April 8, 1958 F. M. O'BRIEN, JR 2,829,744

AWNING WINDOW STRUCTURE

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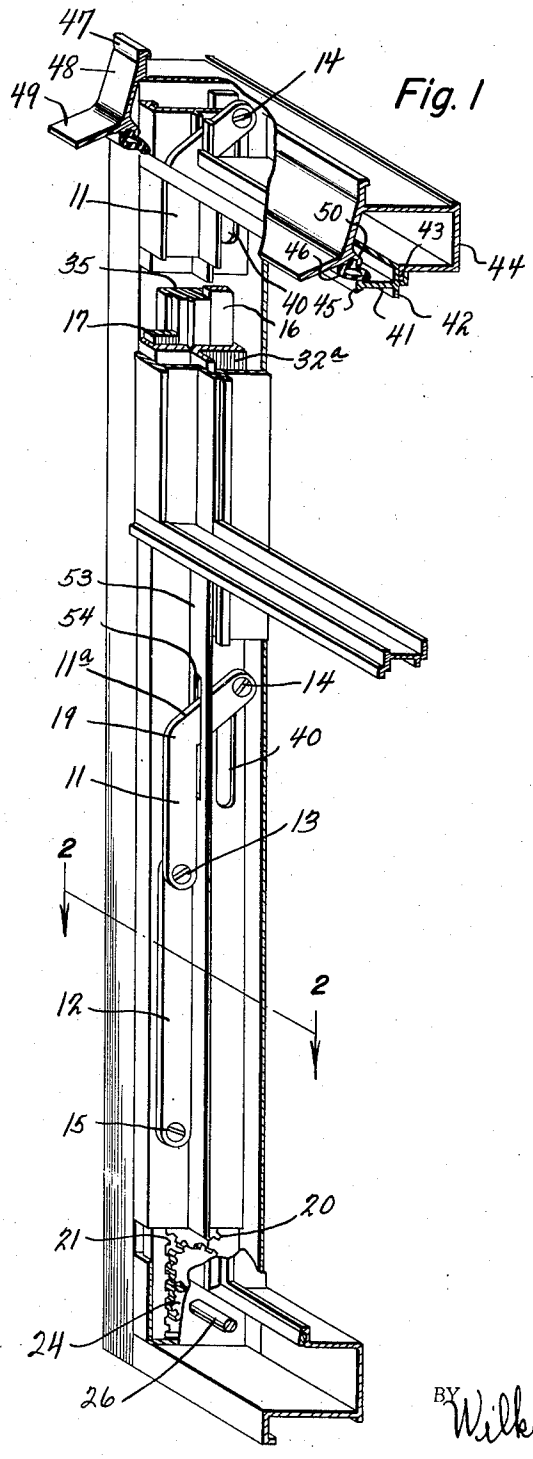
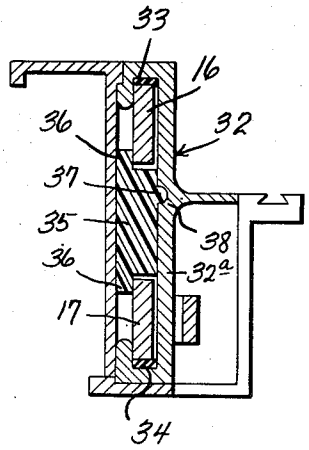


