.

The window frame **10** includes blind stops **34** and **36**, head and side jambs **38** and **40**, and head jamb extension **42** and side jamb extension and stop **44** for the head and sides of the window, respectively. These elements are terminally located as shown with tongue and groove joints and define side recesses **46** between the blind and side stops in which the extrusion members **50** are mounted for limited relative movement therebetween both inwardly and outwardly and in the plane of the window opening. The window sash **47** is shown with side stiles **49** and upper and lower rails **51** and **53**, respectively. The window stiles contact only the extrusion members **50**.

Referring to FIGS. 1 and 3 the preferred construction of the extrusion members **50** is shown comprising two substantially identical C-section portions **52** and **54** spaced from each other and offset as already mentioned to provide offset inner and outer slide tracks **56** for the stiles **49** of the bottom and top sash respectively. The C-sections are essentially rectangular in shape and outline a rectangular channel defined by a back wall **41** disposed close to the side jamb **40**, inner and outer side walls **43** and **45**, respectively, and a front wall **55** which is longitudinally breached to provide a guide way slot **60** disposed adjacent to the inner wall **43** for access to the channel and to leave a wide leg portion **57** the external surface of which provides the major portion of the slide track **56**. The leg portion **57** also provides a combination housing and runway. It protects a counterbalance spring **72** and defines runway **73** for a spring locking assembly **169** which will soon be described. The channel space behind the slot **60** is free and clear through to the back wall **41**.

As part of each C-section, means are provided to receive pressure springs **66** and weather sealing elements **70** which as shown in FIGS. 3 and 12 confine two T-shaped grooves **64** and **68** on a support web or wall **75**. The support wall **75** is integrally formed externally on the side walls **45** of the C-sections at right angles thereto and close enough to the slide tracks **56** that the wool pile of the weather sealing element seals against the wood sash. This also provides adequate depth on the back side to accommodate springs **66** of sufficient length that their pressure effort is not rapidly variable with slight differential compression. Overhanging beads **74** are formed marginally along both edges on both faces of the wall to define the T-shape of the grooves **64** and **68** which receive and hold the elements **66** and **70** in place and in this connection it will be noted that the weather sealing element **70** is essentially T-shaped in cross section with the edges of the heavy backing thereof forming the arms that interlock under the beads. The pile forms the legs of the T. The springs held in place may be either coil or blade type in their form. As shown in FIGS. 1, 3 and 13, coil springs **66** are shown with their reduced diameter end coils engaging under the beads. This is established by turning the spring like a screw to thread the end coil in place before installation of the extrusion. In FIGS. 11, 12 and 14 outwardly bowed blade springs **70***b* glide against the side jamb **40** and are

terminally slit at 70*k* and spread at one end to form ears as at 70*s* and reversely at its other end at 70*e*. In FIG. 12 the ears are offset upwardly far enough from the bow that they will be received against the wall 75 when the spring is being installed with the blade portion at right angles to the groove. In FIG. 14 the ears are received between flat walls 73*a* and 78*a*. Thereafter a quarter turn of the spring drives the ears into interlocking relationship under the beads or bite into the side walls for securement thereof and the other end 70*e* is snapped into contact to slide along the wall 75 when the bow of the spring is depressed by relative movement between the window frame side jamb 40 and the extrusion.

The location of the spring and weather sealing elements 66 and 70 coincide at the outer marginal edges of the window sash stiles to assure frictional sealing contact at the margins first exposed to the weather and each supplements the other in providing a slidable frictional support in this area under a substantially constant pressure in each installation regardless of minor dimensional variations between window frames and sash widths. The pressure exerted by the springs can be varied by the number of springs installed and also to some extent by their spacing, it being desirable to have pressure adequate to support the window in the area of most use. This generally resolves itself into simple criteria. In economy and sash weight installations a pressure mid-length-to-high in the window frame is desired. With installations where counter balance springs are employed a mid-length-to-low pressure is desired to match the increased force of the counter balance when additionally stretched by the sash being moved to their lowermost position. Accordingly with either or any other type of sash installation the optimum operating conditions can be attained merely by noting instructions or an instruction chart computed on the width and height of the sash and upon a balance by spring or otherwise. The invention lends itself to top performance with all types of installations merely with the number and spacing of springs being followed by a mechanic as set forth in a simple chart prepared and furnished for each type and any sash size since the invention works with standard window constructions. Not only this but same can be varied according to the desires of different customers and thereafter remain constant.

