Nov. 14, 1950 C. G. BARROWS 2,530,218

WINDOW SHADE CONSTRUCTION

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Fig. 1.

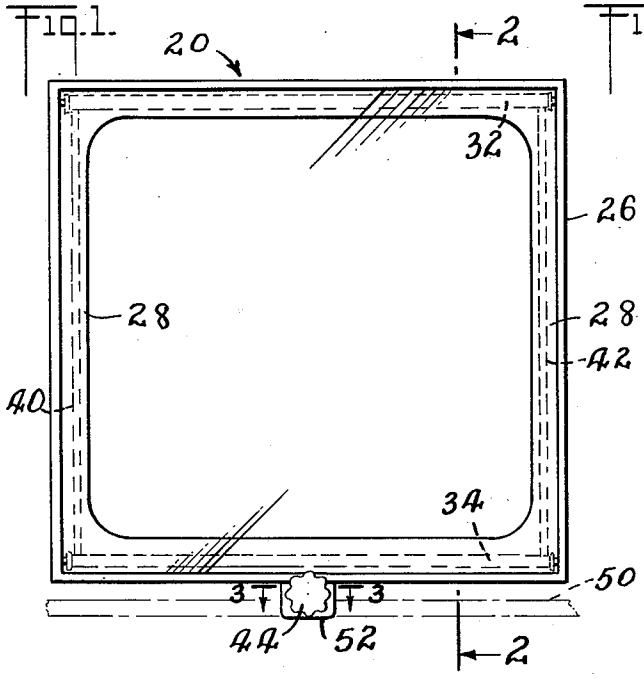


Fig. 3.

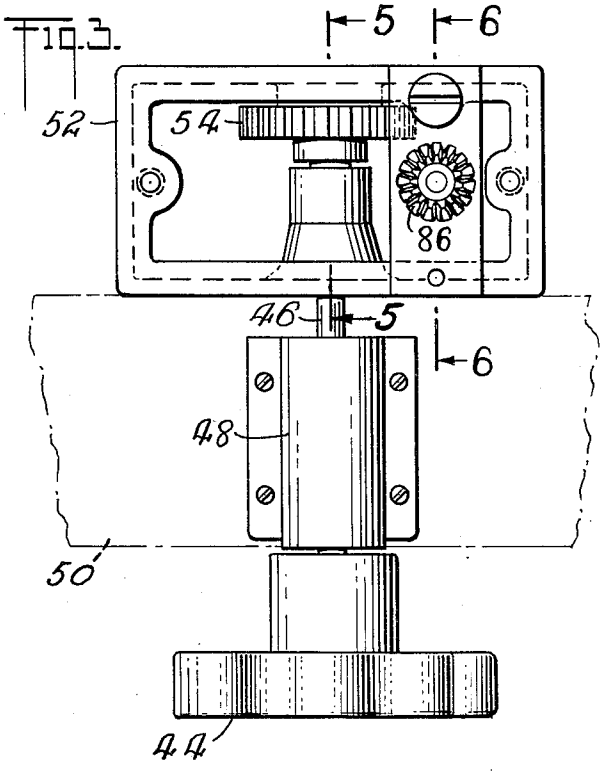
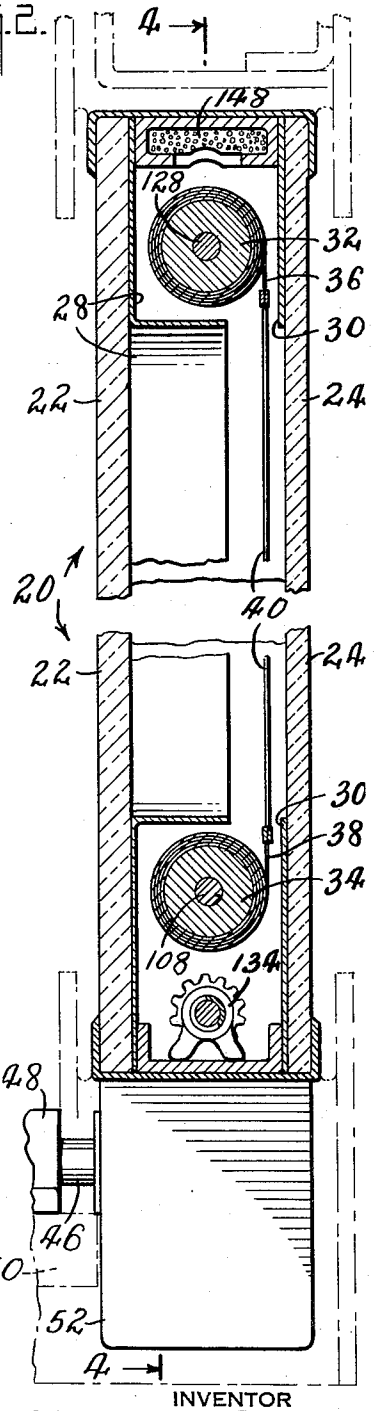


Fig. 2.



