May 13, 1952 S. L. POTTS 2,596,433

SLIDING HINGE CASEMENT WINDOW STRUCTURE

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FIG. 1.

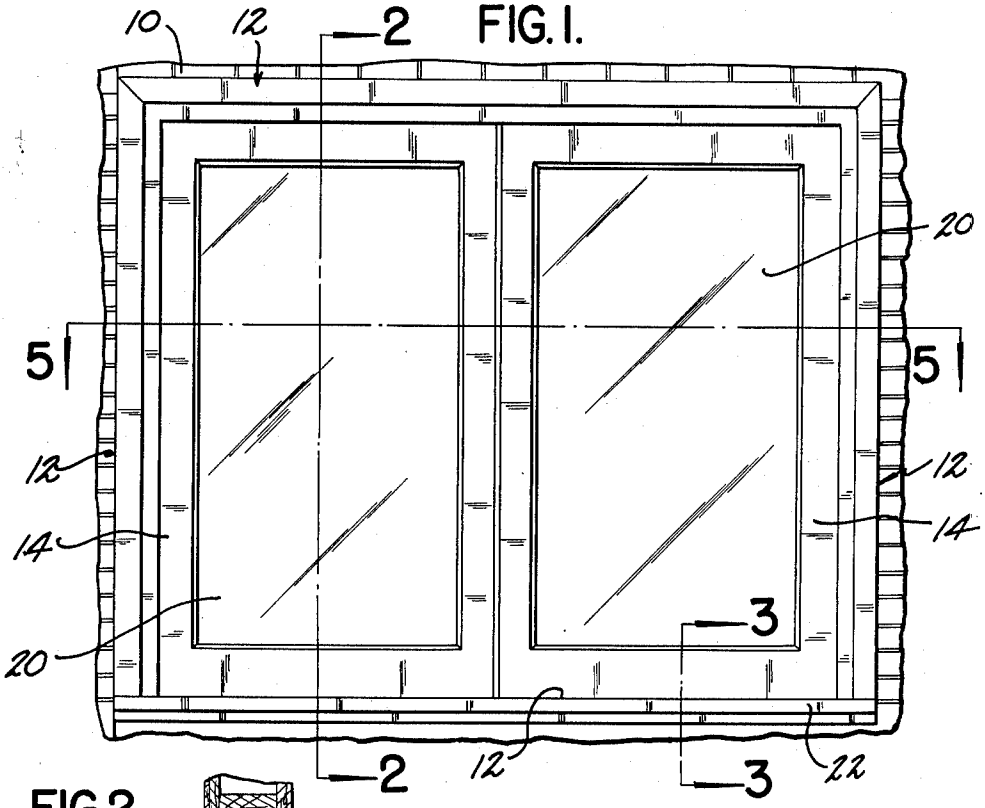


FIG. 2.

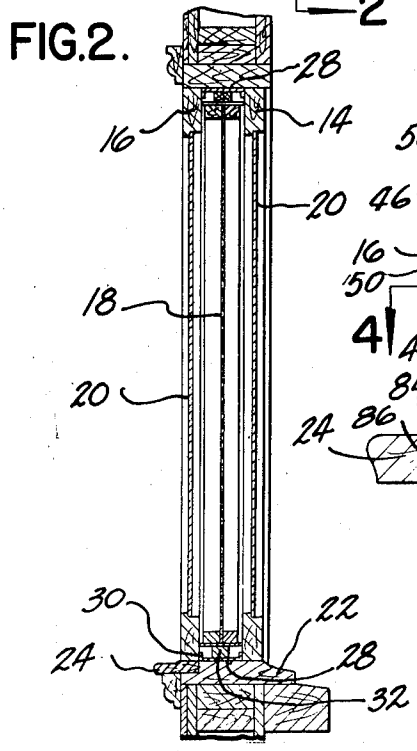
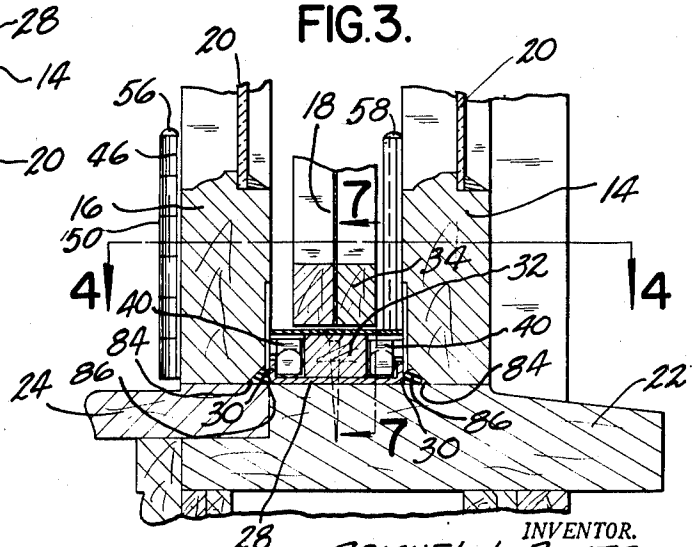


FIG. 3.



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FIG. 6.

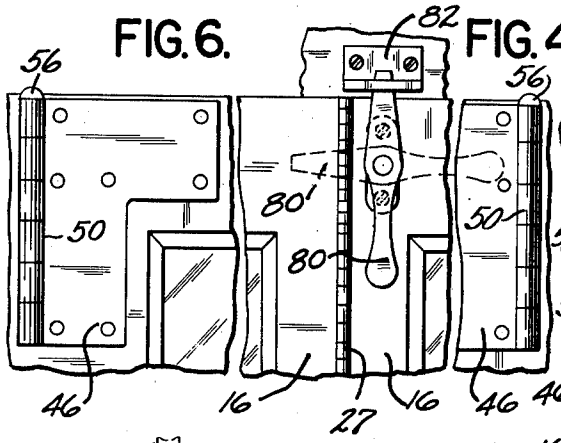


FIG. 4.

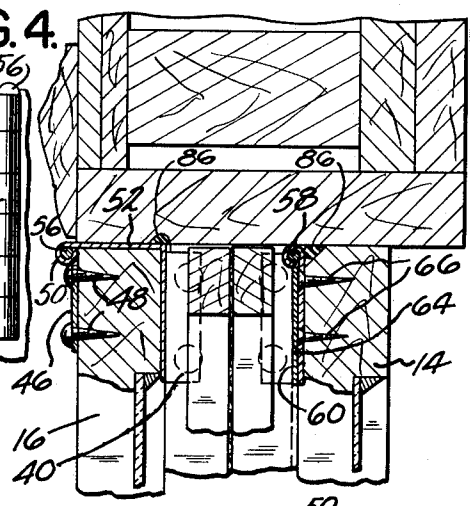


FIG. 5.

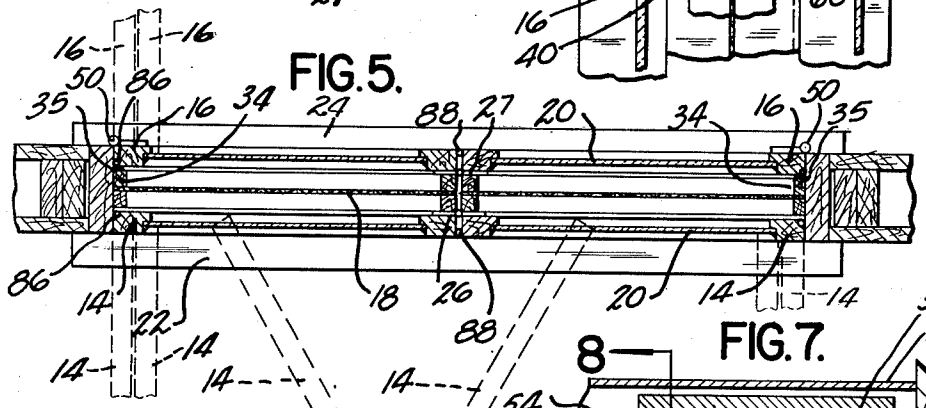


FIG. 7.