Fig. 1

Fig. 2



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AWNING WINDOW STRUCTURE

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Fig. 3

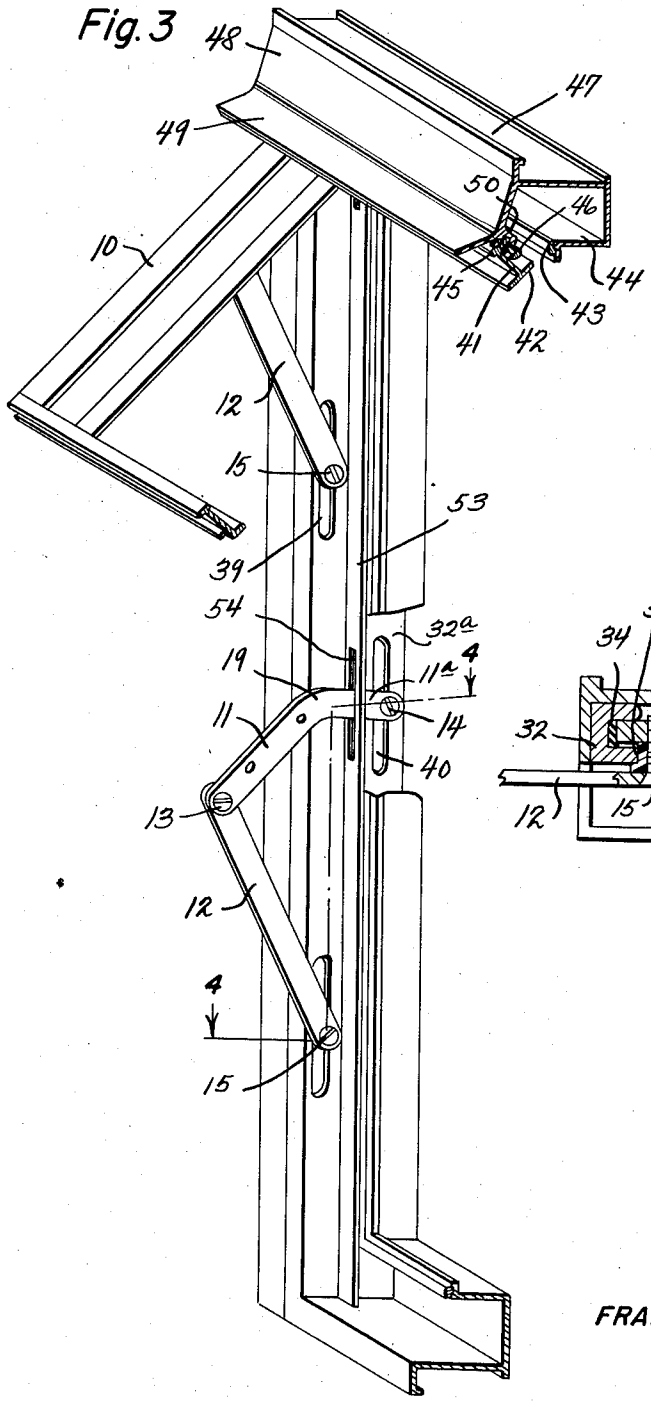
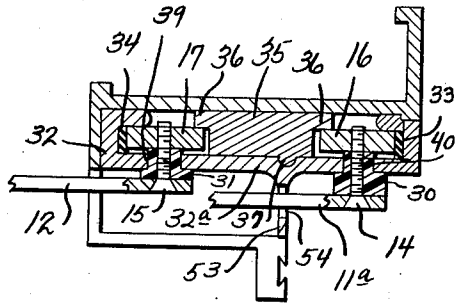


Fig. 4



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AWNING WINDOW STRUCTURE

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Fig. 5

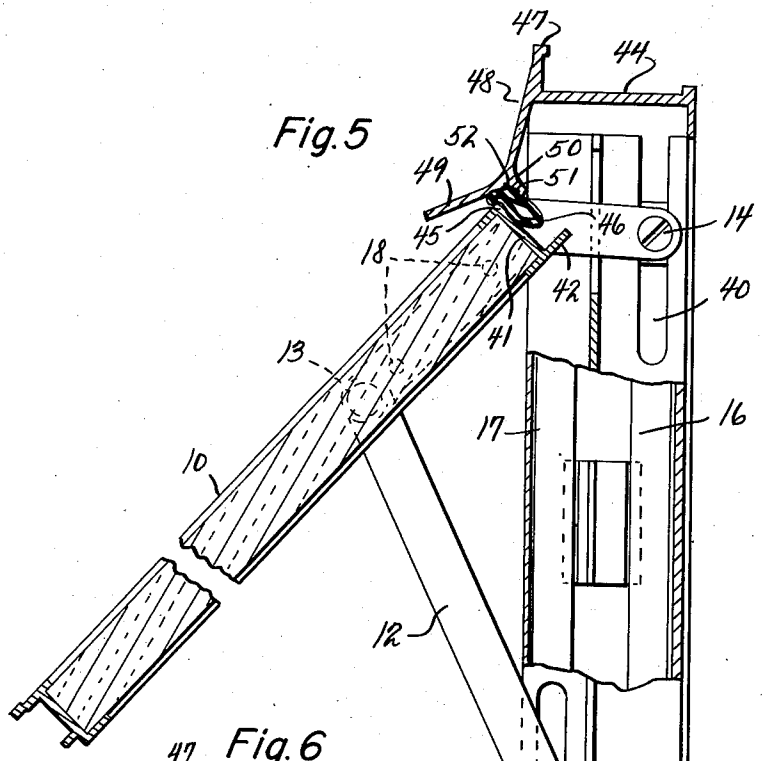
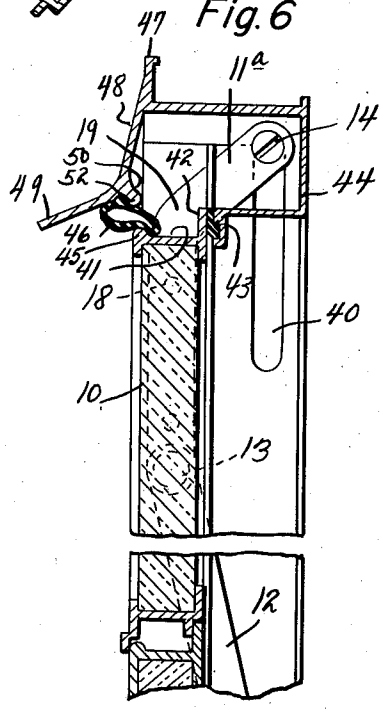