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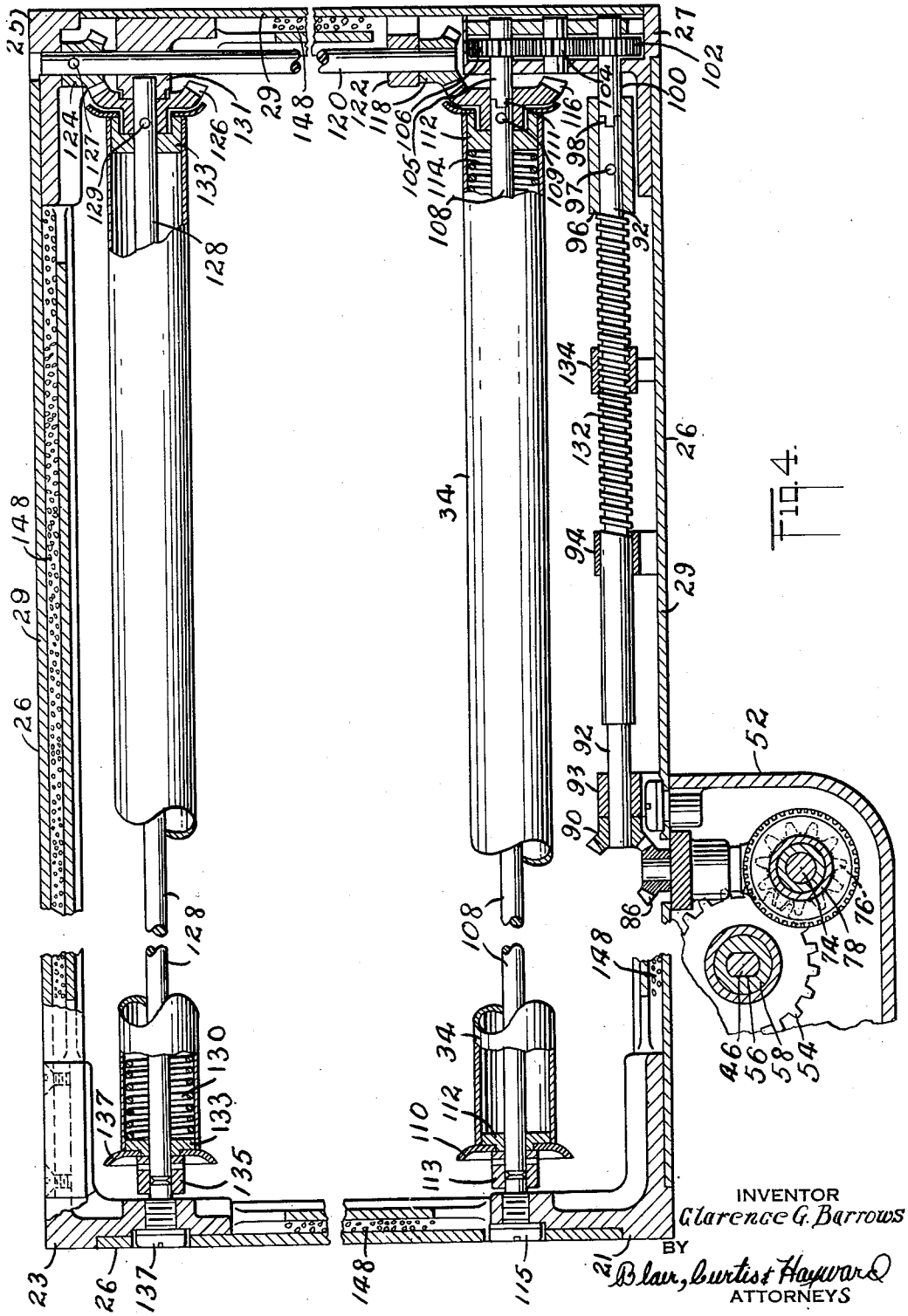


FIG. 4.

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WINDOW SHADE CONSTRUCTION

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Fig. 5.

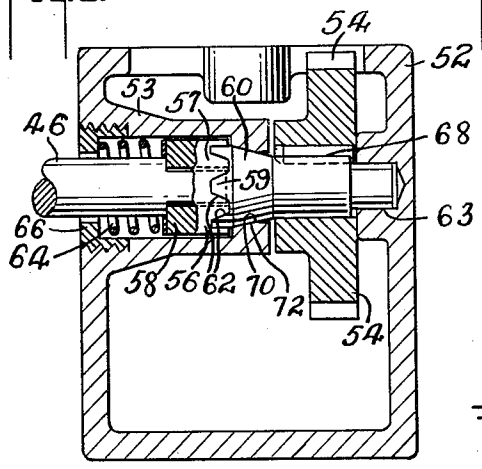


Fig. 8.

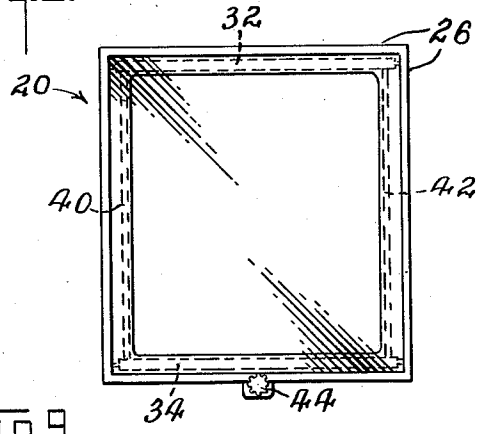


Fig. 6.