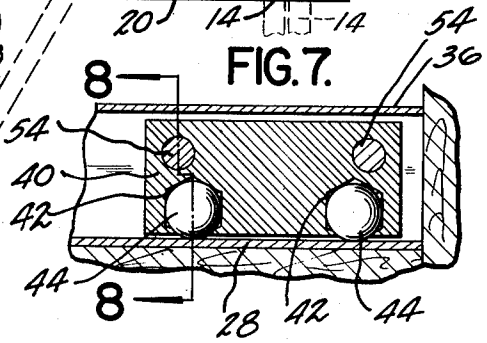


FIG. 9.

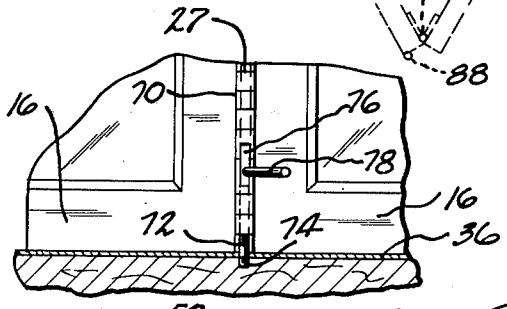
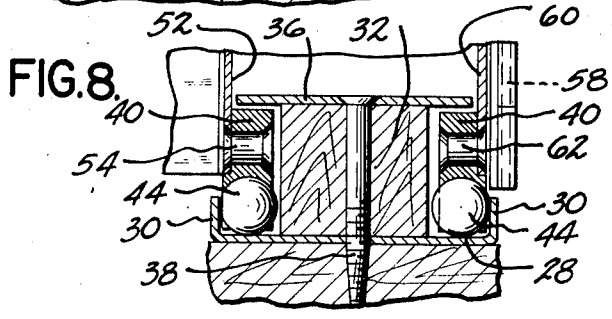


FIG. 8.



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SLIDING HINGE CASEMENT WINDOW STRUCTURE

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FIG.10.

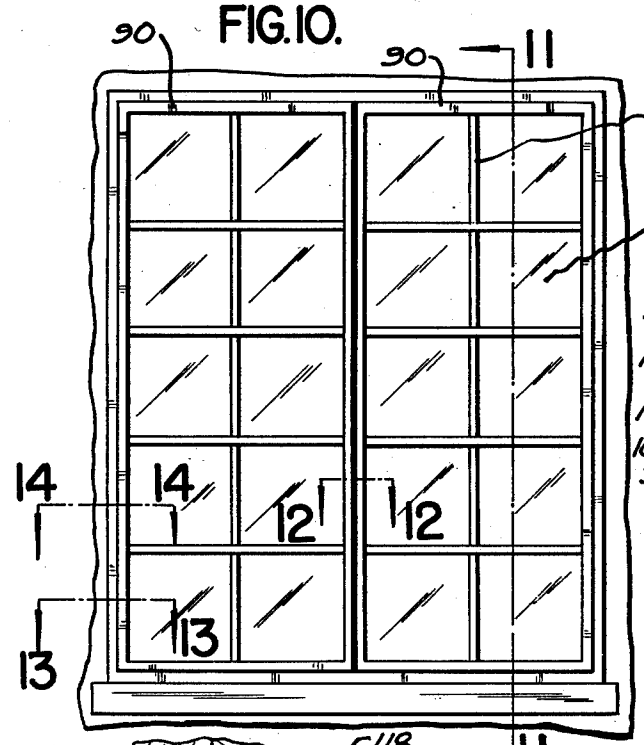


FIG.12.

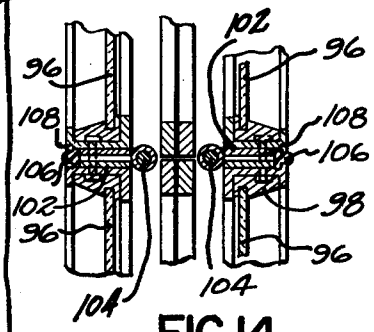


FIG.14.

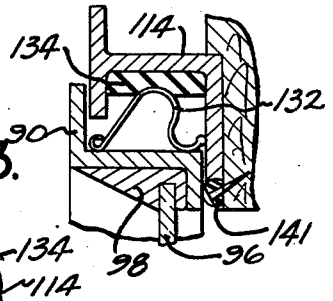


FIG.11.

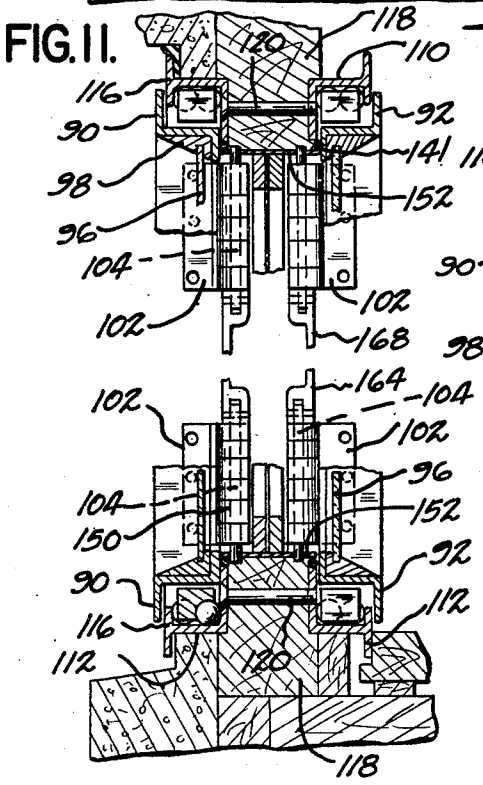
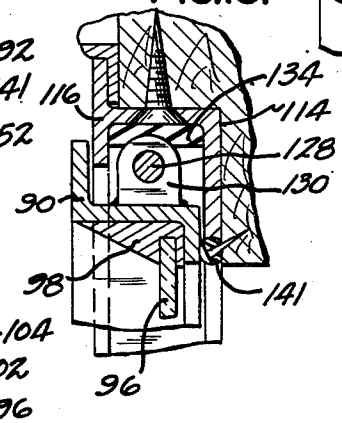


FIG.13.



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FIG.15.

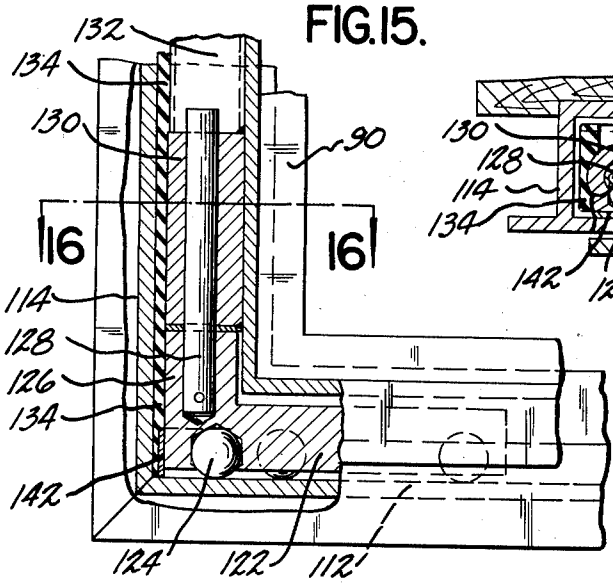


FIG.16.