Fig. 6



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AWNING WINDOW STRUCTURE

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Fig. 5A

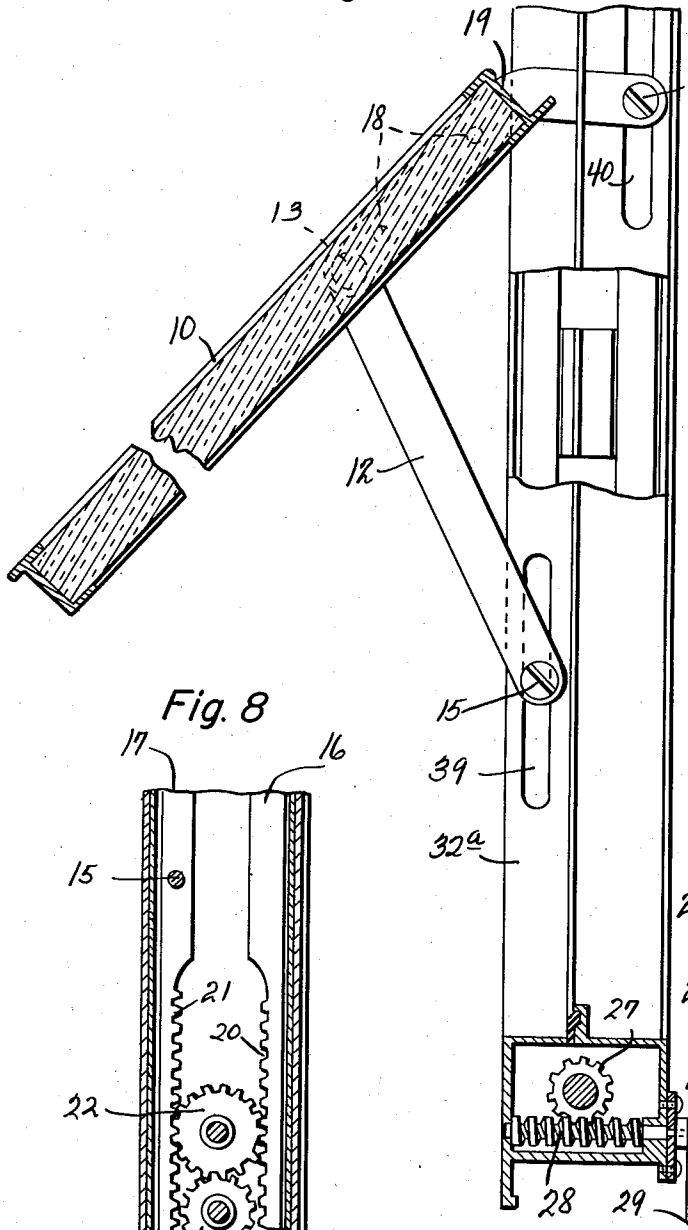


Fig. 7

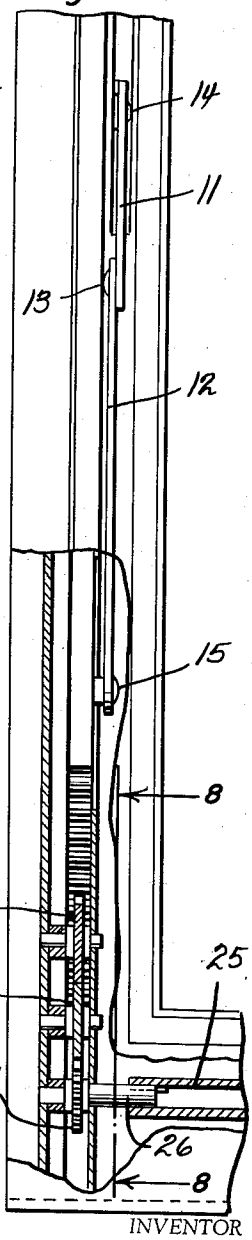


Fig. 8