The outer support wall and beads 74 are bordered by a flat top T-flange 77 whose inner edge 76 extends above the level of the adjacent outer slide track 56 to serve as a blind stop and the other edge 78 loosely engages the window frame blind stop 36 in face-to-face relationship.

The inner edge of the extrusion is also provided with a flat face flange construction 80 which rests against the window frame side stop 44, and a spring type metal weatherstrip 88 is mounted between the window side jamb 40 and extrusion members 50. The weatherstrip 88 comprises thin strip stock of spring material either of brass or ferrous metal protected with a weatherproof coating. Intermediate its edges it is bent to form a right angle at 104 (FIGS. 9 and 14). One leg is reversely bent upon itself to form a base 86 which serves as a securement with a snap edge 105 and the other leg 108 is formed to flex outwardly and is reversely turned marginally to provide a rounded edge 110 that engages the window frame jamb 40 in sealed relationship.

The weatherstrip 88 can be secured to the extrusion at the inner wall 80 when the spring 66*c* is located between the C-sections as shown in FIG. 9, but preferably the springs 66 are located at the edges of the extrusion as shown in FIG. 13 with the weatherstrip secured to one of the two walls 43 and 45 that face each other in the center of the extrusion with the free edge 110 behind the C-section adjacent thereto. As shown in FIG. 14 the weatherstrip is mounted on wall 45 so that its free edge is directed towards the inner side stop 44. The weatherstrip 88 supplements the other springs in that it acts like a compression spring the full length of the extrusion while weather-sealing the back of the extrusion.

In mounting the weatherstrip as shown in FIG. 9 the side wall 43*a* turns outwardly to form a web 82 that supports the flange 80 and defines therewith a channel 84 along the outer edge which receives in a snapped-in relationship the base portion 86 of a metal strip 88 made of thin strip of spring metal. The channel is bordered at its mouth by a right angle corner configuration at 100 and an overhanging lip 102. The base 86 of the weatherstrip 88 is received in the channel 84 with the right angle 100 nesting in the right angle 104. Upon insertion the free edge 105 flexes inwardly and snaps outwardly under the lip 102 to lock itself in the channel. The lip 102 has an inner surface 106 which is essentially flat and at its inner extremity is disposed tangentially to the arcuate path of movement of the free edge 105 as it snaps into place.

In FIG. 14 the channel is shown at 84*a* defined between the wall 45 and a parallel wall 45*c* spaced therefrom as supported on the back of the wall 75. The face of the wall 45 is longitudinally serrated with ribs as at 103 with the edges of the ribs directed inwardly. Thus when the base 86 is inserted into place along the wall 45*c* the edge 105 snaps into place behind one of the ribs 103 and locks the strip in place.

In both installations the other edge 108 of the weatherstrip flexes outwardly and the rounded edge engages the window frame side jamb 40 in weather sealing relationship under a resilient pressure which is established by the leverage between the corner 100 and the bite of the edge 105 on the surface 106 or ribs 103. Although there is clearance to fully accommodate the double thickness of the reversely bent edge 105, the back wall 41 can be offset as at 109 (FIG. 9) where same would be engaged if the extrusion element 50 was installed with the weatherstrip solid against it.

The web 82 also defines in conjunction with the flange 80 and a front leg portion 112 a channel 114 for the detachable mounting of a curtain hold back 191 shown in FIGS. 9, 10 and 14 and described later.

Referring again to FIG. 3 the two C-sections 52 and 54 are integrally secured together by a web 116 spaced from each other a distance that accommodates the standard distance between the sash. The web 116 is coplanar with the face of the track 56 on the C-section 54 and is offset inwardly with the face of the track 56 on the C-section 52 as at 118 to provide between the two tracks a side stop for the lower sash.

It will be observed that the track surfaces are not square to the plane of the window opening but preferably are disposed at an acute angle of approximately 93° to the plane of the window so that when the sash is pushed into place they are expanded away from each other slightly without any extra movement outwardly to establish the frictional pressure sliding relationship with the sash stiles. Thus, the blind stops 36 and side stops 44 have a greater effective height than they actually appear to have in preventing any further movement of the sash outwardly. Preferably the overall effective height of the blind stops over the inner edge of the track is at least as great as the total movement available to the two extrusions in moving into solid contact with the side jambs from positions supporting the sash in working position. This prevents any outward movement of the sash either accidentally or surreptitiously yet permits either sash to be tilted inwardly from and past the slide tracks.

