

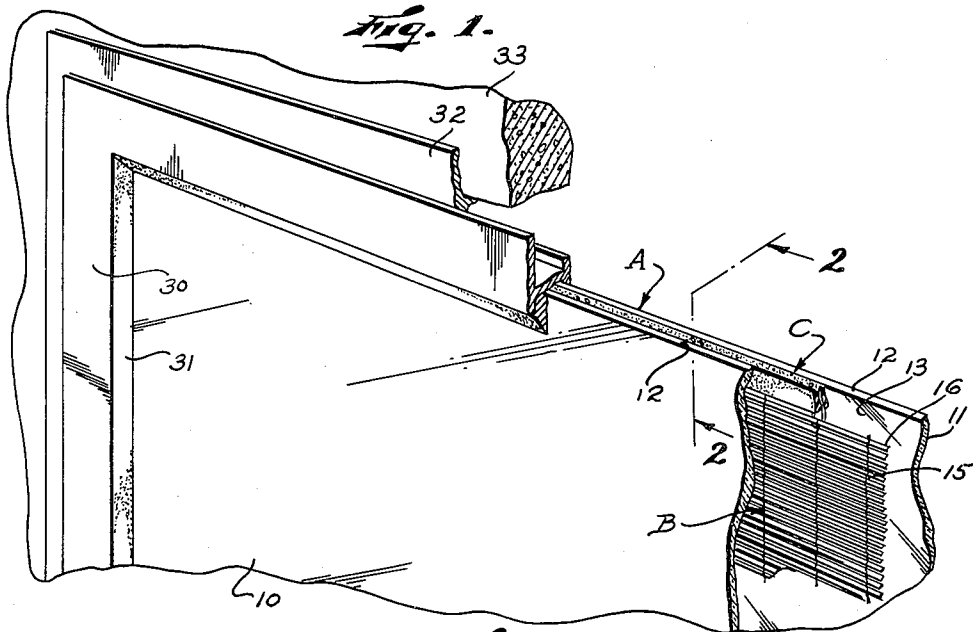
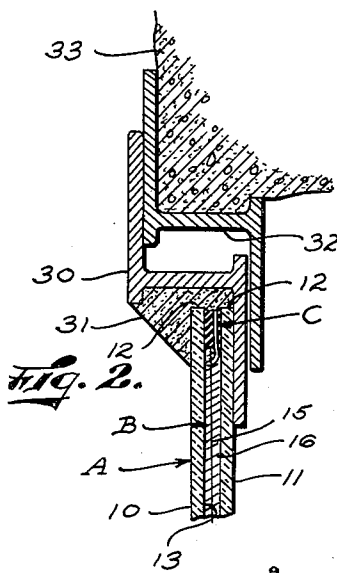
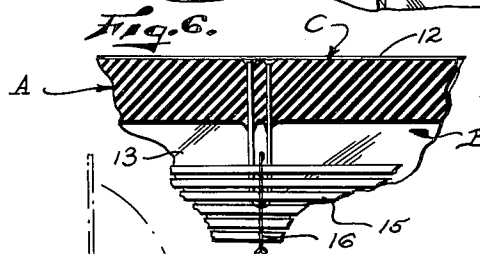
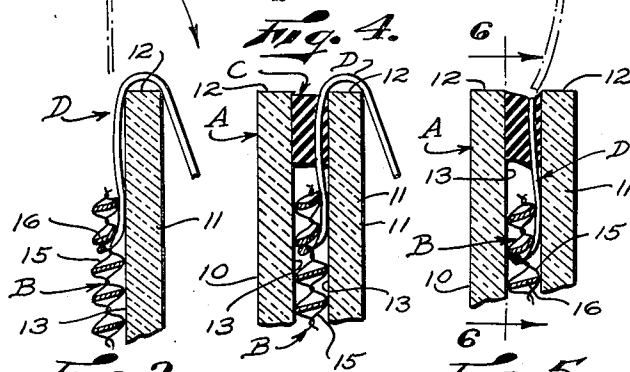
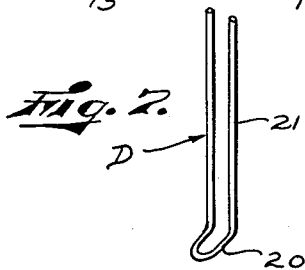
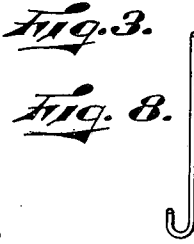
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WINDOW CONSTRUCTION