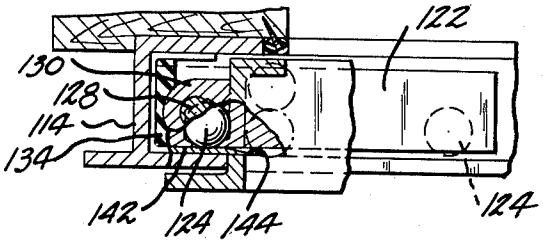


FIG.17.

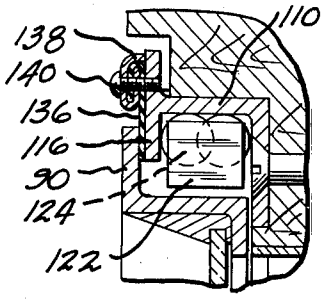


FIG.18.

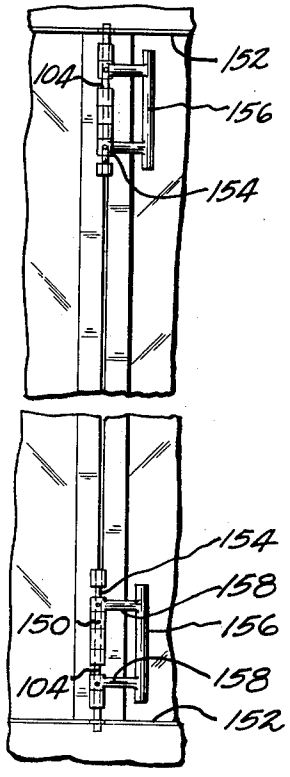
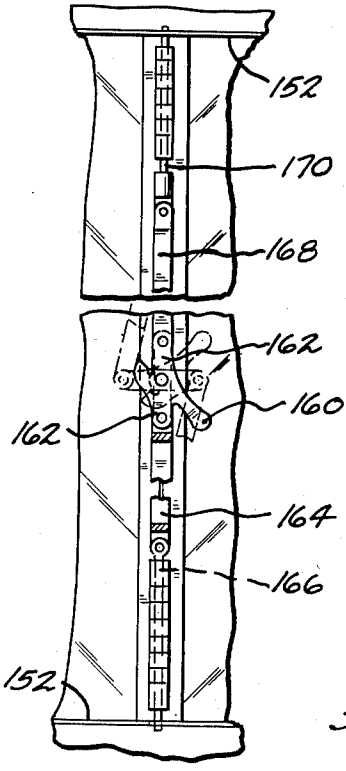


FIG.19.



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UNITED STATES PATENT OFFICE

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SLIDING HINGE CASEMENT WINDOW STRUCTURE

Samuel L. Potts, Detroit, Mich.

Application June 20, 1946, Serial No. 678,097

12 Claims. (Cl. 160—201)

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This invention relates to window constructions and more particularly to a casement window structure employing one or more pairs of hinged sashes capable of swingable and slidable movement in the window frame.

An important object of this invention is to provide a novel window structure employing hinged sashes capable of movement from closed position to opened position with ease and rapidity and of retaining their adjusted position without being moved in either direction by the wind. Another object of this invention is to provide a novel double casement window structure composed of inner and outer sashes which effectively insulates the window and permits the use of a screen between the inner and outer sashes which is retained in place in whatever position the sashes are moved.

A further object of this invention is to provide an improved ball bearing support for slidably guiding the sashes for movement in the frame from one side to the other thereof and providing lateral swinging movement of the sashes from the plane of the window frame. A still further object of the invention is to provide improved sliding hinges for supporting the window sashes in their movement in the window frame.

More particularly an important feature of this invention is to provide a novel casement window structure having an improved means of construction for guiding the sashes in their opening and closing movements. This means comprises rollers or spherical bearings movable in tracks in the window frame which not only take the load of the sashes but also provide a frictionless contact laterally with the sides of the track. Another object of the invention is to provide an improved track and roller guide for the sashes of certain types of double casement windows in which a single member is shaped in a novel manner to function as a track for both the inner and outer sashes.

A novel feature of the invention is the arrangement of parts so that the hinges and the hinge pins are enclosed and made inaccessible from the outside of the window, but when desired enable the sashes to be readily removed from the inside of the window without difficulty. A further object of the invention is to provide a novel air and weather seal completely around the window frame and between the sashes which in the window closed position provides a sealed dead-air space between inner and outer sashes, insulating the window and preventing frosting and condensation on the window panes.

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An important feature of this invention is the construction of the parts of the window in order to reduce the cost of manufacture, assembly and installation of the completely assembled window structure in an opening in a building. The parts of the structure made in accordance with this invention are simple in design and can be quickly shaped and accurately assembled and installed. A further feature of the invention is the ability to manufacture the double casement window structure separately as a unit and to shape and install the unit without difficulty in a wall opening. The entire window unit can be factory assembled and delivered to the building for installation in a wall opening by carpenters in one operation.

Various other objects, advantages, and meritorious features will become more fully apparent from the following specification, appended claims, and accompanying drawings wherein:

Fig. 1 is an outside elevation of a casement window structure of this invention showing same installed in a wall opening,

Fig. 2 is a vertical cross sectional view of the casement window structure of Fig. 1 along line 2—2 of Fig. 1,

Fig. 3 is a detailed enlarged sectional view along line 3—3 of Fig. 1,

Fig. 4 is a horizontal sectional view along line 4—4 of Fig. 3,

Fig. 5 is a horizontal sectional view of the installed window structure of Fig. 1 along line 5—5 of Fig. 1, showing the adjustable sashes in various adjusted positions,

Fig. 6 is a detailed view of a locking mechanism for the sashes of the window structure of this invention,

Fig. 7 is a detailed vertical sectional view along line 7—7 of Fig. 3,

Fig. 8 is a horizontal sectional view along line 8—8 of Fig. 7,

Fig. 9 is a detailed view of a combination hinged pin and locking mechanism for the sashes,

Fig. 10 is an outside elevation of a metal window structure utilizing the principles of this invention,

Fig. 11 is a broken vertical sectional view along line 11—11 of Fig. 10,

Fig. 12 is a detailed horizontal sectional view along line 12—12 of Fig. 10,

Fig. 13 is a detailed horizontal sectional view along line 13—13 of Fig. 10 rotated 90° clockwise and showing the manner in which the hinges of the sashes engage the seal,

Fig. 14 is a detailed horizontal sectional view

along line 14—14 of Fig. 10 rotated 90° clockwise,

Fig. 15 is an enlarged detail view of one corner of a sash of Fig. 10 partly broken away to show the connection of the sash hinge to the sash caster,

Fig. 16 is a horizontal sectional view along line 16—16 of Fig. 15 partly broken away to show the action of the rollers in the closing movement of the sash,

Fig. 17 is an enlarged vertical sectional view of the upper end of the window frame and sash showing one method of forming a seal at the top to prevent water drip,

Fig. 18 is a fragmentary view in elevation of one form of the combination sash hinge and locking mechanism, and

Fig. 19 is a fragmentary view similar to Fig. 18 showing another form of sash locking mechanism.