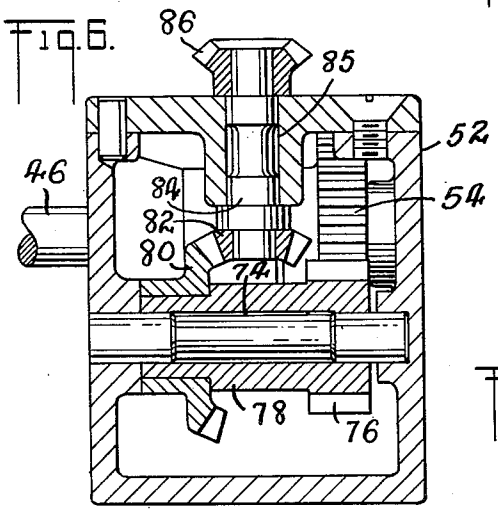


Fig. 9.

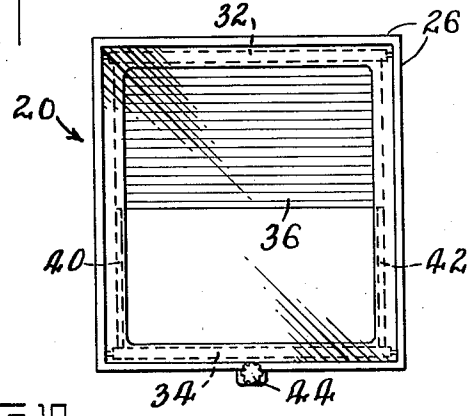


Fig. 10.

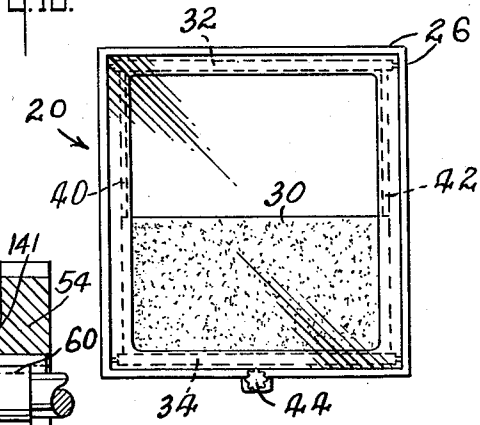
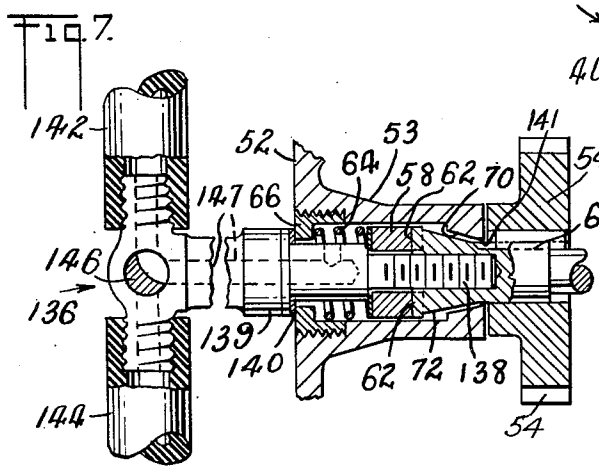


Fig. 7.



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UNITED STATES PATENT OFFICE

2,530,218

WINDOW SHADE CONSTRUCTION

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Application April 22, 1946, Serial No. 663,794

16 Claims. (Cl. 160—98)

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This invention relates to window constructions. More particularly it has to do with constructions of the double glazed hermetically sealed type wherein a shade is positioned within the enclosure between the two panes of glass and wherein means are provided for operating the shade by a handle which extends to a point of access outside the sealed enclosure. The present invention relates to the invention disclosed and claimed in my copending application Serial No. 544,721, filed July 13, 1944, Patent No. 2,461,870 issued February 15, 1949.

Various novel window constructions have been introduced into use in railway cars. Some of them have found their way into office and factory buildings, especially where air conditioning is available; some have been used in home constructions. It is now common to find a window of the double glazed type. Such windows have the advantage not only of insulating the interior from atmospheric temperature extremes existing outside but also they reduce the passage of sound through the closed window. They have as one disadvantage a tendency to become cloudy through the condensation of moisture on interior surface portions of the glass in regions where it is not possible to wipe or clean the glass.

In my application above-mentioned I proposed a window construction of the double glazed type wherein window shades are positioned within the hermetically sealed enclosure formed between the window panes. With my present invention I provide an improved window construction wherein a novel arrangement of shades is provided within the sealed enclosure. With this construction I have incorporated a shade operating mechanism such that the window shades can be readily positioned and adjusted while at the same time the interior of the window enclosure where the shades are located is maintained in an airtight condition. My construction also includes a valve which may be opened to exhaust the air within the sealed enclosure and to refill the enclosure with clean dry air. Thus, the panes may at all times be maintained clean and in a transparent condition.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts and methods of operations as will be exemplified in the structures and sequences and series of steps to be hereinafter indicated and the scope of the application of which will be set forth in the claims.