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AWNING WINDOW STRUCTURE

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Fig. 9

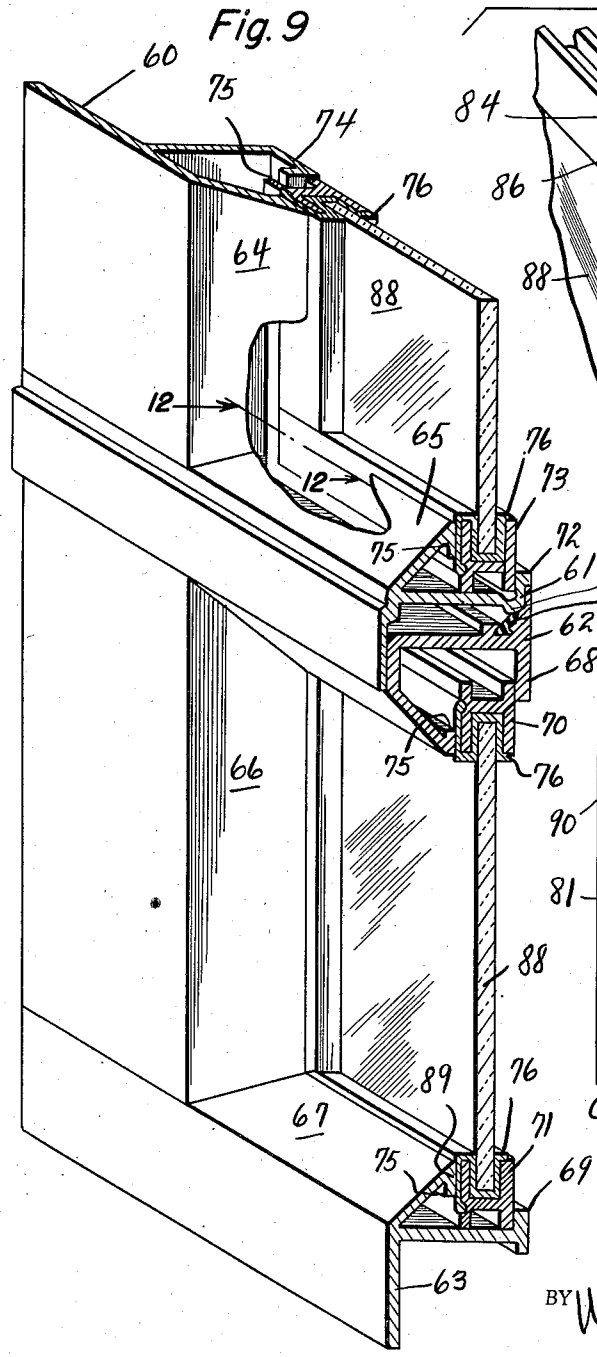


Fig. 10

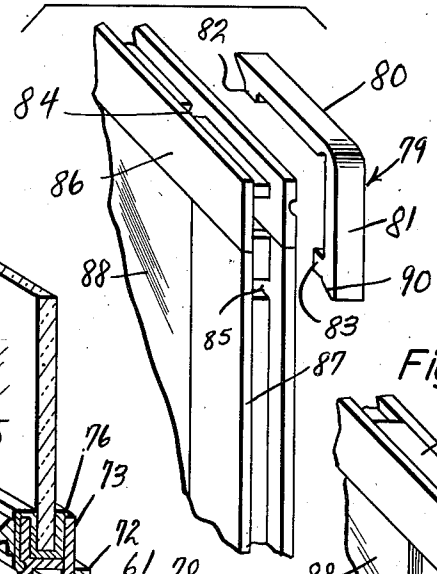


Fig. 11

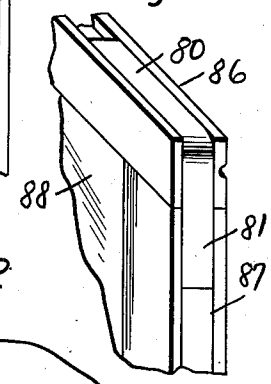
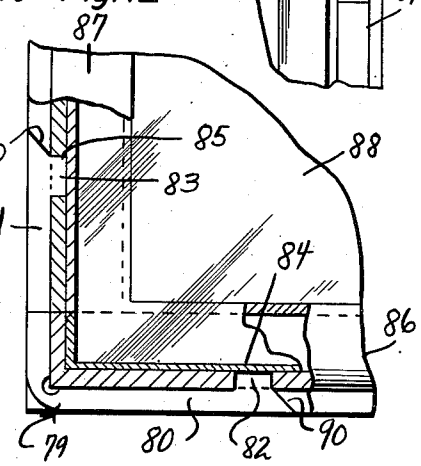