The invention as exemplified herein is applied to two types of casement window structures, one relating to wooden structure and the other of metal structure. Figs. 1 to 9 inclusive relate to casement window structures formed in the main of wooden materials and Figs. 10 to 19 inclusive relate to structures formed of metal parts.

Referring to the invention illustrated in Figs. 1 to 9, reference numeral 10 indicates a fragmentary portion of a building wall surrounding a window opening 12 in which is installed a wooden double casement structure of this invention. The window structure comprises an outer pair of sashes 14—14 similar in construction to one another and each occupying in closed position substantially one half of the window, and an inner pair of sashes 16—16 of like construction similarly occupying the window opening area. The two pairs of sashes are arranged so that in closed position as illustrated in Figs. 2 and 5 they are slightly spaced apart in parallel planes. Between the two pairs of sashes is preferably disposed a two-sectional window screen 18 which extends across the entire area of the window opening. The sashes are mounted for opening movement away from the plane of the window on either side of the screen and the latter may therefore be retained permanently in place regardless of whether the sashes are opened or closed. As customary, each sash carries a window pane indicated at 20 which may be entirely of one piece or subdivided into sections in the manner illustrated in Fig. 10. The bottom of the window opening carries an outer sill member 22 over which the outer sashes swing and an inner stool member 24 over which the inner sashes swing.

The adjacent or substantially abutting edges of each pair of sashes 14—14 and 16—16 are hinged together as indicated at 26 and 27 respectively in Figs. 5 and 9. This enables the sashes to swing outwardly away from the plane of the window and fold or collapse upon one another in the manner shown in dotted outline in Fig. 5. At the outer ends or corners of the top and bottom portions of the sashes are improved bearing assemblies or casters for slidably guiding these ends in tracks provided along the top and bottom margins of the window opening. These tracks preferably extend the width of the window opening from one side to the other and thereby enable each pair of sashes to not only fold upon one another but also to be shifted in a folded state from one side of the window opening to the other.

Mounted upon one of the sill members, in this instance the sill member 22, and in the plane of the screen is a channel shaped metal member 28 arranged with the bottom thereof bearing upon the sill and having such a width that the side flanges 30—30 of the member substantially abut the inner surfaces of the sashes when the latter are moved to closed position. A similar channel shaped member extends along the top or head of the window opening and since it correspond exactly with the bottom channel member the same reference numerals will apply thereto. The two channel members extend the width of the window opening and form top and bottom tracks for the sliding casters that carry the sashes in their opening and closing movements.

Extending longitudinally of each channel shaped member 28 and substantially mid-way between the side flanges 30—30 thereof is a separator member or filler 32 formed either of metal or wood which as illustrated in Figs. 2 and 3 may have a substantially square cross sectional dimension. The screen 18 as previously described is divided into two sections each of which is enclosed between outer and inner frames 34—34. The screen sections are preferably mounted for inward swinging movement about vertical axes along the sides of the window structure as shown by the hinges at 35 in Fig. 5. The screen sections are foreshortened in their vertical dimensions so that they may be received between the top and bottom filler members 32 with a close fit in the manner illustrated in Fig. 2. Preferably a metal plate 36 in Fig. 8 is provided along the outer surface of each filler member and the top and bottom frame sections of the screen are received upon these plate members. These plates 36 are shown with a lateral dimension greater than the filler members so that they extend beyond the members on either side thereof but terminate short of the sashes. Any suitable means may be used to secure these elements together. Preferably the plates are countersunk at spaced intervals, and as shown in Fig. 8, a screw member 38 is received in each countersunk portion and extends through the plate 36, filler member 32, and through the base of the channel member 28 into the adjacent structure of the surrounding wall of the window frame. In this manner all the elements may be quickly assembled and installed in the window opening by the simple expedient of threading the screw members into place. If desired, for ready removal of the plates 36 for cleaning purposes, fastening means other than the screws 38 may be used for separately securing the plates to the filler members.

The channel member 28 in cooperation with the centrally located filler members 32 and the plates 36 form a pair of parallel tracks along the top and bottom of the window frame, one track of the top and bottom channel members serving as a guide for the outer pair of sashes 14—14 and the other track of the top and bottom channel members serving as a guide for the inner pair of sashes 16—16. Slidable in these tracks are guide blocks or casters which are attached by means of hinge assemblies to the outer corners of the sashes to provide the movement of the sashes in the manner previously described. One such block or caster is associated with each outer corner of each pair of sashes and since all these blocks are similarly constructed and attached to their respective sashes the description of one will apply to all.

Referring to Figs. 7 and 8, each guide block or

caster comprises an elongated member 40 preferably formed of metal having a width somewhat less than the space between filler member 32 and track flange 30 in which it is received as shown in Fig. 8. Opening out of the edge of the block adjacent to the base of the channel member in which it rides are a plurality of ball receiving recesses 42. Two such recesses are illustrated in the guiding block of Fig. 7 but it is understood that more of such recesses may be utilized if desired. Received within each recess is a spherical roller or ball bearing 44 which is of such a size as compared to the recess that it projects downwardly out through the opening of the recess into engagement with the bottom of the track member 28 in which the guiding block is received. The recesses 42 of each guiding block or caster not only open out through the bottom face thereof but also laterally out of both sides of the block as indicated in Figs. 7 and 8. The rollers or balls 44 have such a diameter that peripheral parts thereof project laterally from both sides of the block as well as from the bottom side. The balls are therefore capable of bearing not only upon the bottom parts of the channel members 28 but also upon the adjacent side flange 30 thereof and the side faces of the filler member 32 attached to the channel member.

Preferably the diameter of each ball is slightly less than the distance between the side faces of the filler member and the inside faces of the flange 30 so that a slight clearance is provided either on one side of the ball or the other in the guideway as indicated in Fig. 8. As a result of this construction the relation of the balls to the guide blocks and the tracks is such that frictionless movement is provided not only along the bases of the channel members but also laterally along the side flanges 30 and the side faces of the filler members 32. This freedom of movement allows the sashes to travel along the tracks under light pressure and without binding.

As previously mentioned, the guiding blocks or casters 40 are attached by hinge assemblies to the outer corners of each pair of sashes. One guiding block or caster is provided for each corner and for each pair of sashes there are four such casters. To permit the lateral swinging movement of the sashes the guiding blocks or casters are attached thereto by hinge assemblies having their pivotal axes extending in vertical direction. Referring to Figs. 4 and 8 each hinge assembly comprises a pair of hinge leafs one of which is attached to the adjacent guiding block and the other to the corner faces of the sashes. For the inner pair of sashes 16—16 the hinge leafs engaging the outer corners of the sashes are indicated by reference numeral 46 and they are secured by any suitable means such as screws 48 to the room side of the corners of the sashes 16. The knuckle of each hinge assembly is indicated at 50. The hinge leafs attached to the guiding blocks are indicated by reference numeral 52 and they are shaped as shown in Fig. 4 to extend around the outer corners of the sashes to a position bearing against the side of the caster block 40 with which they are associated. Rivets 54 are used to secure these leafs or plates to the guiding blocks or casters in the manner illustrated in Fig. 8. The hinge pins extending through the knuckles 50 are indicated at 56 and serve to couple the two hinge leafs 46 and 52 of each assembly together as in conventional door hinges. It is noted that the hinge pins 56 for the inner pair of sashes are located in exposed position on the room side of these sashes. These hinge pins are easily retractable to remove the sashes from the frame.