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WINDOW CONSTRUCTION

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This invention relates to a window construction and is more particularly concerned with an improved window construction involving two, parallel panes of glass with a sun screen engaged therebetween adapted to absorb and deflect the short wave solar radiation.

In recent years, many attempts have been made to provide a satisfactory window construction involving two panes of glass with a woven metal sun screen engaged therebetween and such a construction wherein the space between the glass panes, and in which the screen is engaged, is hermetically sealed. To date, such attempts have only met with limited success.

The ordinary sun screen such as is referred to is a woven metal fabric and involves a plurality of elongate, horizontally disposed slats or louvers arranged in vertical spaced relationship and secured together by means of a series of laterally spaced, vertically disposed pairs of wire looped over the edges of the louvers and twisted together between the louvers. The several louvers are slanted or inclined at a predetermined angle in order to suitably control the passage of light therethrough and so that they normally prevent the passage of the direct ray of the sun through the screen.

It is extremely important in the use of such a sun screen that it be supported or suspended under tensions vertically so that it will not buckle or wrinkle in a manner to cant the louvers in a manner to allow the direct rays of the sun to pass through the screen. It is also extremely important that the tensional forces not be so great as would tend to stretch the vertical wires, causing the loops established thereby to elongate and thereby change the angle of the louvers extending therethrough.

Due to the high coefficient of expansion of the materials used to establish such sun screens and due to extremes in temperature to which they are subjected, which causes them to expand and contract vertically and horizontally to a considerable extent, the prior art has failed to provide a suitable method or means for properly supporting and tensioning such screens between two panes of glass.

For example, the prior art has taught methods of supporting such screens between two panes of glass which involves cementing or otherwise fixing the upper and lower edges of the screen to one or both of the panes of glass. Due to the difference of the coefficient of expansion between the screen and the glass panes, such methods of securing or supporting such screens have proven unsatisfactory and have resulted in window constructions wherein the angles of the louvers of the screens is disturbed and varied as the temperature of the construction changes. Even attempts wherein rubber cement was employed to secure the top and bottom edges of the screen to the glass panes of the window have proven unsatisfactory.

Other attempts by the prior art to mount a sun screen between two panes of glass have involved the use of metal clips and other mechanical fastening means, which

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clips or means are fixed to the top and bottom edges of one or both of the window panes and hook or grip the top and bottom edges of the screen. Due to the difference in the coefficient of expansion between the glass panes and the screen and due to the lack of resiliency and/or flexibility of the clips or mechanical fastening means, such attempts have met with the same unfavorable results as the methods of mounting screens, which involve fixing the upper and lower edges of the screen to the glass panes.

Still further, in constructions where mechanical fastening means are employed, it becomes extremely difficult to hermetically seal off the space occurring between the panes of glass and often requires the employment of special frames and the like.

An object of the present invention is to provide a novel window construction involving two panes of glass and a sun screen engaged therebetween.

Another object of the present invention is to provide a window construction of the character referred to including novel means for supporting the screen in tension between the panes of glass.

A further object of this invention is to provide a construction of the character referred to in which said means employed to support the screen, also serves to secure the two panes of glass together and to hermetically seal off the space occurring between the said panes in which the screen is arranged.

An object of my invention is to provide a means for supporting a sun screen between two panes of glass, which means maintains substantially uniform tension on the screen at all times and which is not adversely affected by the differences in the coefficients of expansion between the screen and the glass panes.