Fig. 12



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United States Patent Office 2,829,744 Patented Apr. 8, 1958

2,829,744

AWNING WINDOW STRUCTURE

Frank M. O'Brien, Jr., Miami, Fla.

Application April 19, 1954, Serial No. 423,962

5 Claims. (Cl. 189—67)

The present invention relates to awning window structure and has for an object a combined sash hanger and sash operator which eliminates the objectionable dropping of the top of the sash in its opening and closing movements thus maintaining the sash top portion in contact, in all positions, with the weatherstripped drip cap.

Another object of the invention is to provide a sash operating mechanism which in relation to the sash hanger affords a double motion multiplying the mechanical effort applied by the operator to reduce the time factor in opening and closing the sash, making for greater ease of operating and requiring a minimum number of revolutions of a crank handle to open and close the window while increasing the angle of sash opening.

A further object of the invention is to dispense with metal to metal friction in that all adjacent moving parts are shielded by non-metal (for example plastic or fiber) channels or bushings, thus eliminating galling of metal to metal contact, silencing the movement and extending the life of the mechanism.

A still further object of the invention is to provide an operating mechanism for the sash that can be removed from the window frame without taking the frame out of the building opening which is of advantage in case of required repair.

A still further object of the invention is to add greatly to the appearance of awning windows by so constructing the frame in relation to the working parts that all mechanism is completely concealed which further serves to keep out dirt, trash and other foreign matter as this is a problem in existing forms of awning windows.

A still further object of the invention is to floatingly mount the sash with no fixed points making for easy and quick operating under all conditions through a wide arc of movement with no lubrication required.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views:

Figure 1 is a fragmentary isometric view of an awning window constructed in accordance with the present invention and shown in closed position.

Figure 2 is a horizontal sectional view taken on an enlarged scale on the line 2—2 of Figure 1.

Figure 3 is a fragmentary isometric view showing the partially open position of the parts.

Figure 4 is a horizontal sectional view taken on an enlarged scale on the line 4—4 on Figures 3.

Figure 5 is a fragmentary vertical sectional view taken on an enlarged scale through the upper portion of the window frame showing the uppermost sash in partly opened position.

Figure 5A is a similar view of the lower portion of the window frame showing the lowermost sash in partly open position and also showing a form of sash operating mechanism.

Figure 6 is a fragmentary vertical sectional view of the window frame showing the position assumed by the uppermost sash when closed and interlocked with the next lower sash.

Figure 7 is a fragmentary front elevational view of a window frame with parts broken away and parts shown in section to reveal a form of sash operating mechanism.

Figure 8 is a vertical sectional view taken on the line 8—8 in Figure 7.

Figure 9 is a fragmentary perspective view with parts shown in section showing a modified form of the sash part of the window.

Figure 10 is also a fragmentary perspective view in exploded form showing a clip for joining the sides of the inner sash frame.

Figure 11 is a similar view showing the attached position of the clip, and

Figure 12 is a vertical sectional view taken on the line 12—12 in Figure 9.

Referring more particularly to the drawings in which one side only of the window frame and operating mechanism is shown, it being understood that the parts shown are duplicated on the opposite side of the frame, and it being further understood that any number of sash members may be mounted in the frame, **10** designates the sash members and **11** and **12** combined hanger and operating links which are pivoted together at **13** at their meeting ends and at **14** and **15** at their outer ends respectively to oppositely moving bars **16** and **17**.

The upper links **11** are secured by fastenings **18** to upper portions of the side rails of the sash members **10**, and such upper links **11** are angled at **19** where they extend inwardly of the window off the upper end portion of the sash **10**. The angle or elbow **19** is an obtuse angle. The two links **11** and **12** constitute in mechanical effect a toggle lever. In the closed position of the sash **10** the links **11** and **12** are disposed in substantial vertical alinement except for the angled end **11a** of the upper link **11** which projects diagonally upwards and inwardly to the pivot **14**.