For the outer pair of sashes 14—14 a slightly different arrangement is made in order to position the hinge leafs and the hinge pins in a position inaccessible from the outside of the window opening. The hinge pin 58 of each hinge assembly on the outer pair of sashes is located at the inner corner or room side of the sash as indicated in Fig. 4. One hinge leaf 60 of the assembly is secured to the guiding block or caster 40 for that particular corner of the sash such as by rivets 62 in the manner previously described for the inner pair of sashes. The other hinge leaf 64 is secured by screws 66 or other suitable fastening means to the inner side of the sash 14 as indicated in Fig. 4. In the window closed position the two hinge leafs 60 and 64 extend in juxtaposition paralleling the plane of the sash. It is to be especially noted that the hinge leafs and pins 58 for the outer pair of sashes are concealed and inaccessible from the outside when the sashes 14—14 are in closed position. This serves to prevent any unauthorized tampering with the hinge pin in an attempt to gain access to the room through the window opening. If desired, for the sake of appearance, the hinge assembly for the inner pair of sashes may be constructed and mounted like that shown for the outer pair of sashes thereby concealing the hinge plates and pins from room view.

The improved construction of the hinge assembly is such as to reenforce and make more rigid the corner joints of each sash by overlapping the joints with the hinge leaf of each assembly. The inner and outer pairs of sashes may be removed easily for painting, replacing broken glass, or for any other reason, by simply removing the hinge pins. This can be done easily when the sashes are in open position. Although a single outer and inner pair of sashes are shown in the illustrated embodiment of the invention herein, it is understood that multiples of pairs of sashes, such as two or three pair or more, may be used in long wall openings such as to enclose large porches or other spaces. When it is desired to open a porch on which multiples of pairs of these sashes are used, all the sashes may be folded together at one end of the porch or left at any convenient place on the tracks.

A feature of the invention is the provision for locking the sashes and particularly the inner pair 16—16 in closed position. This is accomplished by having the hinge assembly 27 which joins the two sashes together to also serve as the locking mechanism. Referring to Fig. 9 the hinge assembly is generally indicated at 27. The two hinge leafs of the assembly are disposed on the outer edges of the sashes and are therefore not visible from the room side. However, the adjacent edges of the sashes are slightly spaced apart for at least a part of their vertical length and the overlapping sections or knuckles 70 of the hinge leafs are partially exposed therethrough. The hinge pin enclosed by these overlapping knuckles is indicated at 72. It is mounted within the encircling knuckles 70 for vertical reciprocating movement and is adapted in its lowermost position to be received within the recess 74 formed in the striking plate 36. In this position the hinge pin locks the sashes against any swinging movement. To raise the pin and thereby release the sashes for opening two or more of the overlapping knuckles 70 are

cut away to form a vertical elongated slot 76. Extending through the slot and fixed to the hinge pin 72 is a handle member 78 which when lifted raises the pin from its locked position. The hinge pin therefore has the dual function of providing pivotal swinging movement of the sashes and of locking the sashes in closed position in the opening.

Although a similar provision may be made locking the upper ends of the inner sashes 16—16 the type of lock illustrated in Fig. 6 may be employed. It consists of a handle member 80 pivoted to one of the sashes and adapted when the sashes are closed to swing into engagement with a slot in a bracket 82 secured to the head of the window structure.

Another feature is the provision of sealing means which extends completely around the window structure when the sashes are in closed position and forms an air-tight seal which effectively insulates the dead-air space between the outer and inner pair of sashes. This novel provision consists of chamfering or beveling the edges of the two pairs of sashes on the sides thereof facing toward one another and locating in the places thus provided any suitable weather sealing material. Referring particularly to Fig. 3 the bottom edges of the two opposed sashes 14 and 16 are shown similarly chamfered or beveled at 84. This provides a triangularly shaped space along the bottom edges of the sashes when the sashes are moved to closed position. In these triangular areas there are located sealing members which in the closed position of the sashes are compressed thereby forming an air-tight seal between sash and window frame. The sealing members preferably consist of elongated cords or ropes 86 of yieldable weather resisting material which are tacked or otherwise secured to the sill members 22 and 24. This form of sealing not only extends along the bottom of the window structure but also around the two sides of the sash as indicated in Fig. 5 and across the top of the window opening. Where the form of exposed hinge 46, 52 and 56 is used, the window frame opposite the hinge leafs 52 may be recessed to receive the weather strip 86 as shown in Figure 4. Also a similar weather stripping is carried on one of the middle hinged sides of each pair of sashes as shown at 88 in Fig. 5 which in closed position of the sashes is adapted to be engaged by the other sash and compressed thereby forming a sealing along the substantially abutting edges thereof. As a result, in the closed position of the inner and outer pairs of sashes an insulated dead air space is provided between the two pairs of sashes which effectively prevents the transmission of heat, dust, and moisture from either the room side or the outside of the window structure.

In the modification of the invention illustrated in Figs. 10 to 19, the casement window structure is formed of metal parts. The arrangement is generally similar to the modification of the invention previously described. Referring to Fig. 10, the outer pair of sashes 90—90 is illustrated in elevation. These sashes are hinged together along their adjacent edges for outward swinging movement similar to the sashes 14—14 previously described. On the room side of the outer pair of sashes is an inner pair of sashes 92—92, one of which is shown in Fig. 11, which correspond to the pair of sashes 16—16 in the previous modification of the invention. The inner pair of sashes are capable of inward swinging movement about a vertical hinge connecting

their adjacent edges. In closed position the two pairs of sashes in Fig. 11 form a dead air space therebetween similar to the sashes 14—14 and 16—16, and a two-sectional sectional screen of the type previously described may be installed therebetewen as shown. The window area of each sash may be subdivided as shown in Fig. 10 by a plurality of horizontal and vertical muntin bars 94 and glass panes 96 provided in each subdivided area. The members or rails forming the frame of the inner and outer pair of sashes 90 and 92 are formed of metal as previously described and are similarly shaped with the cross sectional configuration shown in Fig. 11. The glass panes 96 are secured to these rails and muntin bars 94 by the usual putty securing means indicated at 98.

The adjacent edges of each pair of sashes are hinged together as previously mentioned and the preferred form of hinge assembly which is adapted for both inner and outer pairs of sashes is that shown in Fig. 12. The hinge assembly for each pair of sashes includes the hinge leafs 102 and 102 each secured to the adjacent edge of the two sashes and the hinge pin 104. The hinge assemblies extend for part of the vertical length of the sashes and unless the sashes are abnormally high, two hinge assemblies, one at the top and one at the bottom, are sufficient as shown. Running the entire length of the inner and outer sashes between the adjacent edges thereof including the areas between the hinge assemblies and beyond the ends of the hinge leafs are strips of weather resisting yieldable material such as the rubber strips 106. These strips are compressed between the edges of the sashes when they are swung to closed position. Either one of the sashes of each pair of sashes may carry this rubber stripping or if desired each sash may carry a longitudinal section of the stripping arranged so that the sections compressibly abut one another when the sashes are moved to closed position. To assist in retaining the rubber stripping in place, the edges of the rails opposite the hinge pins are provided with lips 108 which extend toward one another part way across the space between each pair of sashes and act to hold the rubber in place.

Top and bottom members and side members of the metal window frame, into which each pair of sashes is mounted, are of the same formation. Referring to Fig. 11 top and bottom window frame members for each pair of sashes are indicated at 110 and 112 respectively. A side frame member is indicated at 114 in Fig. 13 and it is understood that the opposite side member is of similar formation. These window frame members correspond in shape to one another and as shown are generally L-shaped in formation.

