United States Patent

Malone

[15] **3,645,317**

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[54] VENETIAN BLIND

[72] Inventor: **Charles H. Malone**, New York, N.Y.

[73] Assignee: **Charles H. Malone & Company, Inc.**, New York, N.Y.

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[21] Appl. No.: **880,337**

[52] **U.S. Cl.** **160/168**, 160/236

[51] **Int. Cl.** **E06b 9/26**

[58] **Field of Search** 160/166–178, 236, 160/241

[56] **References Cited**

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Primary Examiner—Peter M. Caun

Attorney—Pennie, Edmonds, Morton, Taylor and Adams

[57] **ABSTRACT**

A Venetian blind is formed of strips which are provided with a thin layer of metal such that they reflect unwanted infrared radiation yet are substantially transparent to visible light except in the closed position when, by causing adjacent strips to overlap, the closed blind is substantially less transparent to visible light.

8 Claims, 9 Drawing Figures

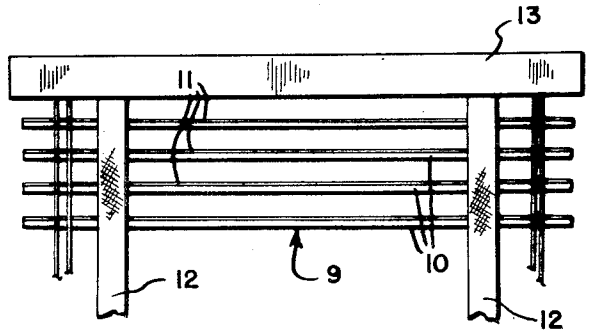


FIG. 1

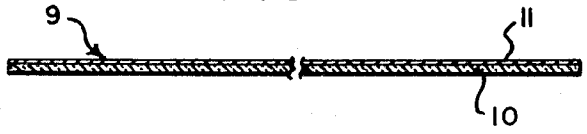


FIG. 2

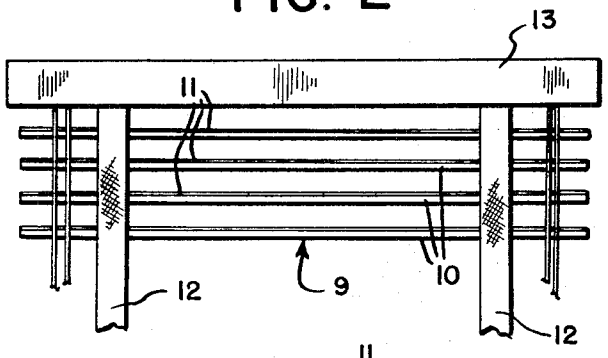


FIG. 3

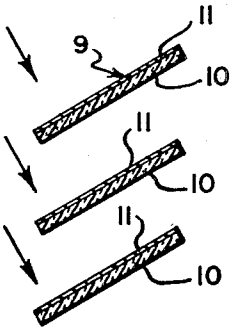


FIG. 4

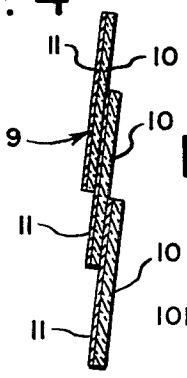


FIG. 6

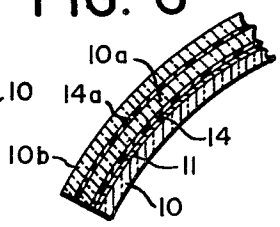


FIG. 5

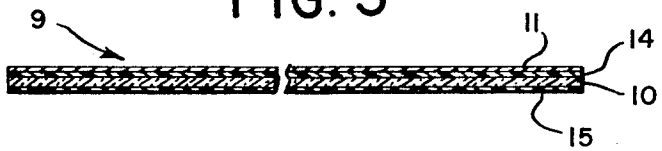


FIG. 8

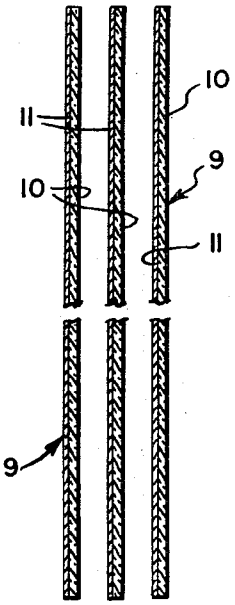


FIG. 7

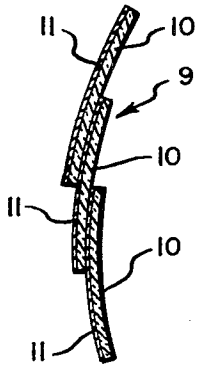
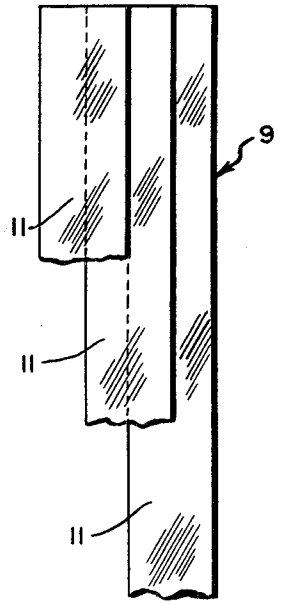


FIG. 9



INVENTOR
CHARLES H. MALONE
BY
Pennie, Edmonds, Morton, Taylor & Adams
ATTORNEYS

VENETIAN BLIND

This invention relates to Venetian blinds and, more particularly, to a Venetian blind which is heat reflective but substantially transparent to visible light in all but its fully closed position.

Venetian blinds are generally made of nontransparent strips of metal, plastic or cloth, with the result that when their strips are closed they obstruct vision. Venetian blinds also have been proposed heretofore in which the strips or slats are made of transparent material such as glass or plastic and bear a layer of metal which is sufficiently thin to be transparent yet capable of effectively reflecting solar heat rays or the like. Thus, when completely closed, such blinds reflect enough infrared radiation to reduce heat transmission and, because they also reflect light, they appear completely nontransparent from the outside. At night, however, when a room is interiorly lighted, the closed blind prevents outward visibility but permits substantially unhindered inward visibility with resulting lack of privacy in the room.

