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THERMALLY CONTROLLED LIQUID
SHADING OR SCREENING UNIT
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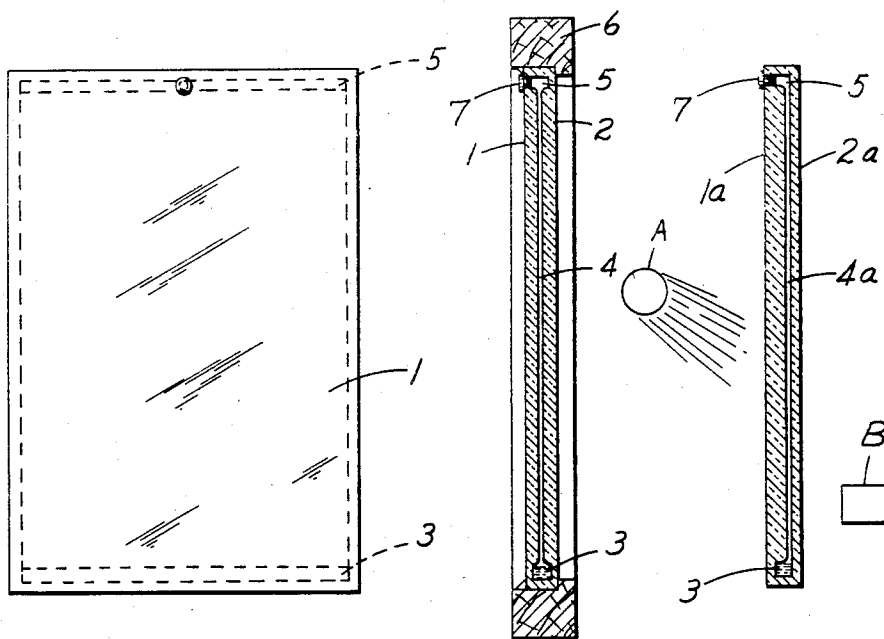


FIG. 1.

FIG. 2.

FIG. 3.

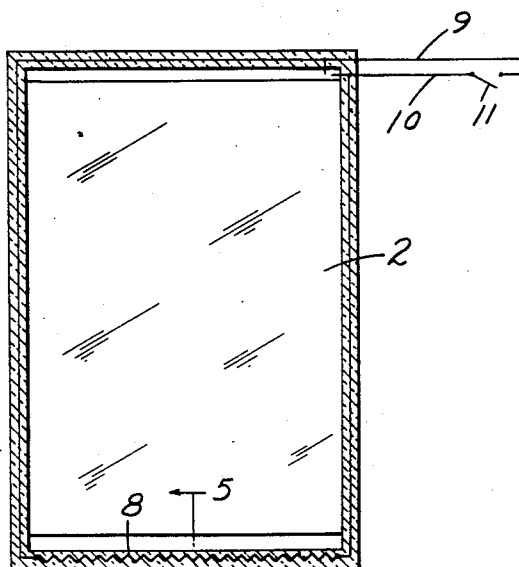


FIG. 4.

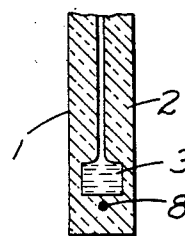


FIG. 5.

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THERMALLY CONTROLLED LIQUID
SHADING OR SCREENING UNIT

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5 Claims. (Cl. 88—60)

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The object of my present invention has been to provide a novel form of thermally controlled shading or screening unit involving the use of shading or screening transparent, translucent, or opaque materials that may be availed of in the construction of any product where thermal or visible shading or screening is desired at one time and not at another.

In the carrying out of my invention I utilize the principle of the expansive nature of practically all liquids when subjected to an increase in temperature, as expressed by their individual coefficients of expansion.

In one of the practical embodiments of my invention I employ a unit made up of two planes of material separated by a relatively narrow space, and hermetically sealed together with an enclosed liquid, the latter acting as the shading or screening means when the unit is subjected to the action of heat so that the enclosed liquid is caused to expand from a collecting chamber between the said planes of material and occupy the major portion or all of the narrow space between said planes, at which time the liquid forms a shading or screening film. The extent of the area of shading or screening for the unit may be controlled by the size of the collecting chamber in conjunction with the distance between the inside surfaces of the two planes of material making up the unit.

In a further practical embodiment of my invention if a liquid shading or screening medium is employed, which liquid is either absorptive or reflective toward light rays, a partial or total screening of light is obtainable depending upon the totality of the absorptive or reflective qualities of the liquid used. On the other hand, if a liquid is availed of which is either absorptive or reflective toward heat rays, a partial or total screening of radiant heat is obtainable in the use of my invention. In the latter connection, namely when a transparent liquid resistant to heat rays is employed, my invention is particularly useful in conjunction with window lights for greenhouses, skylights, automobile windows, glass building bricks, and any other places where light but not heat is desired either on occasion or at all times.