It is a feature of the present invention to support a sun screen of the character referred to in tension between two panes of glass by means of a plurality of hangers carried by bodies of flexible, resilient material fixed to one or both of the glass panes and engaging the screen.

Another feature of the present invention is to provide a structure of the character referred to in which the hangers are simple, U-shaped wire elements engaged through the sun screen to occur about the vertical wire elements thereof and a structure in which the body of flexible resilient material which carries the hangers extends between the two panes of glass about the entire perimeter thereof to secure the panes together and hermetically seal the space between the panes of glass and in which the screen occurs.

Another object of the present invention is to provide a structure of the character referred to which has no parts or elements projecting from or occurring about the perimeter of the panes of glass which would in any way affect or impede the mounting and glazing of the window construction in a suitable frame, or the like.

An object of my invention is to provide a novel method of establishing the construction provided by the present invention.

Another object is to provide a window construction of the character referred to which is easy and economical of manufacture and which is both highly effective and dependable in operation.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a perspective view of a portion of the construction provided by the present invention, showing it engaged in a frame and a wall structure.

Fig. 2 is an enlarged detailed sectional view of my new construction taken as indicated by line 2—2 on Fig. 1.

Figs. 3, 4 and 5 are enlarged detailed sectional views showing the steps involved in establishing my new construction.

Fig. 6 is a view taken as indicated by line 6—6 on Fig. 5.

Fig. 7 is a perspective view of one of the hangers that I provide.

Fig. 8 is a perspective view of a modified form of hanger.

The window construction A that I provide and which is illustrated throughout the accompanying drawings involves generally, a pair of glass panes, there being front and rear panes 10 and 11, a sun screen B arranged between the panes 10 and 11, a body C of elastic, resilient bonding and sealing compound between the panes 10 and 11 about their perimeters and a plurality of hangers carried by the body C and engaging the screen.

The panes 10 and 11 are like, flat, vertically disposed, rectangular panes of glass having straight, flat, horizontally disposed top edges 12, vertically disposed side edges, (not shown), and straight, flat, horizontally disposed bottom edges, (not shown). The panes 10 and 11 are arranged in parallel, vertical planes and so that their several edges occur in parallel relationship and so that their inner opposing surfaces 13 are in spaced relationship with each other.

The sun screen B arranged between the panes 10 and 11 is a woven metal fabric and consists of a series of spaced vertical or upright pairs of wires 15, and a multiplicity of vertically spaced, horizontal louvers or slats 16. The pairs of wires 15 are looped over the edges of the louvers 16 and are twisted together between the louvers as shown in Figs. 3 through 4. Such a sun screen construction is conventional and is now in general use and therefore is not claimed per se herein.

The sun screen B is rectangular in shape and is slightly less in horizontal and vertical extent than the panes of glass 10 and 11, so that when the screen is positioned between the said panes the marginal portions of the panes project freely outwardly and beyond the side edges of the screen.

The two panes of glass 10 and 11 are positioned to occur adjacent the opposite sides of the sun screen B with the longitudinal edges of the louvers 16 in contact with the inner opposed surfaces 13 of the glass panes. The two panes 10 and 11 are retained in fixed position with each other and in engagement with the sun screen by the body C of bonding and sealing compound, which body C occurs between the marginal portions of the panes 10 and 11 and extends continuously about the perimeter of the assemblage. The body C is clear of or spaced from the side edges of the sun screen B, as clearly illustrated in the drawings.

The body C is formed of an elastic, resilient material and is bonded to the inner opposed surfaces 13 of the panes 10 and 11.

The body C is initially in a fluid or plastic state and is injected or otherwise deposited between the panes 10 and 11 and is allowed to set and cure. In practice, I have found that the material produced by Thiokoal Chemical Corporation and sold under the trade name of Thiokoal, is particularly suitable for establishing the body C of my new construction. This material is a synthetic rubber base compound and has excellent bonding and sealing characteristics. It is not subject to deterioration and has excellent memory.