I have now devised a Venetian blind of the transparent, heat-reflective type which nevertheless provides complete privacy at night in an interiorly lighted room. The Venetian blind of my invention comprises a plurality of axially aligned blind strips supported adjacent their ends by movable supporting elements capable of simultaneously rotating the strips substantially about their longitudinal axes from a closed position in which the strips lie in substantially a single plane to an open position in which the planes of the individual strips are substantially parallel but spaced to allow passage of light, the blinds being composed essentially of body material substantially transparent to visible light and carrying a superimposed transparent reflective layer of metal, the strips being mounted with their central longitudinal axes positioned apart by a distance approximately one-half the width of the strip. The blind strips are advantageously comprised of a substantially transparent body material carrying a superimposed transparent reflective layer of metal over the surface of which there is applied a layer of transparent film-forming material in intimate contact with the layer of metal.

These and other novel features of the invention will be more readily understood from the following description taken in conjunction with the accompanying drawings in which

FIG. 1 is a cross-sectional side elevation of a Venetian blind strip or slat used in the blind structure of the invention;

FIG. 2 is a partial front elevation of a Venetian blind formed of horizontal strips embodying the invention and shown in the open position;

FIG. 3 is a schematic side section of the blind of FIG. 2 shown in the half-closed position;

FIG. 4 is a schematic section of the blind of FIG. 2 shown in the fully closed position;

FIG. 5 is a cross-sectional side elevation of another form of blind strip useful for embodiment in the invention;

FIG. 6 is a cross-sectional side elevation of a presently preferred form of curved blind strip for use in the Venetian blind pursuant to the invention;

FIG. 7 is a schematic side section of a closed blind embodying the invention wherein the strips are of concave shape;

FIG. 8 is a schematic front elevation of a blind, formed of vertical strips, embodying the invention and shown in the open position; and

FIG. 9 is a schematic front elevation of the blind of FIG. 8 shown in the closed position.

