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E. CLERK

2,387,119

INSULATING WINDOW

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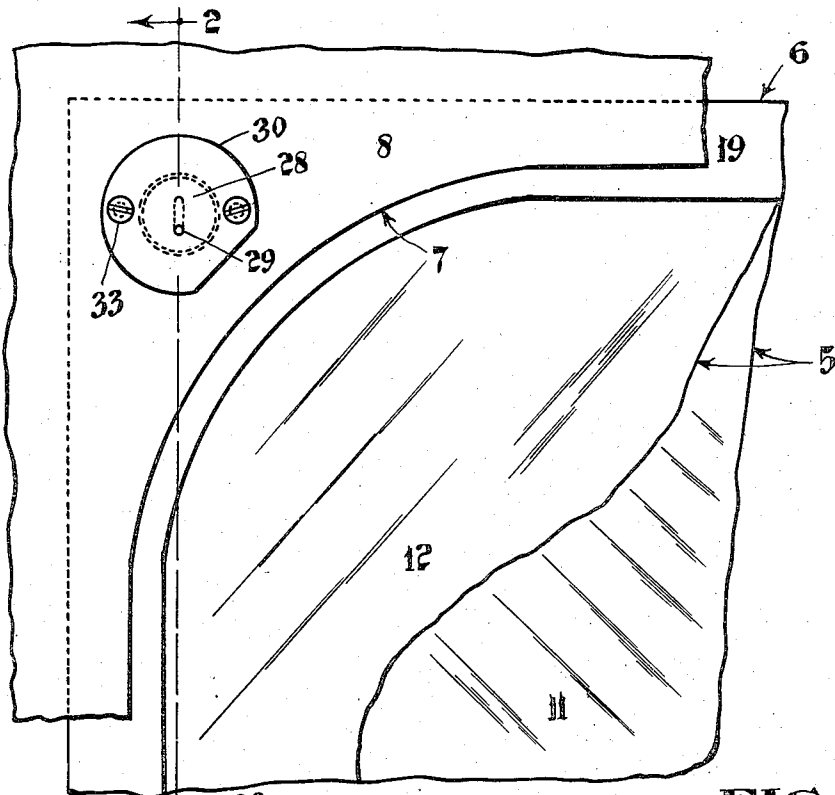


FIG. 1

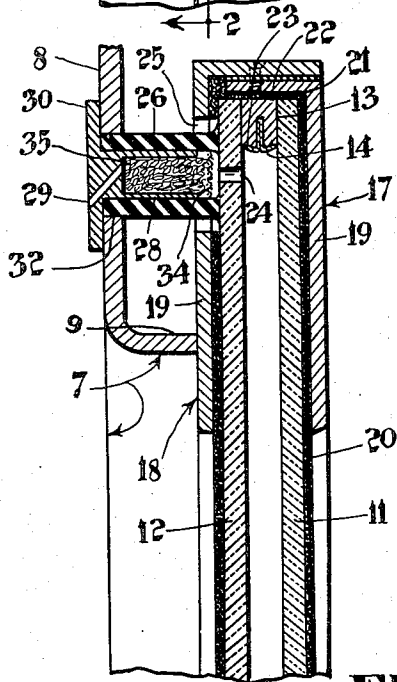


FIG. 2

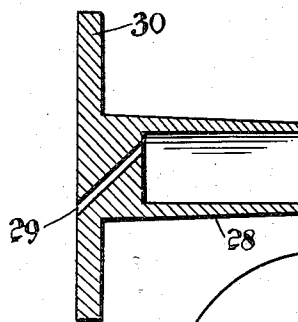
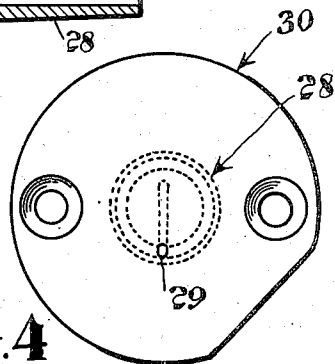


FIG. 3

FIG. 4



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INSULATING WINDOW

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11 Claims. (Cl. 20—56.5)

This invention relates to multi-pane insulating windows of the "breathing vent" type described in the Lipsett U. S. Patents 2,207,745, granted July 16, 1940, and 2,233,952, granted March 4, 1941.