In this specification and the accompanying drawings, I have shown and described a preferred embodiment of my invention; but it is to be understood that this is not intended to be exhaustive nor limiting of the invention, but on the contrary is given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify and adapt it in various forms, each as may be best suited to the conditions of a particular use.

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In the drawings:

Figure 1 is an elevation on a relatively reduced scale of a window construction embodying the invention;

Figure 2 is a broken vertical section taken through the construction of Figure 1 along the line 2—2;

Figure 3 is a fragmentary transverse, horizontal, sectional view along the line 3—3 of Figure 1;

Figure 4 is a broken vertical section through the construction of Figure 2 along the line 4—4;

Figure 5 is a sectional view along the line 5—5 of Figure 3 rotated 90° clockwise;

Figure 6 is a sectional view along the line 6—6 of Figure 3 rotated 90° clockwise;

Figure 7 is a sectional view with parts broken away of a portion of the apparatus illustrated in Figure 5 showing another aspect of the invention;

Figure 8 is a view similar to that of Figure 1 showing a window unobstructed by any shade portion;

Figure 9 is a view similar to that of Figure 8 showing the window with the shade partially lowered from the top thereof; and,

Figure 10 is a view similar to that of Figure 8 showing the window with the shade partially raised from the bottom thereof.

Referring to Figure 1, a window unit generally indicated at 20 is formed by two panes of glass 22 and 24 (see Figure 2) rigidly mounted in a metal frame 26; the panes and the frame are sealed to form an airtight compartment or sealed enclosure. As shown best in Figure 4, frame 26 has four corner brackets 21, 23, 25 and 27 connected by top, bottom and side channel members 29. Between the panes of glass and forming a border adjacent the frame (Figure 1) are sheet metal border pieces 28 and 30. These border pieces form a channel within which is positioned the operating mechanism for the shade assembly. The shade assembly is formed by an upper roller 32 upon which is rolled an upper shade 36 (Figure 2) and a lower roller 34 upon which is rolled a lower shade 38, and at the

left and right edges of the window (see also Figure 1) are two tapes 40 and 42, respectively, which connect the free ends of the shades. Tapes 40 and 42 are of sufficient length to permit both of the shades to be rolled upon their respective rollers with the tapes extending from the top to the bottom of the window; and the tapes are hidden by border pieces 28 and 30 so that they do not obstruct the view through the window. By turning the roller clockwise (Figure 2), the tapes are wound onto the lower roller 34 and the upper shade is unwound and pulled down so as to cover the window progressively from the top downwardly. In a like manner, counter-clockwise rotation of the rollers winds the tapes onto roller 32 and unwinds the lower shade 38 and pulls it up so as to cover the window starting from the bottom and progressing upwardly.

Centrally positioned at the bottom of the window is a knob 44 which is rotated to raise and lower the shades as desired. As shown best in Figure 3, knob 44 is fixed to a control shaft 46 which is carried by a self-aligning pillow block 48 mounted on the window sill 50. The end of shaft 46 projects into a gear box 52 which is fixed to the lower surface of window frame 26. Gear box 52 is sealed around its upper rim to the lower surface of frame 26 and registering openings in the adjacent walls connect the interior of the gear box to the sealed enclosure within the frame.

Referring to Figures 4 and 5, the extreme end of shaft 46 is cut away on opposite sides to provide a spline head 56 which is snugly received in a recess in a cylindrical clutch plate 58. Clutch plate 58 is held in a cylindrical pocket 53 in casing 52 (Figure 5) and is urged to the right by a spring 64 which in turn is held in place by a spring retainer 66. The right-hand end face of clutch member 58 is provided with an annular row of clutch teeth 57 and these teeth mate with similar teeth 59 on the adjacent end of a driving spindle 60. Spring 64 urges clutch plate 58 to the right so that teeth 57 normally interengage teth 59 and a clutch drive is thereby formed. However, excessive torque on this clutch drive causes teeth 57 to ride up the sides of teeth 59 with the result that the clutch is disengaged; then spindle 60 remains stationary even though shaft 46 is turned.

Spindle 60 is positioned in a tapered hole through the bottom wall of pocket 53 and the spindle has a tapered portion which provides a frusto-conical sealing surface 70 which mates with the similarly shaped surface 72 of the tapered hole. Proper lubrication on these surfaces insures an air-tight seal at these surfaces so that a shaft-seal barrier is formed. At its right-hand end spindle 60 carries a gear 54 which is keyed to the spindle by a key 68 to provide a positive drive connection, but the key slot in spindle 60 is slightly larger than the key so that the spindle may slide axially within the gear. The extreme end of spindle 60 is supported in a bearing recess 63 in the wall of gear box 52. Thus, spindle 60 and gear 54 are rotatably mounted by the tapered surface 72 and bearing recess 63 and a positive driving connection is provided for the gear.