An example of the usefulness of my invention in reference to the shading phase of the action of the unit may be indicated as when the invention is employed for tellers' or cashiers' windows in banks, or for private offices and the like, where normally transparent windows are

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desired to be rendered opaque when privacy may be desired at certain times.

My invention further involves the utilization of a shading or screening unit of the type above referred to wherein the thermal action of the liquid hermetically sealed in the unit to cause the same to occupy the space between the planes of the material employed, is effected by means of a heating coil or member physically applied to the shading or screening unit above described, whereby to artificially produce sufficient heat that when generated in the unit, it will cause the flowing of the liquid between the planes of the unit, from the collecting chamber or reservoir therefor, over the surface of the said planes at the facing sides thereof to occupy the space between the planes in the form of the shading or screening film. Other objects of my invention will appear hereinafter.

For a full understanding of my invention and the parts thereof, reference may be had to the following detail description and the accompanying drawings, in which:

Figure 1 is a front elevation view of a simple form of shading or screening unit embodying the essential features of my invention.

Figure 2 is a vertical sectional view of the unit as seen in Figure 1, as applied to a frame structure which may be the frame for a window or any like frame.

Figure 3 is a view similar to Figure 2 in that it is a vertical sectional view similar to Figure 1, the construction being slightly modified in reference to the arrangement or formation of the collecting or reservoir chamber at the base of the unit and the overflow chamber at the top of the unit.

Figure 4 is a front elevation view similar to Figure 1, but illustrating a modified embodiment of my invention where I utilize an electric heater for generating the heat availed of to cause the thermal expansion of the liquid in the unit for effecting the desired screening or shading results thereof.

Figure 5 is an enlarged fragmentary view taken on the line 5—5 of Figure 4.

Now specifically describing the different embodiments of my invention as presented herein, I refer first to the construction shown in Figures 1 and 2, Figure 1 disclosing a panel-like unit which is made up of the spaced planes of material designated 1 and 2. The members 1 and 2 are hereinafter referred to as panes since they are preferably made out of glass or similar substance. I may avail of the use of plastic for

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making the unit of my invention, however, and Lucite as a transparent plastic would be suitable for my purpose, although I do not wish to be limited to any particular material other than as characterized by the scope of the claims attached hereto.

At one end of the unit the space between the panes 1 and 2 is in communication with a collecting reservoir or chamber 3, and at the other end of the unit, said space, designated 4, is in communication with an overflow reservoir or chamber 5.

When my unit is employed as a window member it may be mounted in a frame 6 of wood, metal, or the like, as may be desired and dependent upon the particular structure in which the unit is incorporated.

As previously suggested herein, it is contemplated that a liquid, such as water, in a small volume, approximately filling the chamber 3, shall be received in said chamber, and said liquid is hermetically sealed between the parts 1 and 2 by hermetic sealing of the edge portions of said members 1 and 2.

It is contemplated according to my invention that previous to emplacement of liquid or water in the chamber 3 or the space between the members 1 and 2, the said space shall be vacuumized. Any known method of accomplishing the latter operation may be resorted to, but a simple method that can be readily used may be to employ a plug opening at one end of the unit near the chamber 5, flowing the necessary amount of liquid previously measured between the parts 1 and 2 and to the collecting chamber 3. Thereupon, by applying heat to the panes 1 and 2 the liquid from the reservoir 3 will move between the panes 1 and 2 and occupy the space 4 practically up to the overflow chamber 5, forcing the air out of the unit to the desired extent, after which the said plug opening may be closed by the plug shown at 7 to hermetically seal the liquid in the unit.

I contemplate, according to the construction of my invention, that the unit comprising the parts 1 and 2 and the chamber portions 3 and 5 may be of an integral formation, or said unit may be constructed of assembled parts suitably hermetically sealed together in order to provide the desired ultimate construction.

In Figure 3 of my drawings the shading or screening unit is of substantially the same construction as in Figure 1, except that space 4a between the transparent or pane members 1a and 2a is located closer to one side of the panel or unit than to the other side. Under some conditions this arrangement of the screening or shading space may be desirable.