The present invention comprises an improved "breathing vent" window installation in which the cell space between the transparent panes of the preformed glazing unit is vented to the outdoor atmosphere through a vent connection comprising a vent opening extending through one of the defining walls of said cell space and a resiliently compressible vent tube arranged with one end encircling said vent opening and pressed tightly against the outer surface of said wall. In the preferred embodiment of the invention the vent opening extends from the inner to the outer surface of the outdoor pane and the vent tube is supported independently of the glazing unit and its associated sash frame in a manner which provides for longitudinal compression of said tube. The vent tube is conveniently mounted in a suitable opening provided in the wall structure in which the window opening is formed.

An important feature of the vent connection provided in accordance with this invention is that it does not resist or interfere with relative movement between the transparent panes of the glazing unit and its associated sash frame or with relative movement between the sash frame and the wall structure in which the window opening is formed. The advantage of this is that it minimizes danger of over-stressing and failure of the sealing means between the cell forming panes due to flexing of said panes relative to the associated sash frame or to other unavoidable relative movements between the transparent panes, the sash frame, and the wall structure in which the window opening is formed.

Another advantage of the vent connection provided in accordance with the present is that the vent opening is the only part of the vent connection carried by the glazing unit, the remaining parts, including said tube, being carried by said wall structure and being removable from said wall structure without disturbing the glazing unit or its associated sash frame.

Other characteristic features and advantages of the invention will be more readily understood from the following detailed description taken in connection with the accompanying drawing, in which—

Fig. 1 is a side view of a "breathing vent" window installation embodying my invention.

Fig. 2 is a sectional view taken substantially along the line 2—2 of Fig. 1.

Fig. 3 is an enlarged longitudinal sectional view of the filter casing shown in the preceding figures.

Fig. 4 is an end view of said filter casing.

Referring more particularly to the drawing, 5 designates a preformed multi-pane glazing unit mounted in a sash frame 6. This assembly is installed at the indoor side of a window opening 7 provided in a wall structure 8 which represents part of the metal body wall of a railway car. The wall structure 8 is provided with a continuous inwardly directed flange 9 which defines the window opening 7 and is engaged by the outdoor side of sash frame 6.

Unit 5 comprises transparent indoor and outdoor panes 11 and 12 spaced apart by sealing means 13 and spacer means 14 interposed between their marginal edges. The sealing means comprises a continuous marginal strip of plastic composition in which the spacer means is embedded to prevent collapse of the unit by external pressure. The composition 13 and spacer means 14 are preferably applied in accordance with the invention set forth in U. S. Patent No. 2,327,974, granted August 24, 1943.

The sash frame 6 comprises inner and outer frame sections 17 and 18 substantially L-shaped in cross section. These sections are fitted together so that their flanges 19 form the side walls of a channel in which the marginal portions of the glazing unit 5 is sealed by the caulking compound 20. The bottom of the glazing receiving channel is formed by flanges 21 disposed in overlapping relation and held out of direct contact with each other by interposed fibrous or other insulating material 22 of low heat conductivity. Flanges 21 are secured together by screws 23 passing through the interposed insulating material 22.

A "breathing vent" opening 24 is provided in the outdoor pane 12 and is centrally located with reference to a substantially larger opening 25 provided in the outdoor flange 19 of sash frame 6. The opening 24 places the cell space between the panes 11 and 12 in communication with the bore of a vent tube 26 made of rubber or other suitable resiliently compressible material. The inner end of tube 26 extends into the sash frame opening 25 and is in pressure contact with the solid portion of pane 12 which borders the vent opening 24. Tube 26 has a bore diameter which is substantially greater than the diameter of opening 24 and an outside diameter which is sub-

stantially smaller than the diameter of the sash frame opening 25. It will thus be seen that provision is made for considerable relative movement between glazing unit 5, sash frame 6, and tube 26 in the lateral direction of said tube and in such manner that the opening 24 will always be within the circle formed by the inner wall of the tube.