As pointed out above, gear box 52 forms part of the sealed enclosure of the window, and a fixed seal is maintained except at the shaft seal formed by mating surfaces 70 and 72 around spindle 60. However, these mating surfaces are also the valve surfaces which are separated to provide for the exhausting of the enclosed space and the refilling of this space with clean dry air. Thus, spindle 60 acts as a sliding valve and the surrounding wall provides the valve seat. Spring 64 holds the valve closed by urging clutch plate 58 and spindle 60 to the position shown and the valve may be opened by sliding the spindle to the left.

It is thus seen that a shaft seal is provided which is also a valve and at the same time the structure forms a self-releasing clutch assembly between the driving shaft 46 and gear 54. In this way the normal turning movement of shaft 46 is transmitted by the spindle through the wall of the gear box into the sealed enclosure so that gear 54 is rotated. But when there is excessive torque caused by resistance to turning movement of gear 54, the clutch is released and shaft 46 turns while gear 54 remains stationary; the releasing of the clutch does not break the shaft seal.

Within the sealed enclosure a gear train is provided which transmits the turning movement of gear 54 to the rollers 32 and 34. Accordingly, as shown best in Figures 4 and 6, within gear box 52 and parallel to spindle 60 is a shaft 74 which is mounted at its ends in the gear box walls and upon which is mounted to rotate freely a pinion gear 76. Pinion gear 76 meshes with gear 54 and (Figure 6) has a hub extension 78 at the left upon which is rigidly fixed a bevel gear 80. Bevel gear 80 meshes with a bevel gear 82 which is mounted upon and fixed to the lower end of a stud shaft 84. Stud shaft 84 is journaled in a sleeve bearing 85 in the top wall of the gear box. Fixed to the upper end of shaft 84 is a bevel gear 86 which (see Figure 4) projects above the bottom wall of frame 26. In this way a positive-drive gear train is provided between gear 54 and bevel gear 86 so that the movement of spindle 60 is transmitted to this bevel gear.

Bevel gear 86 meshes with a similar bevel gear 90 which is keyed to the end of a shaft 92. Shaft 92 is supported at the left in a sleeve bearing 93 and near its center in a similar sleeve bearing 94, and at the right the shaft carries a coupling sleeve 96 which is fixed to the shaft by a pin 97 and the right end of which receives the end of a stud shaft 100. Stud shaft 100 is journaled in a pair of bearings in corner bracket 27 and this provides additional support for shaft 92. Shafts 92 and 100 are coupled by a spline 98 so that shaft 100 turns with shaft 92. Keyed to shaft 100 is a gear 102 which meshes with an intermediate gear 104 also journaled in corner bracket 27 and in turn geared to a gear 106. Gear 106 is keyed to a stud shaft 105, journaled in corner bracket 27, which projects to the left where it is connected through a spline 111 to a roller shaft 108.

The interengaging ends of shafts 105 and 103 are snugly received in the hub of a bevel gear 116 which is connected to shaft 108 by a pin 109. Roller 34 is mounted on shaft 108 by a pair of end plates 112 which are fixed to the roller and are free to rotate on the shaft. End plates 112 carry flange plates 110, the peripheries of which extend above the surface of the roller to guide the shade as it is received by the roller. At its left-hand end the roller assembly is removably supported by a sleeve 113 fixed to the end of shaft 108 by a pin and a stud bolt 115 which is screwed into a threaded hole in corner bracket 21 of frame 26. The reduced end of the stud bolt is

snugly received in the sleeve so as to provide a bearing support and the end of the roller may be released by removing the stud bolt. Coiled within the right-hand end of roller 34 is a coil spring 114 which is attached at one end to shaft 108 and at the other end to the adjacent end plate 112 and thus to the roller. Spring 114 provides a resilient drive between shaft 108 and roller 34. Thus, the roller tends to turn with the shaft and the resilient drive provides advantages which will be more fully apparent below.

Bevel gear 116 transmits the rotation of shaft 108 to roller 32 and for this purpose bevel gear 116 meshes with a bevel gear 118 keyed to a shaft 120. Shaft 120 is journaled at its lower end in a bearing 122 carried by frame 26 and at its upper end by a pair of bearings 123 and 125 in corner bracket 25. At its upper end shaft 120 carries a bevel gear 124 which is fixed to the shaft by a pin 127 and bevel gear 124 meshes with a bevel gear 126 similarly attached by a pin 129 to a roller shaft 128. Roller shaft 128 is journaled at its right-hand end in a bearing 131 in corner bracket 25 and at its left-hand end the shaft is supported in the same manner as is the left-hand end of roller shaft 108 by a sleeve 135 and a stud bolt 137 which are similar in structure to sleeve 113 and stud bolt 115. Roller 32 is supported at its ends by a pair of end plates 133 which are fixed to the roller and which carry flange plates 137 which are similar to flange plates 110. A coil spring 130 in the left-hand end of roller 32 has one end attached to the roller and its other end attached to the adjacent end plate. This spring provides a resilient drive between shaft 128 and roller 32 which is similar to the drive provided for roller 34 by spring 114.