The inner and outer window frame members 110, 112 and 114 are separated by a filler strip 118 of suitable material formed to cooperate with and fit between the inner and outer window frame members. The inner and outer window frame members are assembled and securely held together by through bolts or machine screws 120 properly locating the frames with respect to one another and extending through the filler strips to securely fasten all these elements together. The filler strip forms the "surrounds" that extend around the sides and top and bottom of the building wall opening. The window frames, surrounds, sashes, glass, locks, weather strip seals, et cetera, are factory assembled in complete form and need only be secured into

the building wall opening to provide a completely installed window structure.

The top and bottom members 110 and 112 of the window frame are formed as shown to produce tracks of channel formation along the top and bottom of the window to guide the roller assemblies or casters which in turn are attached to the outer corners of each pair of sashes by hinges as in the previously described embodiment of the invention. Referring to Figs. 11, 15 and 16, each roller assembly or caster comprises a block 122 in which a plurality of spherical rollers or balls 124 are carried. Three rollers are shown for each block in the present embodiment of the invention and it is understood their number may be varied for different adaptations of the invention.

An important feature of the invention as pointed out in the previous modification thereof is the fact that these rollers are carried by their respective tracks in such a way that not only do the peripheral portions project into engagement with the bases of the channel shaped frame members but also the peripheral portions project laterally for engagement with flanges or webs on either side of the frame members. The rollers are carried in recesses formed in the blocks 122 in the manner shown in Fig. 16 to obtain this desired action. When the three rollers are in use as illustrated herein two rollers are preferably mounted on one side of the block and one roller on the other side in staggered relation to one another. Each roller block assembly or caster is pivotally connected to its respective outer corner of each hinged pair of sashes in order to allow the sashes to swing outwardly from the plane of the window opening in the manner described in the earlier embodiment of the invention.

Referring to Fig. 15, each roller block or caster 122 is provided with a right angled extension 126 arranged to extend around the corner of its respective sash and between the sash and the adjacent side of the frame member 114. Fixed in the block extension 126 is a short vertical pin 128 which is substantially centrally located in the space between the sash and the side frame member. Secured to the side rail member 90 of the sash by welding or other suitable means is a hinge member 130 which is provided with a longitudinal bore in which the pin 128 is closely fitted and is free to rotate relatively thereto. The hinge member 130 being fixed to the sash and free to pivot on the pin allows the corner of the sash to swing in an arc about the axis of the pin when the sash is moved to open position. It is to be noted that each hinge assembly by this construction and arrangement is concealed from view and inaccessible and tamper proof when the sashes are in closed position.

The hinge assemblies for the corners of the sashes extend for a short distance along the side frame members of the window structure. In the intervening space between the hinge assemblies of each side of the window structure as shown in Fig. 14 is a trough-shaped member 132 of flexible sheet metal material, the side margins of which are tack welded or otherwise secured to the side of the sash and the intermediate portion of which is bowed outwardly toward the frame member 114. Extending the length of each side frame member 114 is a strip of yieldable material 134 such as sponge rubber. When the sashes are moved to closed position the hinge members 130 and the trough-shaped members 132 engage and compress the strip of yieldable material 134 as shown in Figs. 13 and 14. This forms an air-tight seal along the sides of the window structure.

Preferably at the top of the outside pair of window sashes there is carried as shown in Fig. 17 a yielding weather strip 136 adapted when the sashes are moved to closed position to be compressed between the top rails 90 and the outer web 116 of the window frame member 110. This weather stripping is preferably an elongated band of rubber sheet material arranged to hang downwardly from the outer face of the web element 116. The upper margins of the rubber strip 136 are secured to the frame member in any suitable way but preferably by means of a galvanized iron strip 138 which extends across the outer faces of the top frame member 116. The lower edge of the metal strip 138 is folded inwardly and the upper margin of the rubber strip is folded outwardly and these two folded sections are interleaved and compressed together and secured to the web 116 by screws 140 as shown in Fig. 17. Upon securement of the metal strip 138 to the web 116 of the upper frame member by screws 140 the rubber insulating strip 136 is mounted in position to be interposed between the adjacent faces of the sashes and web 116 when the former are swung to closed position. The metal strip 138 projects outwardly beyond the rubber strip and over the top rail of the sashes 90 and prevents water running down the outside wall of the building from entering the space between sashes and window frames as is evident from Fig. 17.

In Figs. 11, 13 and 14 there is shown a novel air seal for the inner and outer sashes which as in the previously described embodiment completely insulates the dead air space between the outer and inner sashes. In the corners produced by the window frames 110, 112 and 114 and the filler strips or "surrounds" 118 there are secured cords or ropes 141 of yielding material secured or cemented to the filler. These cords or ropes 141 of yielding material extending completely around the window opening and project into the plane occupied by the sashes in closed position so that when moved to closed position the sashes are pressed tightly thereagainst and provide a positive air seal between the sashes and the "surrounds." These ropes or cords of yielding material also function to cushion the sashes in their closing movements thus preventing the jarring of the glass and the production of noises.

To tightly seal the cords or ropes 141 and rubber strip 136 between the sash 90 and the frame members of the window structure, the tracks in which the sashes are guided for movement are provided with novel means which cause the sashes in their final closing movement to shift bodily inwardly perpendicularly of the plane of the window opening and compress these yielding strips between the sashes and the frames of the window structure. Referring to Figs. 15 and 16, at each of the outer ends of the top and bottom tracks in which the casters 122 travel there is provided a cam-like surface or lift formed by a thin metal shim or wedge 142 fixed to the inside surface of the outer web of the top and bottom frame members 110 and 112. Each lift faces toward the roller block or caster with which it is associated and is provided with an inclined surface 144 up which the outermost roller of the block is adapted to travel. The inclined surface of each lift is so located with respect to the roller block assemblies that when the sashes approach their final closed position,

the outermost roller 124 of each caster rides up the incline 144. This action occurs simultaneously at all four corners of each pair of sashes and shifts the caster assemblies inwardly which by means of the hinge pins 128 carry the sashes slightly bodily inwardly sufficient to compress the cords 141 and rubber strip 136 in the manner previously described and thereby form an effective seal. The bodily shifting movement is perpendicular to the plane of the window structure and thereby precludes any scuffing or wear of the rubber strip.

The manner of locking the sashes of the present modification of the invention is generally similar to the previously described modification of the invention. The pins of the center hinge assemblies for each pair of sashes 90—90 and 92—92 have the novel function of also serving as a locking medium for these sashes. Referring to Figs. 11, 12, 18 and 19, the top and bottom hinge assemblies join the adjacent edges of each pair of sashes. Each hinge assembly comprises the two hinge leafs 102—102 which are secured to the adjacent edges of the pair of sashes and the hinge pin 104 which is enclosed between the overlapping sections or knuckles 150 of the hinge leafs. Each hinge pin is mounted within the knuckles 150 of the hinge leafs for upward and downward reciprocating movement. Extending along the top and bottom filler members 118 is an elongated metal strip or plate 152 which corresponds to the plates 36 previously described. Each plate is provided in line with the hinge pins 104, when the latter are in sash closed position, with an aperture into which the ends of the hinge pins are received. When so received the hinge pins lock their respective sashes in closed position in the window structure.