Referring to FIGS. 2 and 8, elongated spring driven bullet type latch assemblies herein referred to as sash retaining bolts 120 are embedded in a cylindrical bore 122 through the stiles 49 near the top thereof. The bolts comprise a cylindrical housing 124 having a closure plate 125 with a rectangular opening 127 that provides a radial flange 126 around the open end and the housing 124 has ears 128 thereon and the peripheral margin of the flange has wing ribs 130 on them which cut and embed into the stile to

prevent removal and rotation respectively when the housing is driven home. Thus, installation is accomplished merely by driving the latch assembly into a drilled bore.

An internal flange **132** at the other end of the housing prevents inward removal of the rectangular portion **133** of a bolt **134** that is slidably mounted in the housing. A compression spring **137** between the bolt **134** and flange **132** urges the bolt outwardly to a point beyond the stiles (FIG. 8). Rectangular opening **127** in the closure plate supports the rectangular shaft of the bolt against rotation.

The bolt has a reduced shank **136** extending through the flange **132** and is terminally threaded or knurled to receive a pull handle **138** thereon which when pulled inwardly retracts the bolt. The projecting nose **140** of the bolt is disposed eccentrically to the shank portion inwardly of the window sash and is cylindrical along its surface of greatest eccentricity as at **142** where it engages the edges of the guideway slot **60** of the extrusion channels in sliding relationship. The other side of the nose is taper rounded to provide a camming surface **144** which engages the inner edge of the C-section **52** on the side stop **118** and retracts the nose **140** until it coincides with its proper slot in the extrusion whereupon it snaps into a horizontally locking and vertically sliding guided relationship to hold the top part of each window sash in place in sliding sealed engagement with the tracks of the extrusion.

The bolts **134** are preferably made of nylon and the eccentricity of the nose not only imposes no bolt twisting load upon the bolt when being snapped into place, but it permits the extrusion channel to be quite near the inner edge of the window track with greater supporting stile stock being present to support the latch against inward forcing. Moreover, the construction is such that all parts can be quickly serviced or replaced if they become damaged at any time. The sash is tilted slightly, the handle **138** is tapped with a hammer to remove the housing **124**, the handle if threaded can be unthreaded and all parts can be dismantled, repaired or replaced in a very simple procedure, then reassembled and restored. Moreover, the eccentricity of the flange of the end plate assures proper restoration with complete interchangeability with all bolts. Furthermore, the bolts can be relatched in the extrusion at any level. Also this location renders it most inaccessible to outside tampering with the bolt substantially perpendicular at the base of the nose so that a jimmy blade insertion will not retract the bolt from outside the window nor can be blade be levered to "step" the bolt to open position.

Referring now to FIGS. 1, 2 and 6, horizontal holes **150** are bored into the sash stiles to receive snugly therein the shank **152** of the pivot pin **154** longitudinally ribbed at **156** to embed in the wood of the stiles and prevent relative rotation. A head **158** on the shank has a peripheral surface **160** which describes essentially a 360° modified involute whose minimum radius is less than that of the shank with the depression at the minimum radius portion of the involute accentuated over the last 100° to a cylindrical surface **162** whose axis **163** is displaced outwardly from the axis **165** of the involute curve at an angle that is obtuse to the minimum involute radius line at substantially 135°. A radial shoulder **166** is present between the minimum and maximum radii and the shoulder and involute form a right angle at the point **168** of maximum diameter. Thus, the axis of the pin moves downwardly at the minimum radius as the point of maximum radius rotates into pawl releasing position.

It is with the major radius and the cylindrical area that the invention is essentially concerned since they cooperate with a locking assembly **170** for the balance spring **72** when present.

The shoulder **166** approaches perpendicular in a downward direction when the window is vertical, and the two heads **158** for each sash are mirror images of each other for opposite sides of the sash and each are appropriately labelled on the end face with suitable arrows to indicate exact orientation when mounted on the sash.

The balance spring lock assembly **169** is slidably received in the runway **73** and comprise two hollow sandwiching housing sections **172** and **174** preferably of nylon having interlocking ears and notches **176** which assure correct assembly. Upon their upper part they are provided with solid half round bosses **178** which when mated provide a threaded boss onto which the lower turns **73***a* of the spring **72** can be secured by threading (FIG. 6). The sections can be adhered when assembled if desired but the spring turns maintain a unitized assembly and slide pads **171** prevent separation in the extrusion channels **62**. How the housing stock is apportioned between the two sections may be varied for casting or forming convenience but a pawl **170** made of sintered metal is pivoted in the cavity **173** provided by the housing **172** as carried between spacer bosses **175** on a pivot pin **177** which is integral with one section and extends into a support hole **181** in the other section.