The hangers D that I provide are shown as simple, U-shaped members formed of wire stock and each is shown as having a rounded base portion 20 and a pair of elongate, vertically disposed, parallel legs 21 projecting from the base portion.

In practice, it is preferred that the base portion be

inclined relative to the vertically disposed legs and at an angle corresponding to the angle at which the louvers of the sun screen B are inclined.

The hangers D are arranged along the top and bottom edges of the construction and each has its base portion arranged between two adjacent louvers 16 and engaged around one of the pairs of vertical wires 15 of the sun screen B and has its legs projecting outwardly from the screen and bonded in the body C, as clearly illustrated in Fig. 5 of the drawings.

The hangers D are positioned so that they are drawn taut between the body and the screen and so that the body normally yieldingly pulls on the screen through the hangers and maintains it under substantially uniform tension at all times.

As the screen B expands and contracts vertically to decrease and increase the pull on the hangers, the body C in which the legs of the hangers are bonded yields a sufficient amount so that the tension on the screen is maintained substantially constant or within limits which will not result in distortion of the screen.

As the screen B expands and contracts horizontally, the flexibility of the portions of the hanger legs 21 extending between the base portion 20 of the hangers and the body C, coupled with the resiliency of the body and the free manner in which the bases of the hangers engage around the wires 15 of the screen allows the screen to shift horizontally without adversely affecting tensioning of the screen.

In establishing the window construction A provided by the present invention, the screen B is arranged adjacent the inner surface of one of the glass panes, as for instance the inner surface 13 of the pane 11, as illustrated in Fig. 3 of the drawings.

The hangers D are then engaged through the screen along the top and bottom edges and around the wires 15 thereof and so that the legs 21 project from the screen and outwardly from the top and bottom edges of the pane to anchor said part of the screen to the pane. The portions of the legs 21 projecting from the other or opposite edges of the screen and pane are parallel to establish the desired tension on the screen and are then bent to hook over the adjacent edge of the pane and to hold the screen in tension, as clearly illustrated in Fig. 3 of the drawings.

When the screen is thus positioned and held in tension on the pane 11, the pane 10 is then placed adjacent the other or opposite side of the screen, in register with the pane 11 and the body C, in a plastic state, is injected or otherwise deposited between the panes about their perimeters and about the portions of the hanger legs 21 extending between the panes, as clearly illustrated in Fig. 4 of the drawings.

The structure is then left to stand a predetermined length of time to allow the body C to set and cure, whereupon the hooked portions of the legs are bent back and are cut off adjacent the body C, as clearly illustrated in Fig. 5 of the drawings.

When the hooked ends of the legs 21 are disengaged from the pane 11 and cut off, the tensional forces exerted through the hangers on the pane are transferred to the body C.

In practice, it is preferred that the structure be assembled and left to cure in a heated room, or the like, so that the structure is in an expanded condition and so that the body C will cure more rapidly. It is also preferred that a maximum amount of tension be exerted upon the screen at the time of manufacture so that when the structure is finished and in normal use, the screen will be in tension when it is brought to its maximum temperature as a result of solar radiation.

It will be apparent that the window construction A is extremely neat and when finished does not have any parts projecting therefrom which would tend to interfere with its being mounted or framed.

It will also be apparent that the space between the

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panes 10 and 11 and in which the screen B is arranged is hermetically sealed by the body C.

In practice, if desired, a vacuum can be drawn in the space in which the screen occurs, or, if desired, the said space can be filled with a suitable inert gas.

With the construction set forth above, it will be apparent that the sun screen B is suitably maintained in tension and in such a manner that expansion and contraction of the construction, as a result of temperature changes does not adversely affect the tensioning of the screen.