In Figure 4 of my drawings I have shown a modification of my invention wherein there is incorporated adjacent to the lower collecting chamber 3 a heating unit 8 which is made up of a suitable resistance element as by utilizing a piece of wire of higher resistance than the two lead wires 9 and 10 which are shown as entering the unit near the top portion thereof and passing downwardly adjacent to the opposite edges or side portions thereof. A suitable switch 11 may be used to supply current through the lead wires 9 and 10 to the heating element 8 and when the circuit is closed by the switch the resistance coil or member 8 will heat the liquid in the lower or end well 3, forcing it to pass from the well and enter the space between the panes 1 and 2 until it reaches the opposite well or chamber 5, at

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which point the liquid will short circuit, thereby throwing the heating element out of the circuit and discontinuing its operation. When the liquid cools sufficiently to be withdrawn from the well 5, the heating element would be again thrown into the circuit and this process would continue as long as the main circuit remains closed by the switch 11. The distance between the two lead wires in the overflow well or chamber 5 would be determined by the electrolytic qualities of the liquid and the resistance of the heating element employed.

In reference to the forms of my invention as disclosed in Figures 1 to 3 inclusive, it will be apparent that the units set forth are designed primarily, though not exclusively, as an automatic controlling means of maximum heat from natural sources such as the sun. The temperature at which the protection by shading or screening incident to the movement of the film of the water from the collecting chamber 3 up to or toward the chamber 5, commences, is necessarily controlled by the size of the chamber 3 and the temperature at which it is filled. The point or period at which total protection over the entire area of the unit would occur, is governed by the degree or measurement of the space between the two inner surfaces of the members 1 and 2 and the size of the chamber 3.

As a protective factor in the use of my unit, in case of excessive heat such as might lead to over-expansion and explosion within the unit, the plug 7 may be provided in the form of a weak or blow-out spot which would give way under such excessive heat or over-expansion action, thereby to prevent the destruction of the unit under an abnormal condition of use.

For the control of the shading or screening action of the liquid in the unit, it is contemplated that under certain conditions said liquid may have a dye included therein, and its properties of opaqueness thereby regulated for the control of the screening or shading functions of the liquid.

In Figure 3 A indicates a source of light rays or heat, and B an object to be shaded or screened from said source.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. Screening means for windows, the same comprising a hollow window unit including a hermetically sealed hollow space said hollow space being formed by spaced transparent window panes so closely spaced as to form a space therebetween of film-like dimension, said hollow space being provided in such form as to supply a collecting chamber at the base of the window, a liquid disposed in the collecting chamber, heating means for said liquid to produce thermal expansion thereof to cause the same to rise in the film-like space between the window panes to accomplish a screening effect of greater or less extent, in respect to the passage of heat or light, through the window, said heating means comprising a source of electric current including an electric circuit, a heater at the base of the window adjacent to the collecting chamber for heating the liquid in the latter, switch means for closing the electric circuit to supply electric current to said heater, and electric terminals included in said electric circuit near the upper portion of the window unit and arranged in the path of movement of the said liquid after thermal expansion thereof so that said terminals may be

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closed by the said liquid for short-circuiting the electric circuit from the electric heater to discontinue the heating action of the latter automatically.

2. Screening means for windows comprising a hollow window unit including spaced, relatively broad, transparent vision panes normally permitting vision therethrough and so closely spaced together as to provide a space of substantially film-like thickness therebetween, a collecting reservoir communicating with said space at the bottom thereof, said space being vacuumized, and a thermally expansible screening liquid contained in said reservoir and of a volume, when unheated, normally approximating the volume of said reservoir and so proportioned to the volume of the space between the panes as normally not to occupy any portion of such space, said liquid when subjected to heat being adapted by thermal action to expand so as to occupy a greater or less portion of the film-like space between the panes to afford screening effect, said screening liquid being hermetically sealed in said unit and said screening liquid being of a volume so proportioned to the volume of the reservoir and the volume of said space between the panes as to occupy said reservoir and substantially all of said space between said panes when said liquid is heated to a predetermined temperature.

3. Screening means for windows as claimed in claim 2, combined with an instrumentality for artificially heating the liquid in the hollow portion of the unit to thereby control the thermal expansion of the liquid for causing a screening effect incident to the movement of the liquid to occupy a greater or less portion of the film-like space between the panes of the window, said heating means including an electric circuit for heating the liquid at the base of the hollow space of the unit, and instrumentalities including elec-

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tric contacts arranged in the path of movement of the screening liquid so that at a predetermined time in such movement said contacts will be closed to short circuit the electric circuit to discontinue the heating action of the heating means.

4. Screening means for windows as claimed in claim 2, wherein said screening liquid has a dye included therein for regulating opaqueness of said liquid for control of the screening functions of said liquid.

5. Screening means as claimed in claim 2, said unit having a blow-out opening communicating with said space, and a plug hermetically sealing said opening.

JOHN D. W. SNOWDEN, JR.

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