The Venetian blind strip 9 shown in FIG. 1 comprises a strip body 10 of substantially transparent self-supporting sheet material, advantageously substantially noncombustible or noncombustion supporting, such as glass or plastic, on which there is deposited a thin layer 11 of metal such as aluminum, gold, or the like. The metal layer 11 is advantageously applied by vacuum sputtering or deposition but in any event is sufficiently thin so as to be substantially transparent yet thick enough to reflect infrared rays. It is presently preferred that the applied metal layer cut down the transparency of the sheet material to about 15 to 35 percent, and preferably to about 20 to 25 percent, of the transparency of the sheet material without the metallic layer. In general, a metal film thickness of about 20 to 500 angstroms is presently considered to be advantageous and is preferably about 30 to 50 angstroms thick.

The blind strips are supported in any conventional manner to form a Venetian blind in which, as shown in FIG. 2, the strips are mounted in axially parallel positions supported by conventional tapes 12 hanging from a header 13. In a conventional Venetian blind, the strips are so mounted that their central longitudinal axes are positioned apart by a distance only slightly less than that of the width of the strips, whereas in the blind of the present invention the strips are mounted with their central longitudinal axes spaced apart by a distance equal to approximately one-half the width of the strips. When the strips of my blind lie in substantially parallel spaced planes, as they do in the blind-open position shown in FIG. 2, the blind resembles a conventional Venetian blind in that it offers little impediment to visibility through the blind. However, when the blind of the invention is partially closed as shown in FIG. 3, the metallic layer 11 on each strip reflects a substantial amount of solar radiation represented by the arrows, yet the strip, being transparent to visible light, does not significantly impair outward visibility through the blind. When the blind is in the completely closed position shown in FIG. 4, the infrared radiation reflection by the metal layer 11 on the strips is at its maximum because the strips, by virtue of their axial spacing mentioned hereinbefore, advantageously overlap one another so that throughout the area of the blind there is a double layer of strips. As a result, the blind has two metal layers 11 over its entire area and these two layers act to reduce the visible light transparency through the blind sufficiently to make the blind relatively nontransparent from the outside at night even when the room on the inside of the blind is illuminated.

In order to enhance the effectiveness of the doubling of the strips in reducing light transparency, it is advantageous to tint the strip with gray or color which is light enough to leave the strips transparent in the semiclosed position (FIG. 3) but significantly less transparent when the color is doubled by overlapping of the strips in the blind-closed position. This color can be incorporated in the strip body 10 as previously indicated, or it can be applied, as shown in FIG. 5, as a separate layer 14 of a colored plastic sheet or of a liquid film-forming coating of colored plastic, lacquer, or the like, which will form a hard substantially transparent film, with the metal layer either adjacent the strip body 10 or on the outer surface of the tinted or colored layer 14. If desired, a second layer 15 of tinted or colored transparent material can be applied to the other surface of the strip body. When the tints or colors of the layers 14 and 15 are different, it makes possible the use of an inside blind color at night compatible with the interior decor of the room and an outside blind color, tint, or degree of visible light reflectivity in the daytime compatible with the architectural plan of the building in which the blind is installed. By appropriate choice of subtractive colors for the transparent layers 14 and 15, their transparency can be greatly reduced, when the strips are in their overlapping position, by the light-cancelling effect of the two colors.

In the presently preferred embodiment of the invention, the individual strips are formed, as shown in FIG. 6, of at least two layers 10 and 12*a* of transparent plastic sheet material with the thin transparent metal layer 11 applied to the inner surface of one of the layers of plastic sheet material and with the two layers 10 and 10*a* joined by an intermediate layer 14 of heat-setting transparent coloring agent such as a dye. By interposing the thin metal film layer 11 between the two layers of transparent plastic, the metal film is protected against abrasion, and by using two layers 10 and 10*a* of plastic sheet material joined by an adhesive layer 14, the sheet layers 10 and 10*a* can be formed of commercially available clear polyester or vinyl film, or the like, and the color, if desired in the composite blind strip, can be readily obtained in the form of commercially available tinted transparent adhesive in liquid or sheet form which will set to a substantially transparent but

colored or tinted layer **14** between the clear body layers **10** and **10***a*. Where two different tints or colors are desirable, as described hereinbefore, a third layer **10***b* of transparent sheet material can be added to the composite assembly by means of a second layer **14***a* of transparent adhesive in which the second color is incorporated.