In the drawings the elements are shown positioned so that each of the shades is fully wound onto its roller and by turning knob 44 clockwise, the lower roller 34 is caused to wind tapes 40 and 42 onto itself whereas the upper roller 32 is unwound and the upper shade 36 is drawn down to cover the window from the top. Counter-clockwise rotation of knob 44 reverses the direction of rotation of the rollers so that tapes 40 and 42 are wound onto roller 32 and the lower shade 38 is drawn up to cover the window from the bottom. The winding of the shades onto the rollers increases their effective diameters so that when the shade is being unwound from one of the rollers and the tape is being wound onto the other roller there is a tendency for the tapes to wind more rapidly than the shade unwinds; that is, with the roller shafts geared directly together the larger diameter winding surface tends to take up the tapes at an increasing rate, whereas the smaller diameter unwinding surface on the other roller tends to unwind the shade at a decreasing rate. However, the resilient drives formed by springs 114 and 130 between the roller shafts and the rollers permits the rollers to rotate at different rates and therefore the tapes and the shades are held taut and are wound evenly. These springs are loaded at all times to permit this action and to give tension to the shades to hold them taut and to give smooth rolling and neat appearance, and further to compensate for slight stretching, expansion and contraction as might occur during use.

It is desirable to provide limits for the winding operation so that when either the upper or the lower shade completely covers the window, the only possible operation is the rewinding of this shade onto its own roller. Thus, as shown best

in Figure 4, shaft 92 is provided at its central portion with a thread 132 and carried by thread 132 is a nut 134. Nut 134 has a pair of integral radially projecting lugs (see Figure 2) which slide along the upper surface of the channel member 29 and these lugs prevent nut 132 from rotating. Thus, when shaft 92 is rotated nut 134 travels along the shaft, and due to the direct gearing between shaft 92 and the roller shafts, the position of nut 134 is an indication of the position of the shades. Nut 134 is shown in its central position, and, when shaft 92 is rotated clockwise in Figure 2 sufficiently to draw the lower shade 38 up so as to completely cover the window, nut 134 engages the stationary bearing 94 which acts as a stop. Continued clockwise rotation of shaft 92 is resisted sufficiently to cause the releasable clutch (Figure 5) formed by teeth 57 and 59 to be disengaged with the result that the turning of knob 44 does not turn shaft 92. Extended rotation of shaft 92 in the reverse direction moves nut 134 against sleeve 96 which acts as a stop and limits rotation in the opposite direction.

In Figure 7 a fitting is shown by means of which the air may be withdrawn from the sealed enclosure and replaced with clean dry air. With this arrangement shaft 46 is removed by releasing pillow block 48 (Figure 3) and withdrawing the shaft from its normal position in pocket 53, and then inserting a fitting 136 into the pocket. This fitting has a threaded shank 138 which is turned into a threaded bore 141 in spindle 60. The initial threading of shank 138 into bore 141 draws the shoulder of an enlarged portion 139 and a sealing washer 140 against the periphery of the mouth of pocket 53 so that an airtight seal is provided around the pocket. Thereafter, continued threading of the shank into the bore 141 pulls spindle 60 to the left against the pressure of spring 64 and thereby unseats the valve and provides an annular air passageway between surfaces 70 and 72.

Fitting 136 has a tee connection at its outer end with air suction being connected at one side through a suction tube 142 and with a source of clean dry air under pressure being connected through an air-pressure tube 144. A three-way valve 146 is manually controlled to regulate the alternate connection of tubes 142 and 144 to a central bore 147 which is open at its right-hand end to the interior of pocket 53. Thus, with valve 146 in the position shown, air from the enclosed space is drawn through the passageway formed between surfaces 70 and 72 into pocket 53 and thence through bore 147 to the suction tube 142. With valve 146 turned clockwise approximately ninety degrees from the position shown, passageway 147 is connected to the air-pressure line 144 and air reenters the enclosure through passageway 147, pocket 53 and the passageway between surfaces 70 and 72. Thus, it is a simple matter to evacuate the enclosed space and to refill it with clean dry air. In order to insure that the enclosed space will be kept dry, the hollow shell of each of channel members 29 is filled with a desiccant 148. Thus, any moisture which enters the enclosed space is immediately adsorbed so that the windows are kept clean and moisture-free.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying

drawings is to be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In a window construction, the combination of, a pair of window panes positioned in spaced parallel relationship, a rigid frame construction providing mounting means for said panes and forming with said panes a sealed enclosure, a pair of shade rollers rotatably mounted within said sealed enclosure in parallel relationship respectively at the top and bottom edges of said panes, a pair of shades wound respectively on said shade rollers, a pair of connecting strips at the respective side edges of said panes connecting the free ends of the two shades together whereby the complete winding of the strips onto one roller unwinds the shade from the other roller and draws the shade between the panes to cover the window, a gear assembly to rotate said rollers and thereby wind and unwind the shades as desired, and means to operate said gear assembly.