Spaced from the pivot pin **177** towards the interior side of the sash both sections have matching bosses **178** having a concave cylindrical surface **162***a* on the top mating with the cylindrical surface **162**. These surfaces are bordered by a notch **180** which accommodates the shoulder **166** at one limit of its movement and the inner ends of the matching bosses **178** are spaced to permit free movement of the leg **179** of the pawl. The corner of the leg **179** is relieved as at **183** to provide a detent action for the point **168** when the window sash is vertical. A tooth **182** upon the other end of the pawl **170** moves in and out of the cavity **173** as the leg **179** is moved down and up, respectively, and the tooth **182** in its projecting position engages the side wall **45** of the C-sections **52** or **54** directly below the spring **72** at whatever level the locking assembly is left when the sash is tilted inwardly.

The pawl is urged to yield to the control of the pin **154** by a leaf spring **184** held in place at one end by a notch **186** in the bottom of the housing cavity with the other end **188** curved to engage in a concavity **190** in the bottom side of the leg **179**. A spring finger **192** formed integrally with the housing members rides against the side wall **43** or **43***a* of the C-section and urges the assembly towards the wall **45** to assist the tooth **182** in biting into locking position under the influence of spring **184** when the leg **179** is released from depression by relinquishing movement of the high point **168** on the pivot pin **154** when the sash is tilted inwardly.

Referring to FIGS. 4 and 5, when the window is erect the high points **168** on the pivot pins engage the pawl legs **179**, depress same and retract the teeth from contact with the extrusion **50** whereupon the counterbalance spring is free to work vertically with vertical movement of the sash. When, however, the pivot pins are rotated slightly (FIG. 5) by the tilting of the sash, the legs **179** rise quickly, releasing the pawls for the teeth **182** to bite into the extrusions after which the window can be further tilted and even removed without disturbing the relinquished position of the balance spring lock. This can be accomplished at any level where the top of the sash is free to tilt inwardly.

If it is desired to remove the sash completely from the frame, one side of the tilted sash is raised higher than the other to foreshorten the horizontal distance between pivot pins **154** whereupon the pins clear the extrusions. Then when the sash is returned the movements and the above sequence are reversed and when the tilted sash and pivot pins are restored in the extrusions they can be lowered to rest on the bosses **178** (FIG. 6) without dislodging them and then returned to vertical position to release the pawls for resumed window operation.

It will be observed that the locking effort of the counter balance lock assembly is confined to the channelway side walls as balanced out between in a direction normal to the plane of the sash whereby no distortion is exerted on

the channelway affecting the frictional sliding engagement.

By way of assistance in the manipulation of the sash where window curtains are present, curtain hold backs **191** are provided comprising bowed resilient plastic elements **147** having clips **193** provided with hook fingers **194** suitably formed of wire or a stamping to be secured thereon as spaced from one end **195** thereof.

A wire embodiment is shown in FIG. 9 and a stamping embodiment is shown in FIG. 14. Both essentially comprise a central body **200** slidably received on the element **197** with the hook members **194** receivable under the edge **112** of the extrusion. More particularly the preferred embodiment shown in FIG. 14 is roughly in the shape of a figure 8 bent so that the openings **201** are in alignment and receive the element **197** therethrough sharp points **202** at the edge of one of the openings bite into the stock of the element **197** once it is slipped into place and a portion extending beyond one of the openings is formed into the resilient hook form **194** for the purpose mentioned.

In mounting the hold backs, the bowed shape of the elements **197** is straightened enough for the hook **194** to slip through the inner guideway slot **60** into the channel **114** and engage under the front leg portion **112** as it is pulled into place inwardly of the window. Thereupon the end **195** engaging the extrusion snaps into place against the side stop **118** to secure the hold back **191** in place. The folds of the curtain are placed behind the free end **196** of the hold back. The end **196** is released and springs laterally back against the wall of the room and holds the curtain folds out of contact with the sash while it is being pivoted and handled. The hold backs can be located anywhere vertically and easily shifted by straightening to free the pressure of the end **195** against the extrusion. Removal is accomplished by lifting the end **195** or turning the element **197** for the end **195** to clear the side stop **118**.