I have found that the application of a transparent adhesive layer over the applied transparent metal layer provides an unexpected advantage. When the layer **11** of metal is applied to the transparent base sheet layer **10** and the resulting product is moved through a transparency-measuring device, it will be found generally that the transparency will vary considerably from spot to spot. For example, if the transparency of the metal-coated base layer averages about 20 percent, it will be found that the transparency will fluctuate between about 15 and 25 percent. However, after a second layer of transparent base material has been added by means of a layer of transparent adhesive overlying the applied metal layer, the transparency of the resulting product will be substantially uniform over the entire surface of the composite structure. This result is also achieved when only a layer **14** of the transparent adhesive-type material, colored or not, is applied to the surface of the metal layer without the addition of a superimposed layer of plastic sheet material. In either case, the intimate contact between the film-forming material and the metal surface, due either to the application of the film-forming material in liquid form or to the pressure and heat used when the film-forming adhesive-type material is applied in the form of a thin film, appears to make more uniform the overall transparency of the final product assembly. Of course, the thin layer of adhesive-type material will not offer the same degree of protection to the metal layer **11** as will an additional protective layer **10***a* of base sheet material, but for some purposes it does offer sufficient protection for the metal.

I have also found that when the layer **10** is formed of transparent plastic material such as a polyester or vinyl sheet, or the like, and is contour heat-set in the conventional concave shape shown in FIG. **7**, the heat-setting must be effected at a temperature significantly higher, and advantageously 50° to 100° F. higher, than the temperature which the strip will attain in use on a hot sunny day, for example. Unless the heat-setting temperature substantially exceeds the use-temperature of the curved strip, its heat-responsive memory will cause the strip to return at least partially to its original flat form. This effect applies to the curved sheet strip whether it is formed of only a single layer **10** of base material, as shown in FIG. **7**, or of a plurality of base layers **10**, **10***a* and **10***b*, as shown in FIG. **6**. Thus, when using a polyester or polyvinyl material for the base layer or layers, I have found it advantageous to heat-set the desired curvature into the blind strip at a temperature of about 200° to 250° F. in order to avoid memory distortion in service.

It will be readily apparent that the present invention is not limited to blinds made of horizontal flat or concave strips but that the strips can be mounted vertically as shown in FIGS. **8** and **9** wherein the blinds are shown in the open and closed positions, respectively.

I claim:

1. In a Venetian blind comprising a plurality of axially aligned blind strips supported adjacent their ends by movable supporting elements capable of simultaneously rotating the strips substantially about their longitudinal axes from a closed position in which the strips lie in substantially a single plane to an open position in which the planes of the individual strips are substantially parallel but spaced from one another to allow passage of light, the improvement which comprises blind strips composed essentially of transparent body material and carrying a superimposed transparent reflective layer of metal, the strips being mounted so that their central longitudinal axes are positioned apart by a distance approximately one-half the width of the strip to provide, when the blind is in a closed position, two layers of metal over the area of the blind which act to reduce the visible light transparency through the blind sufficiently to make the blind relatively nontransparent.

2. A Venetian blind according to claim **1** in which the body portion of each strip is tinted to an extent such as to remain substantially transparent to visible light.

3. A Venetian blind according to claim **1** in which a layer of tinted light-transparent material is applied to at least one side of the blind strip.

4. A Venetian blind according to claim **1** in which a layer of tinted light-transparent material is applied to each side of the strip, the colors of the tinted material being different from one another.

5. A Venetian blind according to claim **1** in which a layer of tinted transparent material is applied to each side of the strip, the colors of the tinted material being substantially subtractive.

6. A Venetian blind according to claim **1** in which a layer of transparent material is applied to the metal layer in intimate contact therewith.

7. A Venetian blind according to claim **1** in which each strip comprises a composite assembly comprising at least two base layers of substantially transparent heat-setable plastic body material, a transparent reflective layer of metal applied to at least one surface of one of the base layers facing another of the base layers, and a layer of transparent film-forming adhesive material interposed between and securing the adjacent layers of base material, each of the layers of adhesive material containing a different transparent coloring material.

8. A Venetian blind according to claim **7** in which the composite assembly is heat-set in contoured shape, the heat-setting having been effected at a temperature substantially above the temperature which the strip will attain in use.

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