2. A window construction as described in claim 1 wherein said gear assembly includes a horizontal shaft within the enclosed space adjacent the lower edge of said panes and having a threaded portion, a nut threaded onto said threaded portion and adapted to move axially with respect to said shaft, means to prevent said nut from rotating, and means constituting a pair of stops positioned along said shaft and providing limits for the movement of said nut therealong.

3. A window construction as described in claim 1 wherein each of said rollers is mounted to rotate upon a driving shaft, and a coil spring within the roller coiled about said shaft and attached at one end to said shaft and at the other end to said roller whereby the roller is driven by a resilient drive from the shaft by the spring.

4. A window construction as described in claim 1 which includes a shaft-seal assembly mounted in the wall of the frame construction and providing driving means connecting said gear assembly to be operated from outside the sealed enclosure, said shaft-seal assembly including, means fixed to the wall and defining an opening presenting a stationary frusto-conical surface, a spindle rotatably mounted in said opening and having a mating surface which forms with said frusto-conical surface a shaft-seal barrier, and means urging said spindle in an axial direction whereby the mating surfaces are held together.

5. A window construction as described in claim 1 wherein said gear assembly includes, a gear within said sealed enclosure, a spindle rotatably mounted and providing a mounting for said gear with the spindle and the gear keyed together and the spindle slidable axially within the gear, said spindle projecting through a tapered opening in a wall of said frame construction, the spindle and the opening having mating frusto-conical sealing surfaces which provide a shaft seal, said spindle carrying on its end surface outside of the sealed enclosure an annular row of clutch teeth, a clutch plate mounted adjacent the last named end of said spindle and having an annular row of clutch teeth which interengage the clutch teeth on the spindle to provide a driving connection, and a coil spring urging said clutch plate against the end of said spindle whereby said teeth are held interengaged and also urging said spindle toward said opening whereby the mating surfaces are held together.

6. A window construction as described in claim 1 wherein said gear assembly includes, a releasable clutch formed by a clutch plate and a spindle

which are held together by a coil spring, said spindle being mounted in an opening in the wall of said frame construction and having an annular surface which forms with the side wall of the opening a shaft seal, a gear mounted on said spindle and keyed thereto, a horizontally extending drive shaft mounted on said frame construction within the enclosed space, a gear chain providing a positive driving connection between said gear and said drive shaft, and a gear chain connecting said drive shaft to each of said rollers whereby said rollers are driven synchronously.

7. In a window construction, the combination of, a pair of window panes positioned in spaced parallel relationship, a rigid frame construction providing mounting means for said panes and forming with said panes a sealed enclosure, a pair of shade rollers rotatably mounted within said sealed enclosure in parallel relationship respectively at the top and bottom edges of said panes, a pair of shades wound respectively on said shade rollers, a pair of connecting strips at the respective side edges of said panes connecting the free ends of the two shades together whereby the winding of the strips onto one roller unwinds the shade from the other roller and draws the shade between the panes to cover the window, a gear box attached to the bottom of said frame construction and enclosing a portion of said enclosed space, said gear box having a wall which has an opening therethrough defined by a frusto-conical surface, and a gear assembly mounted in said gear box and adapted to transmit rotational movement through said opening into the sealed enclosure to rotate the shade rollers, said gear assembly including, a spindle rotatably mounted in said gear box and extending through said opening, the spindle having a tapered portion the surface of which mates with said frusto-conical surface to provide a shaft seal, and means forming a releasable clutch connection for transmitting rotation to said spindle and thence into the sealed enclosure which means includes a spring exerting a force urging the mating surface of said spindle against said frusto-conical surface.

8. In a window frame construction, the combination of, a pair of window panes positioned in spaced parallel relationship, a rigid frame construction providing support for said panes and including means sealing the edges of said panes to provide a sealed enclosure, a gear box mounted on said frame construction and open to said enclosure and including a wall portion having an opening therethrough into said enclosure, a spindle mounted in said opening and having a sealing surface which cooperates with the periphery of said opening to provide a shaft seal around the spindle, a releasable clutch assembly connected to the end of said spindle outside of said sealed enclosure, an operating shaft releasably connected to said clutch assembly, an operating knob fixed to said operating shaft, and a shade roller mechanism mounted within said sealed enclosure and connected to and operable by rotation of said spindle whereby a shade may be drawn between the panes.

9. In a window construction of the character described, a wall forming a part of a sealed enclosure and having an opening therethrough, a drivable mechanism in said enclosure, and a mechanism driving piece positioned in said opening to transmit movement to said mechanism, said driving piece acting as a plug in said opening and said driving piece and the wall forming

said opening having cooperating surfaces which mate and prevent undesired leakage of air around said driving piece and through said opening.

10. In a window construction of the double glazed type wherein a hermetically sealed enclosure is formed between two sheets of glass, a shade roller rotatably mounted within the sealed window enclosure at the top thereof, a shade roller rotatably mounted within the sealed window enclosure at the bottom thereof, a shade adapted to cover the entire window rolled upon the upper roller, a shade adapted to cover the entire window rolled upon the lower roller, means at the two vertical edges of the window connecting together the free ends of the shades, shade-operating mechanism within the enclosure for driving said rollers in either direction to unroll either shade and thus selectively cover the window from the top down and from the bottom up, said window construction including a wall having an opening therein, and an actuating piece passing through said opening and operatively engaging said shade operating mechanism, said actuating piece acting as a plug in said opening cooperating with the opening to inhibit leakage of air into the enclosure.