With this explanation of the structure and operation of the device embodying the invention its installation and frictional sliding adjustment will be better understood in which the extrusions are preferably secured to the side jambs a short distance from the top and at the bottom out of the way of the moving elements. When screws are used they are slightly recessed and received through the web **116** above and below that portion of the extrusions where the sash engage them when being tilted. Such a screw is shown at **206** in FIG. 1 extending through the recessed aperture **204** in the space between the stiles of the upper and lower sash. However, it will be noted also in FIG. 1 that the lower end of the back wall **41** can be double notched as at **200** and **202** and a U-shaped staple type element **203** can be driven into the side jamb to a predetermined depth at the notches. This is pointed out since a screw or staple can be machine driven to its correct position in factory made original installations whereas screws can be employed in the field on replacement equipment. With a staple, the lower end of the extrusion can be inserted behind the staple and the upper end moved to vertical position and fastened in place.

Noting again that there are tapers on the sash stile slide faces in which the extrusions are closed to each other at their outer edges **76**, the mounting elements **203** or **206** are adjusted so that the outer stile edges of each sash slip easily between the front edges of their respective slideways when being moved initially outwardly towards mounted position. This can be determined by rule measurements or by holding the sash at its entrant position alternately at the top and bottom without introducing pivotal engagement. Once adjusted, pivotal engagement can then be made and the sash tilted into place for testing the frictoinal sliding relationship. This relationship is quite important to the user. Factually sensed ease of operation is a pleasing criteria of quality installation and is generally a matter of personal opinion which can be satisfied by the present invention.

It will be appreciated that where a sash is being installed without any counterbalance, generally referred to as an economy installation, there should be a uniform frictional relationship throughout movement of the sash the length of its travel on the extrusions. With the present invention the springs **66** can be installed at equally spaced intervals in the number prescribed by chart correlated on the avoirdupois of the sash being used. Thereafter the lower end of each extrusion can be inserted behind the staple and the top screw inserted and adjusted.

In event sash are hung with counterweights, the same procedure is followed except the counterweight avoirdupois is subtracted from that of the window and the springs used accordingly prescribed for that weight. In event sash are hung with a spring counter balance **72** the effort of the spring extended as when the sash is "down" is tested and rated in pounds and the effort of the spring when the sash is "up" is also rated. The springs **66** are then installed over the lower half of the extrusion in a manner comparable to an equivalent lesser sash weight and over the upper half more in relation to the full sash avoirdupois, with the number and spacing of the springs **66** used being arranged accordingly. Thereafter the sash in its movement will be subjected to a frictional supporting effort proportional to its vertical movement with a feeling of uniform weight throughout. Thus, for any sash and counter weighting the human effort required can be determined from a sash weight chart against height of the sash and related to a "light," "medium," or "heavy" feeling for individual tastes with a very simple computation.

Having thus described the various structural characteristics and the advantages and results attained by a preferred embodiment of the invention, it will be appreciated how the many objects are accomplished and how various and further changes can be incorporated without departing from the spirit of the invention the scope of which is commensurate with the appended claims.

What is claimed is:

1. In a window sash support a double track extrusion means supported on window side jambs for slidably mounting double hung sash in frictional relation comprising an elongated body element on each side jamb defining essentially rectangular C-sections having two slideways subtended by two channels therein spaced from each other and offset with respect to each other to provide a window stop between them, said slideways having guide slots opening into the channels, a web bordering each slideway and having mounting means on the back and on the front thereof, spring means releasably mounted in said mounting means on the back in spaced relation and having a portion resiliently extending beyond the back walls of said C-sections, weather sealing elements secured in said mounting means on the front and having a portion extending above the face of the adjacent slideway, a window sash mounted between said body elements in frictionally supported sliding relationship, retractible bolt means on the sash stiles at the top thereof and pivot pin means on the sash stiles at the bottom thereof, said bolt means and pin means releasably engaging in said guide slots in vertically slidable guided relationship, counterbalance means in each channel to overcome in part the weight of the sash, a counterbalance locking means secured to the counterbalance means including a housing slidable in each channel and having a surface journaling said pivot pin means in weight supported relationship, a pawl normally urged into engagement with the wall of the channel, means upon said pin means displacing said pawl from said engagement when the window sash is disposed vertically.

