projector's light would be greatly increased without adversely affecting the camera's view. In **FIG. 23A**, the majority of the camera's view only goes through one screen layer, while all of the projected light goes through multiple layers.

[**0212**] There are several ways of achieving the desired effect. Instead of a pleated screen, a flat screen could be supplanted with a microlouver material to create the same effect as a pleated screen, as shown in **FIG. 23B**. Alternatively, small, flat sheetlike particles of screen material could be added (all oriented horizontally) to a transparent substrate, as shown in **FIG. 23C**. In all cases, a typical light ray approaching the screen from an oblique angle encounters far more scattering material than a typical light ray that is perpendicular to the material.

[**0213**] The texture of the screen in all cases should be small enough that the viewer would not notice it. This technique is most useful when using an off-axis projector; however, it is useful in any situation where the projector and camera are viewing the screen from different angles.

[**0214**] It is important to prevent the infrared light source from shining on the screen and reducing the contrast. Thus, if the infrared illuminator is placed behind the screen, it is advantageous to place the infrared illuminator at an angle for which the screen's scattering is minimized.

[**0215**] Alternatively, view control film products (such as Lumisty), which are translucent at a narrow range of viewing angles and transparent at all other angles, can help reduce glare in some cases.

[**0216**] By placing the projector at a particular angle to the screen, it can be ensured that anyone looking directly into the projector's beam will be looking at the screen at an angle for which the view control film is translucent. **FIGS. 24A and 24B** show one method by which view control film can reduce glare. **FIG. 24A** shows the experience of a person (or camera) viewing light through one kind of view control film. Light coming from the translucent region is diffused, reducing or eliminating any glare from light sources in this region. Light sources from the two transparent regions will not be diffused, allowing the person or camera to see objects in these regions. The boundaries of the region of view control film are often defined by a range of values for the angle between a light ray and the view control film's surface along one dimension. **FIG. 24B** shows the view control film in a sample configuration for reducing glare on an interactive window display. The view control film is used in conjunction with the IR-transparent VIS-translucent screen. Because of the angle of the projector, it is impossible to look directly into the projector's beam without being at an angle at which the view control film diffuses the light. However, the camera is able to view objects through the view control film because the camera is pointed at an angle at which the view control film is transparent. Thus, glare is reduced without affecting the camera's ability to view the scene.

[**0217**] Exemplary Configuration

[**0218**] One exemplary embodiment of a window-based display **2500** utilizes a scattering polarizer as a screen, as shown in **FIG. 25**. This embodiment is an interactive window display **2500** in which all the sensing and display components necessary to make the display work are placed behind the window **2505**. The window display **2500** allows users in front of the window **2505** to interact with video images displayed on the window **2505** through natural body motion.

[**0219**] In one embodiment, the displayed image is generated by an LCD projector **2510**. In most LCD projectors, red and blue light are polarized in one direction, while green is polarized in a perpendicular direction. A color selective polarization rotator **2515**, such as the retarder stack "Color Select" technology produced by the ColorLink Corporation, is used to rotate the polarization of green light by 90 degrees. Alternatively, the polarization of red and blue light can be rotated by 90 degrees to achieve the same effect. By placing color selective polarization rotator **2515** in front of projector **2510**, all the projector's light is in the same polarization. The scattering polarizer **2525** is oriented so that the direction of maximum scattering is parallel to the polarization of the projector's light. Thus, when this projector's light reaches scattering polarizer **2525**, it is all scattered, providing an image for the user on the other side of the screen.

[**0220**] A video camera **2530** sensitive to only near-infrared light views the area in front of the screen, referred to as the "camera's field of view". Objects within this field of view will be visible to camera **2530**. Illumination for the camera's field of view comes from sets of infrared LED clusters **2535**, which produce light in wavelengths viewable by camera **2530**, on the back side of the screen. Note that the camera's field of view is slanted upward so that only people who are near the screen fall within the field of view. This prevents objects distant from the screen from affecting the interactive application that uses camera **2530** as input.

[**0221**] The paths of visible and infrared light through the exemplary embodiment in **FIG. 25** will now be described. The two perpendicular polarizations of light are referred to as polarization A and polarization B.

[**0222**] Visible light emerges from LCD projector **2510**, with red and blue light in polarization A and green in polarization B. This light first passes through color selective polarization rotator **2515**, which leaves the red and blue light unaffected, but rotates the polarization of green light such that it is in polarization A. Next, this light passes through a linear polarizer **2520**, which transmits light in polarization A and absorbs light in polarization B. This linear polarizer **2520**"cleans up" the light—it absorbs any of the projector's light which is still B-polarized. Next, the light passes through scattering polarizer **2525**, which is oriented to scatter light in polarization A and transmit light in polarization B. Thus, nearly all of the projector's light is scattered. Note that this scattered light retains its polarization A. Optionally, the light may then pass through a linear polarizer **2540** which transmits light in polarization A and absorbs light in polarization B. This polarizer tends to improve image quality.

[**0223**] The infrared light emitted from infrared illuminators **2535** may begin unpolarized. Optionally, for improved clarity, this light can first pass through an infrared linear polarizer to polarize it in polarization B so that less of it will be scattered by scattering polarizer **2525**. If the light is unpolarized, some of it will be scattered as it passes through scattering polarizer **2525**, but the light of polarization A will pass through scattering polarizer **2525** unscattered. Since the wavelength of the infrared light is sufficiently long, it passes unaffected through any visible-light linear polarizers **2540** and can illuminate objects in front of the screen, such as a human user.

[**0224**] Infrared light returning from in front of window **2505** toward camera **2530** will be unaffected by linear polarizer **2540**. However, as the light passes through scattering polarizer **2525**, the light of polarization A will be