11. In a window construction of the type wherein a pair of window panes are supported by a rigid sealed frame construction to provide a sealed enclosure and wherein shade means is provided within the sealed enclosure, the combination of wall means fixed to the frame construction and having therein an opening to the sealed enclosure which opening presents a peripheral valve seat which tapers and flares outwardly with respect to the sealed enclosure, a spindle rotatably mounted in said opening and having a mating surface which fits said valve seat thereby to provide a shaft seal, said spindle having at its end outside of said opening a threaded axial bore and having an annular row of clutch teeth surrounding said axial bore, a clutch plate resting against the last named end of said spindle and having an annular row of teeth interengaging the teeth on the spindle, the clutch plate having a central bore in alignment with the axial bore in the spindle, a coil spring urging said clutch plate against said spindle with the teeth interengaging and also urging the spindle against said valve seat, and a driving shaft removably coupled to said clutch plate and removable to permit the insertion of a valve-lifting rod which is threaded into the axial bore in said spindle to draw said spindle away from said valve seat and thereby open the valve.

12. In a window construction of the type having a pair of panes held in rigid spaced relationship by a frame construction which forms with the panes a sealed enclosure, a shade operating mechanism mounted within said sealed enclosure, a shade mounted on said shade operating mechanism to be moved between said panes, a spindle rotatably mounted in a wall of said frame construction to transmit rotary movement to said shade operating mechanism to operate said shade, said spindle forming with the wall a shaft seal, a clutch plate engaging said spindle outside of said sealed enclosure and forming therewith a releasable clutch, a spring urging said clutch plate and spindle into interengagement, and means to limit the movement of said shade operating mechanism.

13. In a window construction of the type having a pair of panes held in rigid spaced relationship by a frame construction which forms with the panes a sealed enclosure, a pair of roller assemblies mounted within the sealed enclosure at opposite edges of the panes, each roller assembly comprising a roller shaft and a roller rotatably mounted on the shaft and means providing a non-rigid driving connection between the roller and the shaft, shade means adapted to be wound on one of said rollers, strip means connected to the shade means and adapted to be wound on the other of said rollers, and means connecting said roller shafts to be driven from outside of the enclosure.

14. In a window construction of the type having a pair of panes held in rigid spaced relationship by a frame construction which forms with the panes a sealed enclosure, a pair of roller assemblies mounted within the sealed enclosure at opposite edges of the panes, each roller assembly comprising a roller shaft and a roller rotatably mounted on the shaft and means providing a non-rigid driving connection between the roller and the shaft, shade means adapted to be wound on one of said rollers, strip means connected to the shade means and adapted to be wound on the other of said rollers, and gear means forming a gear chain and connected to said roller assemblies to rotate said rollers to wind and unwind said shade, said gear means including a rotatable drive shaft having a threaded portion, a stop nut threaded and movable upon said threaded portion and upon rotation of the drive shaft movable a limited distance therealong whereby the extent of rotation of the rollers is limited.

15. In a window construction of the type having a pair of panes held in rigid spaced relationship by a frame construction which forms with the panes a sealed enclosure, a pair of roller assemblies mounted within the sealed enclosure at opposite edges of the panes, each roller assembly comprising a roller shaft and a roller rotatably mounted on the shaft and means providing a non-rigid driving connection between the roller and the shaft, shade means adapted to be wound on one of said rollers, strip means connected to the shade means and adapted to be wound on the other of said rollers, gear means forming a gear chain and connected to said roller assemblies to rotate said rollers to wind and unwind said shade, said gear means including a rotatable drive shaft having a threaded portion, a stop nut threaded and movable upon said threaded portion and upon rotation of the drive shaft movable a limited distance therealong, means to operate said gear means, and a clutch having separable elements connected respectively to the gear operating means and said gear means to transmit driving movement to said gear means said separable elements separating when said stop nut reaches either end of said threaded portion to release said clutch and thereby prevent further rotation of said rollers.

16. In a window construction of the type having a pair of panes held in rigid spaced relationship by a frame construction which forms with the panes a sealed enclosure, a pair of roller assemblies mounted within the sealed enclosure at opposite edges of the panes, each roller assembly comprising a roller shaft and a roller rotatably mounted on the shaft and means providing a non-rigid driving connection between the roller and the shaft, shade means adapted to be wound on one of said rollers, strip means connected to the shade means and adapted to be wound on the

other of said rollers, a gear assembly gearing said roller shafts together comprising two roller gears mounted on the gear shafts and a connecting shaft extending between the roller shafts and carrying two gears which mesh respectively with said roller gears, and mounting means for the end of each of the roller shafts opposite the roller gear comprising a sleeve bearing carried by the roller shaft and a stud bolt threaded into the frame construction coaxially with the roller shaft and having its end projecting into the sleeve bearing.

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