The bars are arranged by suitable mechanism to move simultaneously but in relatively opposite directions. When the inner bar **16** is moving downwardly the outer bar **17** will move upwardly, and when the inner bar **16** moves upwardly the outer bar **17** will be driven downwardly. A form of device for achieving this result appears in Figures 5A, 7 and 8, in which toothed racks **20** and **21** are formed on or attached to lower portions of the bars **16** and **17** in relation to mesh with diametrically opposite sides of a pinion or spur gear **22**. The driven pinion **22** is in mesh with an idler pinion **23** which in turn meshes with a drive pinion **24**.

A torque tube or drive shaft **25** extends horizontally across the window frame in the lower sill and is fast with the stub shafts **26** of the drive pinions **24** on opposite sides of the frame, such shaft **25** having a worm wheel **27** fast on the intermediate portion which is in mesh with a worm **28** driven by a hand crank **29**.

As appears more particularly in Figure 4, non-metallic, for example plastic or fiber, tubular bushings **30** and **31** surround the pivot pins **14** and **15** and insulate the metal links from contact with the metal bars **16** and **17** and from adjacent portions of the channel frame in which the bars **16** and **17** are mounted.

Referring more particularly to Figures 2 and 4, to reduce friction the two bars **16** and **17** are mounted to ride up and down in a channel frame **32** having full length non-metallic (preferably plastic) insert strips **33** and **34**, one on each side between the channel frame and outer edge of the associated bars **16**, **17**. A plastic or other non-metallic block **35** is mounted in the channel frame **32** between the bars **16**, **17** with flanges **36** to lap the

sides of the bars on the open side of the channel frame **32**. A bead **37** and groove **38** between the channel frame and block **35** will serve to orient the block **35** so that it may be centered and not unduly crowd one or the other of the bars **16**, **17**. Inturned flanges on the channel frame **32** lap the insert strips **33**—**34** and portions of the reciprocating bars **16**, **17**.

As shown in Figure 4 the pivots **14** and **15** and the shanks of the bushings **30**, **31** move up and down in vertically-elongated slots **39**, **40** of the side closed wall **32a** of the channel frame **32**. The heads of the bushings **30**, **31** overlap the outside surface of wall **32a** and abut the links **11a** and **12** respectively. The inner ends of the bushing shanks project beyond the inside surface of the wall **32a** to space the bars **16**, **17** from the wall **32a**.

The top rail **41** of the top sash **10** has a deep inner upstanding flange **42** adapted in the closed position (Figure 1 and 6) to seat against weatherstripping **43** held by an adjacent part of the casement **44** or top sill of the channel frame, while a shallow bead **45** upstanding from the top rail **41** has permanent contact in all positions of the sash **10** with a weatherstrip **46** on the drip cap **47**.

Such drip cap is carried by the top sill **44** and may be generally composed of a substantially vertical wall **48** and an outwardly and downwardly disposed watershed wall **49**. At the juncture of walls **48**, **49** and at the inner obtuse angle side is a reinforcing strip **50**, preferably integral with the walls **48**, **49**, and having a dovetail or other form of groove **51** to receive the similarly-formed attaching bead **52** of weatherstrip **46** which is preferably in the cross-sectionally hollow circular form illustrated to present to the top rail **41** and its rounded bead **45** a deformable, elastic, rolling body dependent from the strip **50** which overlies the same and affords a rigid backing against which the body may be collapsed in part as the top rail **41** and its bead **45** move beneath the same. The weight of the dependent body **46** will cause the weatherstrip to gravitionally rest with its weight on the top rail **41** and bead **45** so as to preserve water-tight contact between the same in all angular positions of the sash **10**, while the enclosed elastic body of air in the hollow weatherstrip **46** will tend to inflate the weatherstrip to a round cross-sectional condition expanding the lower portion thereof against the top rail **41** and bead **45** in liquid-tight contact. The rounded form of the weatherstrip **46** will enable it to roll on the top rail **41** and bead **45** from the position of Figure 6 to that of Figure 5. The weatherstrip **46** is shown to be readily deformable. When collapsed on one side the entrapped air will be compressed at the other side, balooning the weatherstrip out to fold about the rounded bead **45** to increase the surface area of sealing contact. The weatherstrip **46** is resiliently expansible due both to the rubber or other resilient and flexible character of the tube wall and to the elastic characteristic of the encompassed body of air or other gas within. The weatherstrip **46** thus tends to expand against the top rail **41** and its bead **45** in which function it reacts not only against the strip **50** but also against the watershed wall **49** at the angle subtended between these two parts. When the bead **45** rides out from the closed position of Figure 6 to the open position of Figure 5 the thrust will be in the direction of the walls of this angle and thus the weatherstrip **46** will be kept up to its working surface.