The window construction A thus established can be mounted in any desired manner, as for instance, and as illustrated in Figs. 1 and 2, it can be engaged in a suitable frame 30 and maintained in engagement therewith by suitable glazing 31.

The window construction A thus formed can then be engaged in a suitable framed opening 32 in a wall construction 33, or the like.

In practice, if desired and under certain circumstances, the hangers D need only be provided along one edge of the screen B and the other or opposite edge of the screen can be secured to the body C or one of the panes 10 or 11 in some other suitable manner.

Still further, in practice, the means that I provide for tensioning the screen B between the panes of glass 10 and 11 could if desired be employed in a window construction having but one pane of glass. In such a case, rather than providing one continuous body C about the perimeter of the glass pane, it would only be necessary to provide a single body of limited extent for each hanger D.

In practice, the hangers D need not be U-shaped as illustrated in the drawings and described above. If desired, the hangers D could be simple, straight lengths of wire having hooks at one end to engage either the vertical wire of the screen B or to engage one of the louvers of the screen, without departing from the spirit of the invention. Such a hanger is illustrated in Fig. 8 of the drawings.

It is important however, that the hangers D be such that they will allow for the free flow of the body C therearound when the window is being constructed and so that a complete bond and seal can be assured therearound and between the glass panes.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any modifications or variations that may appear to those skilled in the art and fall within the scope of the following claims:

Having described my invention, I claim:

1. A window pane having a metallic screen related thereto and means securing the screen to the window and normally yieldingly holding said screen in tension, said means including, a pair of hangers engaged with the opposite side edges of the screen, and bodies of resilient material bonded to the pane adjacent the said side edges of the screen and bonded to the hangers and yieldingly coupling the hangers to the window pane with the screen taut therebetween.

2. A window pane having a metallic sun screen related thereto, said screen having a plurality of horizontally disposed, vertically spaced louvers and a plurality of vertically disposed, longitudinally spaced wires connecting said louvers, and means securing the screen to the window and normally yieldingly holding said screen in tension between its top and bottom edges, said means including, a plurality of hangers engaged with the top and bottom edges of the screen adjacent said wires and bodies of resilient material bonded to and coupling the hangers to the window pane with the screen taut therebetween.

3. A window pane having a metallic sun screen related thereto, said screen having a plurality of horizontally disposed, vertically spaced louvers and a plurality of vertically disposed, longitudinally spaced wires connecting said louvers, and means securing the screen to the window

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and normally yieldingly holding said screen in tension between its top and bottom edges, said means including, a plurality of longitudinally spaced hangers engaging the top and bottom edges of the screen and bodies of resilient material bonded to and coupling the hangers to the window pane with the screen taut therebetween, said hangers engaging said vertical wires of the screen.

4. A window pane having a metallic sun screen related thereto, said screen having a plurality of horizontally disposed, vertically spaced louvers and a plurality of vertically disposed, longitudinally spaced wires connecting said louvers, and means securing the screen to the window and normally yieldingly holding said screen in tension between its top and bottom edges, said means including, a plurality of longitudinally spaced hangers engaging the top and bottom edges of the screen and bodies of resilient material bonded to the pane and bonded to the hangers and coupling the hangers to the window pane with the screen taut therebetween, said hangers engaging one of the louvers along the edge portion of the screen to which they are related.

5. A window construction including, a pair of glass panes, a metallic fabric sun screen engaged between the said panes and means normally yieldingly holding said screen in tension including a plurality of hangers engaged with the opposite sides of the screen at spaced intervals and bodies of resilient material bonded to the hangers and the panes and resiliently coupling the hangers to said panes with the screen taut therebetween.

6. A window construction including, a pair of glass panes, a metallic fabric sun screen engaged between the panes and means normally yieldingly holding said screen in tension including, a body of resilient material bonded to and extending between the panes of glass and extending about the perimeter thereof and in spaced relationship from the side edges of the screen and a plurality of hangers embedded in and bonded to said body and engaging the opposite side edges of the screen at longitudinally spaced intervals to yieldingly hold the screen taut.