Vent tube 26 is fitted on and carried by tubular filter casing 28 which is open at its inner end and is closed at its outer end except for a small inclined port 29. The closed end of casing 28 is provided with an outwardly directed attaching flange 30 against which the outer end of tube 26 is butted. The tube 26 is dimensioned so that it is a tight fit on casing 28 and extends from flange 30 to a point well beyond the inner end of said casing.

The car wall structure 8 is provided with a tube receiving opening 32 in line with the vent opening 24 and the sash frame opening 25. After the tube 26 has been assembled with the filter casing 28 this assembly is passed through opening 32 so that the inner end of tube 26 is disposed in the sash frame opening 25 in contact with the solid portion of pane 12 bordering the vent opening 24. The length of tube 26 in relation to the distance from the outer surface of the pane 12 to the inner surface of that portion of car wall 8 in which opening 32 is formed is such that the flange 30 of filter casing 28 will be spaced from the outer side of wall 8 by said tube when the inner end of the tube is initially butted against the pane 12. The flange 30 is then forced tightly against the outer side of car wall 8 and secured thereto by means of fastening screws 33. The tube 26 is thus placed under longitudinal compression with the result that the inner end of the tube is slightly deformed as shown in Fig. 2 and is pressed into tight pressure-sealing contact with the outer surface of pane 12. The tube 26 is preferably a close sliding fit in the car wall opening 32 which is somewhat smaller than the sash frame opening 25. A filter screen 34 is arranged in the inner end of tube 26 and the interior of the filter casing 28 is preferably packed with a suitable filtering material 35 adapted to remove moisture and foreign material from the air passing therethrough. The port 29 provided in the outer end of filter casing 28 is preferably arranged so that it inclines downwardly and outwardly from the interior of said casing to minimize entrance of rain or snow through said port.

In "breathing vent" windows of the type described herein a certain pressure flexing of the transparent panes 11 and 12 is unavoidable. Likewise, there is bound to be a certain amount of relative movement between the glazing unit 5, the sash frame 6 and the car wall structure 8. The vent connection designed in accordance with this invention provides for all of these conditions since the inherent resiliency and longitudinal compression of tube 26 enables it to lengthen and shorten itself to accommodate lateral movement or flexure of the pane 12 against which it bears. Also, since the inner end of the tube is free of permanent connection to the pane 12 and is a loose fit in the sash frame opening 25, it permits of relative movement between the glazing unit 5, the sash frame 6, and the wall structure 8 in the lateral direction of said tube. It will also be seen that the assembly comprising the tube 26 and filter casing 28 may be removed without disturbing the glazing unit and

sash frame assembly and vice versa. A further advantage of the window construction described herein is that the design and assembly of the component parts of the vent connection is simplified by reason of the fact that the vent opening 24 constitutes the only part of this vent connection which is carried by the glazing unit and its associated sash frame.

I claim:

1. An insulating window installation comprising a wall structure provided with a window opening and with a tube receiving opening adjacent said window opening, an insulating window mounted at the indoor side of said window opening, said window comprising spaced indoor and outdoor transparent panes and sealing means joining the marginal portions of said panes to form therewith a cell space hermetically sealed except for a single restricted vent opening leading to the outdoor atmosphere through the outdoor transparent pane at a point directly opposite said tube receiving opening, a sash frame in which said panes are mounted, a vent tube extending inwardly through said tube receiving opening with the inner end of said tube encircling said opening and pressed tightly against the outer surface of said outdoor pane and tube compressing means secured to said wall structure and serving to place said tube under longitudinal compression whereby the inner end of said tube is pressed tightly against said outdoor pane, said tube being made of resiliently compressible material.