In Figures 3 and 4 a reinforcing web **53** projecting inwardly of the window opening is slotted at **54** to accommodate the link end **11a** and its motion which is one of translation with the bar **16** and of rotation about the axis **14**. In the same way the lower link **12** of the pair has a movement of translation or a bodily movement accompanying the bar **17** with which it is entrained and an angular movement about the pivot point **15**.

In operation, as the handle **29** of the center sill operator is turned to the right, power is transmitted through the torque tube or rod **25** to the pinions **24**, and through idlers **23** to the driven pinions **22**, supplying power to pull rack **20** down and push rack **21** upwardly. The bars **16**, **17** being correspondingly moved open the sash by moving pivots **14**, **15** together. By rotating the handle **29** in the opposite direction the pivots **14**, **15** are shifted apart thus closing the sash. Incident to the movement in either direction the pivots **14**, **15** rotate in the plastic or non-metallic bushings.

The bars **16**, **17** ride up and down in the channel frame **32** between the plastic or non-metallic center block **35** and the plastic or non-metallic insert strips **33**, **34**. The plastic block **35** acts as a guide, bearing surface and keeper. The channel frame **32** acts as a guide, bearing, shield and cover, and also as a gear box. The entire unit mounted in the channel frame **32** will snap into a window casement or frame of suitable design.

This mechanism, with the sash floating (i. e. no fixed points whatever) makes for easy operation under all conditions with no lubrication required.

Windows of this type heretofore have employed drop hinges, permitting the top of the sash to drop down in the open position to a point where water may enter. By the invention the top rail of the sash is completely sealed in the fully open position and in all other positions. The sashes may be completely weatherstripped when closed, thus sealing the same on all four sides. This is of particular advantage in cold climates where storm windows must be used.

In Figure 6, the sash is shown in fully closed position where the inner flange **42** fits tightly against the weatherstrip **43** and the bead **45** is at its innermost point engaging the inner portion of the rolling weatherstrip **46**. As the sash opens the pivot **14** descends tending to lower the top rail **41** but as the lower pivot **15** raises the outer end of diagonal link arm **11a** will elevate causing the bead **45** to move outwardly without substantial dropping. The bead rotates beneath the flexible weatherstrip **46** and approaches the crotch or angle between the drip cap walls **48**, **49** so that the gap between drip cap and sash is diminished to a small value and the weatherstrip **46** compressed commensurately. The bead **45** has closed the gap at a point well above the lower end of watershed wall **49** and substantially within the same.

It is to be noted that the plastic guide block **35**, one of which will be installed for each sash **10** in each channel frame **32**, remains stationary while the bars **16**, **17** move up and down. This equal and opposite motion causes the top rail of the sash to move outward and upward through 43° or more of the window opening and inward and downward to the full open position. At the full open position, the top rail of the sash will be in approximately the same position as when closed. The weatherstripped drip cap is designed to hold the weatherstripping in such a position that the top rail of the sash will always be in contact with the weatherstripping.

Referring more particularly to Figures 9–12, inclusive, Fig. 9 shows a typical vent installation.

The sash rails **60**, **61**, **62** and **63** are designed to have the external glazing beads **64**, **65**, **66** and **67** as integral parts of the extrusion. The top rail **62** and the bottom rail **63** of the lower sash also have return flanges **68** and **69** to accommodate and lock the inner sash frame assemblies **70** and **71**. The upper rail of the upper sash is not shown but the lower rail **61** is provided with a return flange **72** to accommodate and lock the inner sash frame assembly **73**. These return flanges **68**, **69**, **72** and the return flange **74** of the side rail **60** also seat against the weatherstripping **43** located in the main frame as stated in the previous description and shown more particularly in Figures 1 and 6.

The sash rails **60**, **61**, **62** and **63** also have return flanges **75** from the 45° external beads **64**, **65**, **66** and **67** against which the weatherstripping **76**, placed in the inner sash frame **70**, **73**, seats. In the closed position

of the sashes, as shown in Figure 9, the weatherstripping **77** on the upper sash rail **62** contacts the bead **78** of the lower sash rail **61**.

The weatherstripping **77** is flexible or resilient, for instance rubber, and is deformed in the position of Figure 9, being forced rearwardly by the bead **78** in the closed position. In this distorted position the inherent resiliency of the weatherstripping **77** tends to upright such weatherstripping with the result that a tight joint is formed resulting in an excellent weather seal.