For relatively short vertical height windows, the type of locking mechanism illustrated in Fig. 18 is preferred. As in the previously described embodiment of the invention, certain of the overlapping sections or knuckles 150 of the hinge plates 102—102 are cut away to form vertically elongated slots. Referring to Fig. 18 the removal of certain of these knuckles provides two spaced apart slots 154—154 in each hinge assembly. A handle 156 is associated for each hinge assembly and is provided with two arms 158—158 which enter the slots 154—154 and are fixed to the hinge pin. Since the hinge is free to rotate, the handle is capable of being swung from side to side as well as being raised or lowered to unlock or lock the sashes.

For long vertical windows where it is difficult to reach the upper hinge pins, the top and bottom hinge assemblies may be interconnected for joint latching and unlatching operation by the mechanism shown in Figs. 11 and 19. At any suitably convenient intermediate point in the height of the window structure a handle 160 may be provided. This handle is pivoted about a horizontal axis to one of the sashes and is provided with two short arms 162 extending in opposite directions from its pivotal connection. A rod 164 extends between the hinge pin 166 of the lower hinge assembly and one of the arms 162 and is pivotally connected to each of these elements. A similar rod 168 extends between the hinge pin 170 of the upper hinge assembly and the other arm 162 and is pivotally connected to these elements. In full line position of the handle in Fig. 19 the hinge pins 166 and 170 are in their sash locking positions. When the handle is rotated to its dotted position in Fig. 19, the two arms 162 are swung out of their vertical position and draw the rods 164 and 168 toward the handle. By virtue of their pivotal connection to the hinge pins, this movement simultaneously retracts the pins from locking engagement in the apertures of the top and bottom metal strips 152.

As a result of this invention there is provided a double casement window structure either of wood or metal which provides an insulated dead air space between the outer and inner pairs of sashes and effectively prevents the transmission of heat, dust and moisture from one side to the other side of the opening in which the structure is located. The feature of providing the all-around weather strips or seals, such as 86 and 141, for both the inner and outer pairs of sashes, and of also providing weather strips or seals 88 and 106 for the hinged edges of the sashes, assures a double air and moisture seal for all the abutting edges of the sashes when they are moved to closed position. These weather strips or seals are engaged by and compressed by the sashes in their final closing movements. The toggle joint action of the hinge assemblies assists in the compressing action of the sashes against the yieldable weather strips. In addition, the feature of bodily shifting the sashes in the window frame as provided by the lift 142 provides a positive tightly engaged seal between the sashes and the weather strips such as the cords 141 previously mentioned and the outside weather strip 136.

The free corners of each pair of sashes are guided for slidable and pivotal movement in inner and outer sets of opposed tracks carried by the window frame. The improved means accomplishing this purpose includes the guiding blocks or caster members 40 and 122 having ball retaining recesses which open not only toward the bases of the channel-shaped tracks but also laterally toward the opposite sides of the channels of the tracks. By virtue of their novel relation to the caster blocks, the balls in the recesses not only have peripheral portions projecting beyond the bottom sides of the members for engagement with the bases of the channel-shaped tracks but also project laterally for engagement with the sides of the channels of the tracks. In the modification of the invention in Figure 8, each ball 44 projects from three sides of the caster members 40, while in the modification of Figure 16 each ball 124 projects from two sides of the caster members 122. By this provision, the caster members are assured of frictionless engagement with the base and the opposite sides of the track channel in which they are disposed, and as a result the sashes are capable of movement under light pressure and without the possibility of binding.

For both types of casement window structures illustrated herein, the novel hinge assemblies for the adjacent edges of each pair of sashes provides not only swinging movement of the hinged edges laterally away from the plane of the window frame but also serves to releasably lock the sashes in closed position. The dual function of these hinge assemblies economizes in the manufacturing and installation costs.

The pivotal connections between the guiding caster members and the free corners of each pair of sashes, such as the pins 86 and 128, are so disposed in novel relation to the sashes and the window frame that in the closed position of the sashes, the pins are inaccessible, thereby rendering them tamper-proof. Only when the sashes are opened is it possible to gain access to the pins if it is desired to remove the sashes for any rea-

son. If such is the case all four pins for each pair of sashes may be readily removed from the room side of the structure.

When it is desired to clean or wash the window panes and sashes, both the outer and inner sides of each pair of sashes are readily available from the inside of the room. To accomplish this, the sashes may be moved from side to side so that the washing or cleaning may be done without the use of extended hinges. The screens being between the inner and outer pair of sashes are protected from rust, storms and dirt. The screens may be left installed in the window frame during all seasons or if desired may be removed by retracting the pins of the screen hinges 35. Either in place of the screens, or alongside thereof, Venetian type blinds may be used. Preferably window shades are carried individually by the inner pair of sashes. Window curtains and drapes are preferably hung from inwardly swingable supports so as not to interfere with the opening of the inner sashes. For cottages and the like which are not inhabited for long periods of time the screens may be replaced by galvanized metal sheets to more effectively prevent unauthorized ingress or breakage of the window panes of the inner sashes.

What I claim is:

1. A casement window structure comprising, in combination, a window frame having an outer set of opposed tracks and an inner set of opposed tracks extending in spaced parallel relationship to one another, a pair of sashes for the outer set of tracks having their adjacent edges hinged together and being outwardly swingable relative to the plane of the frame, a similar pair of sashes for the inner set of tracks having their adjacent edges hinged together and being inwardly swingable relative to the plane of the frame, means slidably and pivotally guiding the corners of each pair of sashes in their associated set of tracks, said pairs of sashes in closed position occupying spaced apart parallel, planes in the window frame and forming a dead air space therebetween, yielding sealing means for each pair of sashes extending along the top, bottom and the sides of the window frame and being compressibly engaged by the sashes when the sashes are moved to closed position, and yielding sealing means carried by one sash of each pair of sashes along the hinged edge thereof being compressibly engaged by the hinged edge of the other sash when the sashes are moved to closed position.

2. A casement window structure comprising, in combination, a window frame having an outer set of opposed tracks and an inner set of opposed tracks extending in spaced parallel relation to one another, a pair of window sashes for the outer set of tracks combining to close the opening of the frame, a pair of window sashes for the inner set of tracks combining to close the opening of the frame, a hinge assembly including a hinge pin swingably connecting the adjacent edges of each of said pair of sashes and providing swinging movement of the sashes away from their respective sides of the plane of the window frame, means slidably and pivotally guiding the free corners of each pair of sashes in their associated set of tracks, yieldable weather stripping for each pair of sashes extending completely around the window frame and being compressibly engaged by the sashes when the latter are moved to closed position, yieldable weather stripping carried by and interposed between the interhinged edges of each pair of sashes and being compressed between these edges when the sashes are moved to closed position, said weather strippings in the closed positions of both pairs of sashes forming an insulated dead air space therebetween, said window frame provided with pin receiving recesses aligning with the hinge axes of the two pairs of sashes in their respective closed positions in the window frame, and means providing axial movement of the hinge pins of said hinge assemblies and projecting the hinge pins into said recesses to lock the sashes in closed position in compressing engagement with said weather strippings.

3. A casement window structure comprising, in combination, a window frame having an outer set of tracks extending along the top and bottom of the window and an inner set of tracks similarly extending along the top and bottom of the window frame in spaced parallel relation to the outer set of tracks, a pair of window sashes for the outer set of tracks combining to close the opening of the frame, a pair of window sashes for the inner set of tracks likewise combining to close the window opening, a hinge assembly including a hinge pin swingably connecting the adjacent edges of each pair of sashes and providing swinging movement away from opposite sides of the plane of the window frame, means slidably and pivotally guiding the free corners of each pair of sashes in their associated set of tracks, a filler member extending along the top and bottom of the window frame between the outer and inner sets of tracks and projecting into the frame opening beyond the tracks, at least one of said filler members provided with recesses in line with the hinge pins of said hinge assemblies, and means providing axial movement of said hinge pins from a retracted position within their respective hinge assemblies to a projected position engageable in the associated recesses of said filler members to releasably lock the pair of sashes with which they are associated in the window frame.