2. In a window sash support a double track extrusion means supported on window side jambs for slidably mounting double hung sash in frictional relation comprising an elongated body element on each side jamb defining essentially rectangular C-sections having two

slideways subtended by two channels therein spaced from each other and offset with respect to each other the effective width of a window blind stop, said slideways having guide slots opening into the channels adjacent to one side of each slideway, a web bordering each slideway and having a T-slot on the back and on the front thereof, spring means releasably mounted in said T-slots on the back in spaced relation and having an end portion secured in the wide portion of the T-slot and a remaining portion resiliently extending beyond the back walls of said C-sections, weather sealing elements secured in said T-slots on the front and having a portion extending above the face of the adjacent slideway, a window sash mounted between said body elements in frictionally supported sliding relationship, retractible bolt means on the window stiles at the top thereof and pivot pin means on the window stiles at the bottom thereof, said bolt means and pin means releasably engaging in said guide slots in vertically slidable guided relationship.

3. The combination called for in claim 2 including counterbalance means in each channel to overcome in part the weight of the sash, a counterbalance locking means secured to the counterbalance means including a housing slidable in each channel and having a surface journaling said pivot pin means in weight supported relationship, a pawl normally urged into engagement with the wall of the channel, means upon said pin means displacing said pawl from said engagement when the window sash is disposed vertically.

4. In a window sash support a double track extrusion means for slidably mounting double hung sash in frictional relation comprising an elongated body element defining essentially rectangular C-sections having two slideways subtended by two channels therein spaced from each other and offset with respect to each other to provide a shoulder, the effective width of a window stop serving as a side stop for the lower sash, said slideways having guide slots opening into the channels adjacent to one side of each slideway, a web bordering the slideways and interconnecting the C-sections having a T-slot on the back thereof and spring means releasably mounted in said T-slots in spaced relation and having an end portion secured in the wide portion of the T-slot and a remaining portion resiliently extending beyond the back walls of said C-sections, said extrusion means having a blind stop along the outer edge thereof disposed parallel to the plane of the sash and said slideways having an appreciable diverging taper inwardly from said stops.

5. In a double hung window sash the combination of extrusion means including two channel portions each having front and side walls defining a channel, said front walls providing slide tracks on their outer surfaces engaging the stiles of the sash and having a guideway slot opening into the channel; a counter balance locking device slidable in said channelway comprising a housing carrying a spring finger slidably engaging one of said side walls, a pawl mounted in the housing to releasably engage the other side wall in locking engagement, means for urging said pawl into said locking engagement and means for moving said pawl out of said locking engagement including a pivot pin carried by a sash stile pivotally journalled in weight bearing relationship on said housing, a raised element on said pivot pin engaging said pawl to move the pawl out of said locking engagement when the sash stile is disposed vertically, and counter balance means disposed in said channel and supporting said housing to overcome in part the weight of said sash.

6. In a double hung window sash the combination of extrusion means including rectangular C-sections having back, front and side walls defining a channel, said front wall providing a slide track on its outer face engaging the stiles of the sash in frictionally supported slidable relationship and having a guideway slot opening into the channel; a counter balance locking device slidable in said channel comprising a rectangular housing slidable in each channel along one side wall having an upwardly open bearing face, a pawl mounted in the housing to releasably engage the other side wall in locking engagement, means for urging said pawl into said locking engagement and means for moving said pawl out of said locking engagement including a pivot pin carried by a sash stile having a minimum modified involute radius area pivotally resting on said bearing face in weight bearing relationship and an involute raised element on said pivot pin engaging said pawl to move the pawl out of said locking engagement when the sash stile is disposed vertically, and counterbalance means disposed in said channel and supporting said housing to overcome in part the weight of said sash.

7. In a double hung window sash construction having sash stile engaging extrusions with a C-section portion having front and side walls defining a channel, said front wall providing a slide track engaging the stiles of the sash and having a guideway slot opening into the channel; a counter balance locking device slidable in said channel comprising a two part housing having a coarse threaded boss on top for receiving a counter balance means disposed in said channel and forming a compartment therebetween open at the top next to the boss and horizontally at the end thereof, a lever pawl having a locking tooth within the end opening and an actuating arm accessible in said top opening, a pin carried by the housing below said boss pivotally mounting the lever pawl for alternate movement of said tooth and arm beyond their respective openings, a spring finger for slidably engaging one of said side walls to urge the housing towards the other side wall, means carried by said housing for urging said pawl to move said tooth into locking engagement with said other side wall, and means upon said housing for pivotally journalling in weight bearing relationship a pivot pin at one side of the top opening to direct a raised element on said pivot pin into engagement with said actuating arm to move the pawl out of said locking engagement when the sash stile is disposed vertically.

