DAYLIGHT REDIRECTING GLAZING LAMINATES

The present application claims priority from U.S. Provisional Application No. 61/830,048, filed on May 31, 2013, which is incorporated in its entirety herein by reference.

Field of the Disclosure

This disclosure relates generally to light management constructions, specifically to light redirecting constructions, such as constructions comprising solar light redirecting layers and glazing units.

Background

A variety of approaches are used to reduce energy consumption in buildings. Among the approaches being considered and applied is the more efficient use of sunlight to provide lighting inside buildings. One technique for supplying light inside of buildings, such as in offices, etc. is the redirection of incoming sunlight. Because sunlight enters windows at a downward angle, much of this light is not useful in illuminating a room. However, if the incoming downward light rays can be redirected upward such that they strike the ceiling, the light can be more usefully employed in lighting the room.

In general, conventional safety glazing is formed from a laminate made of two rigid layers, typically glass, and an anti-lacerative mechanical energy absorbing interlayer, such as, for example, plasticized polyvinyl butyral (PVB). Typically, the glazing is prepared by placing the PVB layer between glass sheets, eliminating air from the engaging surfaces, and then subjecting the assembly to elevated temperature and pressure in an autoclave to fusion-bond the PVB and glass into an optically-clear structure. The glazing may then be used in buildings, or the windows, windshields, or rear glass of a motor vehicle.

Summary

Microstructured films are used to redirect sunlight to provide illumination within a room. Microstructured films are typically adhered to glass substrates with a pressure sensitive adhesive. When microstructured films are adhered to the glass with the structured surface exposed they are susceptible to mechanical damage in use. The optical properties of the microstructured films may be altered if scratched or otherwise damaged. The present disclosure provides microstructured films laminated between glazing panes that retain light-redirecting properties and methods of preparing such microstructured films.

An aspect of the present invention provides a light redirecting construction comprising:

a first glazing substrate;

a light redirecting film comprising at least one microstructure surface;

a second glazing substrate, and

a first interlayer adjacent the first glazing substrate to both the light redirecting film and the second glazing substrate;

wherein the light redirecting film has an area smaller than the area of the first interlayer.

Brief Description of the Figures

Figure 1 shows typical embodiments of the present disclosure. In these embodiments, DRF stands for daylight redirecting film and the "clear glass" substrate can be replaced with any other glazing pane, not necessarily made of glass.

Figure 2 shows a cross-sectional view of an embodiment of the present disclosure.

Figure 3 shows an embodiment of the present disclosure where the space enclosed between the clear glass and a microstructured film is filled by aerogel. In these embodiments, and any other embodiments where "clear glass" is shown in the present application, the "clear glass" substrate can be replaced with any other glazing pane, not necessarily made of glass.

Claims:

1. A light redirecting construction comprising:
   - a first glazing substrate;
   - a light redirecting film comprising at least one microstructure surface;
   - a second glazing substrate, and
   - a first interlayer adjacent the first glazing substrate to both the light redirecting film and the second glazing substrate;

   wherein the light redirecting film has an area smaller than the area of the first interlayer.

2. The light redirecting construction according to claim 01, wherein the light redirecting construction is a laminate.

3. The light redirecting construction according to any of the preceding claims, wherein the light redirecting film is positioned in the light redirecting construction so that the side of the light redirecting film having the at least one microstructure surface is facing the second glazing substrate.

4. The light redirecting construction according to any of the preceding claims, wherein the light redirecting film is positioned in the light redirecting construction so that the side of the light redirecting film having the at least one microstructure surface is facing the second glazing substrate; and

   wherein the light redirecting construction further comprises an optical film located between the light redirecting film and the second glazing substrate.

5. The light redirecting construction according to any of the preceding claims, wherein the light redirecting film is positioned in the light redirecting construction so that the side of the light redirecting film having the at least one microstructure surface is facing the second glazing substrate and further comprises aerogel in the volume defined by the at least one microstructure surface and the second glazing substrate.

6. The light redirecting construction according to any of the preceding claims, further comprising a diffusing film.

7. The light redirecting construction according to any of the preceding claims, further comprising a third glazing substrate bonded to the second glazing substrate by a second interlayer.

8. The light redirecting construction according to any of the preceding claims, further comprising a third glazing substrate, wherein the third glazing substrate is not bonded to the second glazing substrate, and is located a distance L1 from the second glazing substrate.

wherein at least one of the first or the second microstructured surfaces comprises an ordered arrangement of a plurality of asymmetric refractive prisms, such that the first solar light redirecting layer and the second solar light redirecting layer are not identical or mirror images.

24. The light redirecting construction according to any of the preceding claims, wherein the light redirecting film comprises:

- an optical substrate having a first major surface and a second major surface opposite the first major surface;
- a first solar light redirecting layer disposed on the first major surface of the optical substrate, wherein the first solar light redirecting layer comprises a first microstructured surface comprising a plurality of multi-sided refractive prisms; and
- a second solar light redirecting layer disposed on the second major surface of the optical substrate, wherein the second solar light redirecting layer comprises a second microstructured surface comprising a plurality of multi-sided refractive prisms,

wherein at least one of the first or the second microstructured surface comprises an ordered arrangement of a plurality of asymmetric refractive prisms, such that the first solar light redirecting layer and the second solar light redirecting layer are not identical or mirror images.

25. The light redirecting construction according to any of the preceding claims, wherein the light redirecting film comprises:

- a visible light diffusing layer disposed on the first glazing substrate; and
- a light redirecting layer adjacent to the visible light diffusing layer, the light redirecting layer comprising a major surface forming a plurality of prism structures, and wherein the visible light diffusing layer and light redirecting layer are oriented such that incoming solar light contacts the visible light diffusing layer before contacting the light redirecting layer.

~~26. The light redirecting construction according to any of the preceding claims, wherein the light redirecting film comprises:~~

- ~~a patterned visible light diffusing layer; and~~
- ~~a light redirecting layer adjacent to the visible light diffusing layer wherein the light redirecting layer comprises a major surface forming a plurality of prism structures.~~

~~27. The light redirecting construction according to any of the preceding claims, wherein the light redirecting film is chosen from a light redirecting film disclosed in PCT publications Nos. WO 2011/084391, WO 2012/134787, WO 2013/012865 and WO 2013/012858.~~