7. A window construction including, a pair of glass panes, a metallic fabric sun screen engaged between the said panes, said screen having a plurality of horizontally disposed, vertically spaced louvers and a plurality of vertically disposed, longitudinally spaced wires connecting said louvers and means normally yieldingly holding said screen in tension between its top and bottom edges, including a plurality of hangers engaging the top and bottom edges of the screen and bodies of resilient material bonded to and extending between the panes and coupling the hangers to said panes with the screen taut therebetween, said hangers being U-shaped wire members engaged between a pair of louvers along the edge portions of the screen to which they are related, each to occur about one of the wires of the screen and having its legs embedded in said resilient body.

8. A window construction including, a pair of glass panes, a metallic fabric sun screen engaged between the panes, said screen having a plurality of horizontally disposed, vertically spaced louvers and a plurality of vertically disposed, longitudinally spaced wires connecting said louvers and means normally yieldingly holding said screen in tension between its top and bottom edges including, a body of resilient material bonded to and extending between the panes of glass and extending about the perimeter thereof and in spaced relationship from the side edges of the screen and a plurality of hangers carried by said body adjacent the top and bottom edges of the screen and engaging the screen to yieldingly hold the screen taut, said hangers being U-shaped members each engaged between a pair of louvers along the edge portion of the screen to which it is related and to occur about one of the wires of the screen, the legs of each of said hangers being embedded in and bonded to said body of resilient material.

9. A window construction including, a pair of glass panes, a metallic fabric sun screen engaged between the panes, said screen having a plurality of horizontally disposed, vertically spaced louvers and a plurality of vertically disposed, longitudinally spaced wires connecting said louvers and means normally yieldingly holding said screen in tension between its top and bottom edges including, a body of resilient material bonded to and extending between the panes of glass and extending about the perimeter thereof and in spaced relationship from the side edges of the screen and a plurality of hangers engaged in and carried by said body adjacent the top and bottom edges of the screen and engaging the screen to hold the screen taut, said hangers being U-shaped members each engaged between a pair of louvers along the edge portion of the screen to which it is related, to occur about one of the wires of the screen, said body securing the panes together in fixed position and hermetically sealing the space between the panes in which the screen is arranged.

10. A window construction including, a pair of glass panes, a metallic fabric sun screen engaged between the panes, said screen having a plurality of horizontally disposed, vertically spaced louvers and a plurality of vertically disposed, longitudinally spaced wires connecting said louvers and means normally yieldingly holding said screen in tension between its top and bottom edges including, a body of resilient material bonded to and extending between the panes of glass and extending about the perimeter thereof and in spaced relationship from the side edges of the screen and a plurality of hangers carried by said body adjacent the top and bottom edges of the screen and engaging the screen to hold the screen taut, said hangers being U-shaped metal members having rounded base portions engaged about the wires of the screen at

points spaced inward of the sides of the screens to which they are related and having legs projecting from the said sides of the screen embedded in and bonded to the body.

11. The method of manufacturing a window construction including two panes of glass arranged in spaced parallel planes with a metallic sun screen engaged therebetween to be hermetically sealed therebetween and yieldingly held in tension by a plurality of U-shaped malleable wire hangers having rounded base portions and elongated legs including, arranging said screen adjacent one surface of one of the panes of glass, then engaging the base portions of said wire hangers along the opposite side edges of the screen, then pulling said hangers to draw the screen taut and under tension, then bending the legs of said hangers over the adjacent edges of the pane of glass to hook therewith and maintain the screen under tension, then applying the other pane of glass adjacent the other side of the screen and in register with the first mentioned pane, then depositing a body of plastic resilient material between the panes about the perimeter thereof to bond with the said panes and with the hangers, then allowing the material to set and cure and then bending the hooked legs of the hangers from engagement with said pane of glass and transferring the tensional force exerted therethrough onto said resilient body.

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