4. A casement window structure comprising, in combination, a window frame having on each of two opposite sides thereof an outer sash guiding track and an inner sash guiding track extending parallel to one another and running the full length of the side of the window frame, a pair of sashes for said outer set of tracks having their adjacent edges hinged together and being outwardly swingable relative to the plane of the window frame, a similar pair of sashes for said inner set of tracks having their adjacent edges hinged together and being inwardly swingable relative to the plane of the window frame, means slidably and pivotally guiding the outside corners of each pair of sashes in their respective tracks including caster members slidable in the tracks and movable from one end to the other end thereof and hinges connected to the respective caster members and to the associated corners and providing simultaneous slidable and pivotal movement of the corners as the pairs of sashes of which the corners form a part are swung outwardly and inwardly relative to the plane of the window frame, said sashes in closed position occupying slightly spaced apart parallel planes in the window frame and forming together a dead air space therebetween, the track guiding means for the outer pair of sashes being located on the dead air space side thereof, rendering the same inaccessible from the outside of the window structure.

5. In a casement window structure, a frame

member having an outer sash guiding track and an inner sash guiding track extending in spaced parallel relationship to one another and running the full length of the frame member, a filler member secured to the frame member between the tracks and projecting inwardly of the window opening beyond the tracks, said filler member extending the full length of the frame member and at each opposite side of the frame providing the inner guiding walls of the tracks, a pair of sashes for the outer track having their adjacent edges hinged together and a pair of sashes for the inner track having their adjacent edges hinged together, and means slidably and pivotally guiding the opposite remote corners of each pair of sashes in their respective tracks and providing movement of the hinged edges thereof laterally in the plane of the window, each of said corner guiding means including a rotatable ball shaped element engageable with both the track and the wall formed by the adjacent side of the filler member.

6. A casement window structure comprising, in combination, a window frame, a pair of sashes combining to close the opening of the window frame, a hinge assembly including a hinge pin swingably connecting the adjacent edges of the sashes together, means slidably and pivotally guiding the outer corners of the pair of hinged sashes in the window frame as the sashes are swung with respect to one another about the hinge pin of said hinge assembly, said frame provided with a pin receiving recess aligning with the hinge axis when the pair of sashes assume a closed position in the opening of the window frame, and means mounting said hinge pin for axially bodily shiftable movement to a position projecting one end of the pin beyond the sashes, said hinge pin adapted in the closed position of the sashes to be axially shifted to project said end of the pin into interlocking engagement with said recess.

7. A casement window structure comprising, in combination, a window frame, a pair of sashes combining to close the opening of the window frame, a pair of spaced hinge assemblies swingably connecting the adjacent edges of the sashes together, means slidably and pivotally mounting the outer remote corners of the pair of sashes in the window frame as the hinged edges of the sashes are swung relative to one another and to the plane of the window frame, said window frame provided with a pair of oppositely disposed pin receiving recesses aligning with the hinge axis in the closed position of the sashes, each hinge assembly including an axially movable hinge pin adapted in the closed position of the sashes to be projected beyond the sashes into interlocking engagement with the nearest recess in the window frame, and manual control means carried by said sashes between said hinge assemblies and operatively coupled by linkage to the hinge pins thereof for simultaneously projecting the hinge pins into said recesses and for simultaneously retracting the hinge pins therefrom.

8. In a casement window structure, a window frame having an opposed set of inwardly facing channel shaped tracks, a sash, means slidably and pivotally guiding two adjacent corners of the sash in said tracks, said means including a member pivotally connected to each of said corners of the sash and received within the channel of the track for travel therealong, each of said members provided with one or more ball receiving recesses opening toward the base of the channel and opening laterally toward one side of the channel, and a ball carried in each of said one or more recesses having a diameter greater than the dimension of the recess such that peripheral portions of the ball project beyond the openings of the recess for engagement both with the base of the channel and with said side of the channel of the track.

9. In a casement window structure, a window frame having an opposed set of inwardly facing channel shaped tracks, a sash for the window frame, means for slidably and pivotally guiding two of the adjacent corners of the sash in said opposed tracks, said means including a member pivotally connected to each of said corners of the sash and received within the track for travel therealong, each of said members provided with one or more ball receiving recesses opening out toward the base of the channel and opening out laterally toward the opposite sides of the channel of the track, and a ball carried in each of said recesses having a diameter greater than the dimension of the recess such that peripheral portions of the ball project beyond said openings of the recess for engagement with the base of the channel of the track in which the member is disposed and with the opposite sides of the channel of the track.

10. A casement window structure comprising, in combination, a window frame having on each of two opposite sides thereof an outer sash guiding track and an inner sash guiding track extending in spaced parallel relationship to one another and running the full length of the side of the window frame, a pair of sashes for said outer tracks having their adjacent edges hinged together and outwardly swingable with respect to the plane of the window frame, a similar pair of sashes for said inner tracks having their adjacent edges hinged together and inwardly swingable with respect to the plane of the window frame, means slidably and pivotally guiding the outer corners of each pair of hinged sashes in the tracks with which it is associated and providing travel of each outside corner substantially the full length of the track in which it is guided, yielding sealing means extending along the top, bottom and the sides of the window frame and compressibly engageable by the sashes when the sashes are swung to closed position in the window frame, and yielding sealing means carried by at least one of each pair of window sashes along the hinged edge thereof, said means being compressibly engageable with the adjacent edge of the other sash when the pair of sashes are swung to closed position in the window frame, said sashes, in closed position occupying slightly spaced apart parallel planes in the window frame and cooperating with the sealing means to form an insulated dead air space therebetween.

11. A casement window structure comprising, in combination, a window frame having an outer set of opposed tracks and an inner set of opposed tracks extending in spaced parallel relationship to one another, a pair of sashes for the outer set of tracks having their adjacent edges hinged together and being outwardly swingable relative to the plane of the frame, a similar pair of sashes for the inner set of tracks having their adjacent edges hinged together and being inwardly swingable relative to the plane of the frame, means slidably and pivotally guiding the corners of each pair of sashes in their associated set of tracks, said pairs of sashes, in closed position, occupying spaced apart parallel planes in the window frame and forming a dead air space therebetween, yield-

ing sealing means for each pair of sashes extending along the top, bottom and sides of the window frame and being compressibly engaged by the sashes when the sashes are moved to closed position, yielding sealing means carried by one sash of each pair of sashes along the hinged edge thereof adapted to be compressibly engaged by the hinged edge of the other sash when the sashes are moved to closed position, a screen for the opening of the window frame, and means mounting the screen in the window frame and between said inner and outer sets of opposed tracks.

12. In a casement window structure, a window frame having a pair of opposed inwardly facing channel shaped tracks, a sash, means slidably and pivotally guiding two adjacent corners of the sash in said opposed tracks, said means including a caster member pivotally connected to each of said corners of the sash and received within the channel of the adjacent track for travel therealong, said caster members each carrying at least one ball, and peripheral portions of said balls projecting beyond the caster members for engagement with the base and at least one side of the channel of the track.

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