2. An insulating window installation as set forth in claim 1, in which said tube compressing means comprises a filter casing inserted in said tube and provided with an outwardly directed flange overlying the outer end of said tube and adapted to be attached to said wall structure, said tube being of a normal length which is greater than the distance between said flange and the outdoor pane when the component parts of the window installation are in their final position of assembly and said filter casing having openings at each end for the passage of air therethrough.

3. An insulating window installation as set forth in claim 1, in which the sash frame comprises side flanges forming the side walls of an inwardly opening channel in which the marginal portions of said transparent panes are mounted, the outdoor flange being provided with a relatively large opening which surrounds and is substantially concentric with the restricted vent opening in said outdoor pane, said sash frame opening receiving said vent tube therethrough and being of a diameter substantially greater than the outside diameter of said tube.

4. A vent tube assembly for insulating windows of the character described comprising a tube of resiliently compressible material open at both ends, a filter casing fitted in said tube and provided, at one end, with an outwardly directed flange overlying the adjacent end of said tube, the bore of the filter casing being fully open at the end remote from said flange and being closed at the flanged end except for a restricted port, said tube projecting a substantial distance beyond the end of the filter casing remote from said flange.

5. A vent tube assembly as set forth in claim 4, in which said part is diagonally inclined with respect to the central axis of said filter casing.

6. A vent tube assembly for insulating windows of the character described comprising a tube of

resiliently compressible material open at both ends, a filter casing inserted in said tube and having openings at both ends to provide for the passage of air therethrough and a flange extending outwardly from one end of said filter casing in pressure transmitting contact with the adjacent end of said tube, the latter being of sufficient length to project an appreciable distance beyond the end of the filter casing remote from said flange.

7. A vent tube assembly for insulating windows of the character described comprising a tube of resiliently compressible material provided with an opening for the passage of air therethrough and a tube compressing member fitted in said tube and provided with an outwardly directed tube compressing flange arranged in pressure transmitting contact with the adjacent end of said tube, the latter being of sufficient length so that the end thereof remote from said flange projects an appreciable distance beyond the adjacent end of the portion of the tube compressing member which is fitted in said tube.

8. A vent tube assembly for insulating windows of the character described comprising a tube of resiliently compressible material open at both ends, a filter casing inserted in said tube and having openings at both ends to provide for the passage of air therethrough, a flange extending outwardly from one end of said filter casing in pressure transmitting contact with the adjacent end of said tube, the latter being of sufficient length to project an appreciable distance beyond the end of the filter casing remote from said flange, a screen arranged in said tube adjacent the last mentioned end of the filter casing and air filtering material contained within said filter casing.

9. An insulating window including a sash

frame, a glazing assembly mounted in said sash frame comprising spaced indoor and outdoor transparent panes and sealing means interposed between and joining the marginal portions of said panes to form therewith an enclosed cell space hermetically sealed except for a single restricted vent opening extending from the inner to the outer surface of the outdoor pane, an external vent tube made of resiliently compressible material and arranged with one end encircling said opening and bearing against the outer surface of the outdoor pane, the bore diameter of said tube being substantially greater than the diameter of said opening, means for mounting said tube independently of said sash frame and glazing assembly and means for subjecting said tube to longitudinal compression to thereby press the aforesaid end of the tube tightly against said outdoor pane.

10. An insulating window as set forth in claim 9, including air filtering means located within said tube.

11. In an insulating window of the character described, wall members joined together to define a cell space hermetically sealed except for a single restricted vent opening leading to the outdoor atmosphere through one of said wall members, an external vent tube arranged with one end encircling said opening and bearing against the outer surface of the wall member through which said opening extends, means for independently mounting said wall members and tube so that the tube and the vented wall member engaged thereby are capable of relative lateral movement in the lateral direction of the tube and means for pressing said tube against the outer surface of said vented wall member.

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