Referring more particularly to Figures 10, 11 and 12, these figures show a method of joining the sides of the inner sash frames **70**, **73** by the use of a clip **79** advantageously made from extruded aluminum. The clip **79** comprises angularly disposed arms **80** and **81** having lugs **82** and **83** positioned to snap into holes or sockets **84** and **85** in the respective sash frame rails **86** and **87**, forming solid tight corners.

In actual practice the complete window will be assembled and shipped with the required number of inner sash frames rails **86**, **87** and clips **79**, not assembled. After the window has been installed, the inner sash frame rails **86**, **87** are placed around glass cut to size and the clips **79** pressed in place, the weatherstripping **76** filling the spaces between glass and rails. The entire inner sash frame assembly **70**, **73** is then inserted in the top sash rail **62** between the return flange **68** and the return flange **75** by an upward motion and locked in position by a downward motion, placing the inner sash frame assembly **70** behind the return flange **69** of the bottom sash rail **63**. The upward motion referred to will be sufficient to clear the inner sash frame assembly **71** over the return flange **69** after which the sash frame is lowered so that the assembly **71** finally seats behind the return flange **69** and forwardly of the return flange **75**, shown at the lower portion of Figure 9.

This method of construction makes the inner sash frame completely removable for cleaning or replacement and eliminates puttying which is expensive and untidy. The weatherstripping **76** is substantially U-shaped about the edges of the glass **88** but has an additional outlying section **89** fitting against the return flanges **75** to maintain the window frames in place in the upper and lower rails and to provide sealing against moisture. For replacing glass, the inner sash frame is removed by an upward motion to clear the flange **69** and then an inward and downward motion to withdraw the upper inner frame portion **70** from beneath the return flanges **68**, **75**. A screw driver may be inserted under one or the other tapered tips **90** of the clips **79**, snapping the clips out of the retaining sockets **84**, **85**. The sash frame rails **86**, **87** are then removed from the glass and these rails are assembled about new glass **88**. In other words, the glass is then easily replaced, the clips **79** reinstalled and the inner sash frame replaced in the upper and lower rails **62**, **63**.

The weatherstripping **76**, **89** and **77** in combination with the weatherstripping previously described make a completely sealed window in the closed position.

Although I have disclosed herein the best form of the invention known to me at this time, I reserve the right to all such modifications and changes as may come within the scope of the following claims.

What I claim is:

1. In an awning window structure, a channel frame, bars movably mounted in the frame, a non-metallic block between the bars having parts overlapping the bars at the open side of the channel, means to center the block in the channel, non-metallic bushings abutting the sides of the bars, a sash, and links connected to the sash and pivoted through the bushings to said bars.

2. In an awning window structure, a drip cap having an internal strip and a watershed wall forming an angle with the strip, a cross-sectionally tubular resilient air-filled weatherstrip dependent from the internal strip and deformable against said strip and wall, a sash having a top rail in liquid sealing engagement with the weatherstrip movable in and out substantially horizontally.

3. In an awning window structure, a shaft in the lower transverse sill of the window, drive pinions fixed on the shaft at opposite sides of the window, idler pinions meshing with the drive pinions, driven pinions driven by said idlers, rack bars meshing with the driven pinions for movement in relatively opposite directions, toggle levers pivoted to the rack bars, and sashes fixed to the levers.

4. In an awning window structure, pairs of oppositely driven bars, toggle levers pivoted to the bars comprising upper bent hanger links and lower pitman links, a sash carried by the toggle levers, and means for driving the bars in opposite directions.

5. In an awning window structure, a frame, bars movably mounted in the frame, non-metallic strips between the frame and bars, a non-metallic block between the bars, a sash, and means including links operatively connected to the sash and bars for swinging the sash in and out incident to movement of the bars.

References Cited in the file of this patent

UNITED STATES PATENTS

2,316,442	Lootens	Apr. 13, 1943
2,451,076	Edwards	Oct. 12, 1945
2,610,371	Hite	Sept. 16, 1952
2,622,672	Thomas	Dec. 23, 1952
2,640,567	Pressnall	June 2, 1953
2,644,557	Westman	July 7, 1953
2,654,921	Blanchard	Oct. 13, 1953
2,667,950	Bancroft	Feb. 2, 1954
2,699,579	Jones	Jan. 18, 1955
2,723,732	Pettersen	Nov. 15, 1955