8. In a double hung window sash the combination of extrusion means including offset C-section portions having side walls and offset front walls defining channels in side by side relationship, said front walls providing slide tracks engaging the stiles of the sash and each having a longitudinally disposed guide way slot opening into the channel; counter balance means disposed in said channel to overcome in part the weight of said sash, a counter balance locking device slidable in said channelway comprising a housing secured to the counterbalance means carrying a spring means slidably engaging one of said side walls, a pawl mounted in the housing to releasably engage the other side wall in locking engagement, means for urging said pawl into said locking engagement, and means for moving said pawl out of said locking engagement including a pivot pin carried by a sash stile pivotally journalled in weight bearing relationship on said housing, and a raised element on said pivot pin engaging said pawl to move the pawl out of said locking engagement when the sash stile is disposed vertically.

9. The combination called for in claim 8 including a web member between the C-section portions having a T-groove adjacent to the level of said slide track, weather sealing elements supported in said groove to engage one of the stiles of the sash.

10. The combination called for in claim 8 including spring means secured on the outside of said extrusion for engagement with a window frame side jamb and means for limiting inward movement of said extrusion away from said side jamb.

11. The combination called for in claim 8 in which said slideways are divergingly inclined inwardly of said window sash, side stop means in the extrusion facing inwardly

at the inner marginal edge of the outer slideway, and blind stop means on the extrusion at the outer margin of said outer slideway.

12. In a window sash support a double track extrusion means for slidably mounting double hung sash in frictional relation comprising an elongated body element defining essentially rectangular C-sections having two slideways subtended by two channels therein spaced from each other and offset with respect to each other the effective width of a window blind stop, said slideways having guide slots opening into the channels adjacent to one side of each slideway, a web bordering the slideways and interconnecting the C-sections having a T-groove on the back thereof and spring means releasably mounted in said T-grooves in spaced relation and having an end portion secured in the wide portion of the T-groove and a remaining portion resiliently extending beyond the back walls of said C-sections, said remaining portion comprising an arched blade spring and said end portion comprising a flat head offset from said arched blade and wider than the opening into said T-groove and resting flat against the web and a longitudinal length less than said opening into said T-groove whereby said end portion is inserted and mounted with a rotation of the end portion in said T-groove to dispose the arched blade in alignment with said T-groove.

13. A window construction for tiltable mounting of sash comprising side extrusions having stile engaging slideways defining inwardly diverging planes and movable laterally with respect to each other a distance less than the width of a blind stop when supporting a sash, said slideways having a recessed guide way, a sash supported in slidable relationship between said slideways and having means engaging in each of said guideways including a retractible bolt at the top of the stiles and aligned rigid pivot pin at the bottoms of the stiles projecting into the guideways, said guideways being deeper than the distance of projection of said bolt and pin from the stiles for the stiles to frictionally engage said slideways in sealed sliding relationship.

14. The method of converting a standard double hung vertically sliding window sash and frame construction for pivotal mounting about a horizontal axis comprising eliminating the center stop of the window frame to provide full width recesses between the front and blind stops on opposite sides of the window frame, mounting opposingly faced extrusions resiliently in said opposite recesses, each extrusion having two laterally offset tracks with respect to each other and each track having a recessed guideway, locking upwardly exposed pawl devices within the guideways secured in weight bearing relation to sash counterbalancing elements, securing oppositely projecting pivot pins coaxially in the lower ends of the sash stiles, inserting outwardly projecting spring-urged latch bolts in the top of the sash stiles, canting the upper window sash to move the axis of the pivot pins from the horizontal to foreshorten the horizontal distance between the pivot pins, inserting one pin laterally in one of the outermost guideways and lowering the other pin in the matching guideway in the other extrusion by bringing the window sash and the axis to a horizontal orientation lowering the pins into said upwardly exposed pawl devices to engage and release them within the guideways as the window is moved towards upright position, and then raising and advancing the top of the sash between the extrusions about said horizontal axis past the innermost tracks into the outermost tracks to spread them, and snapping the latch bolts into the said outermost guideways opposite each other for movement with the counterbalance device effective to assist in sliding the sash frictionally between said opposing extrusions in sealed relationship with the window frame.

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