

Nov. 28, 1933.

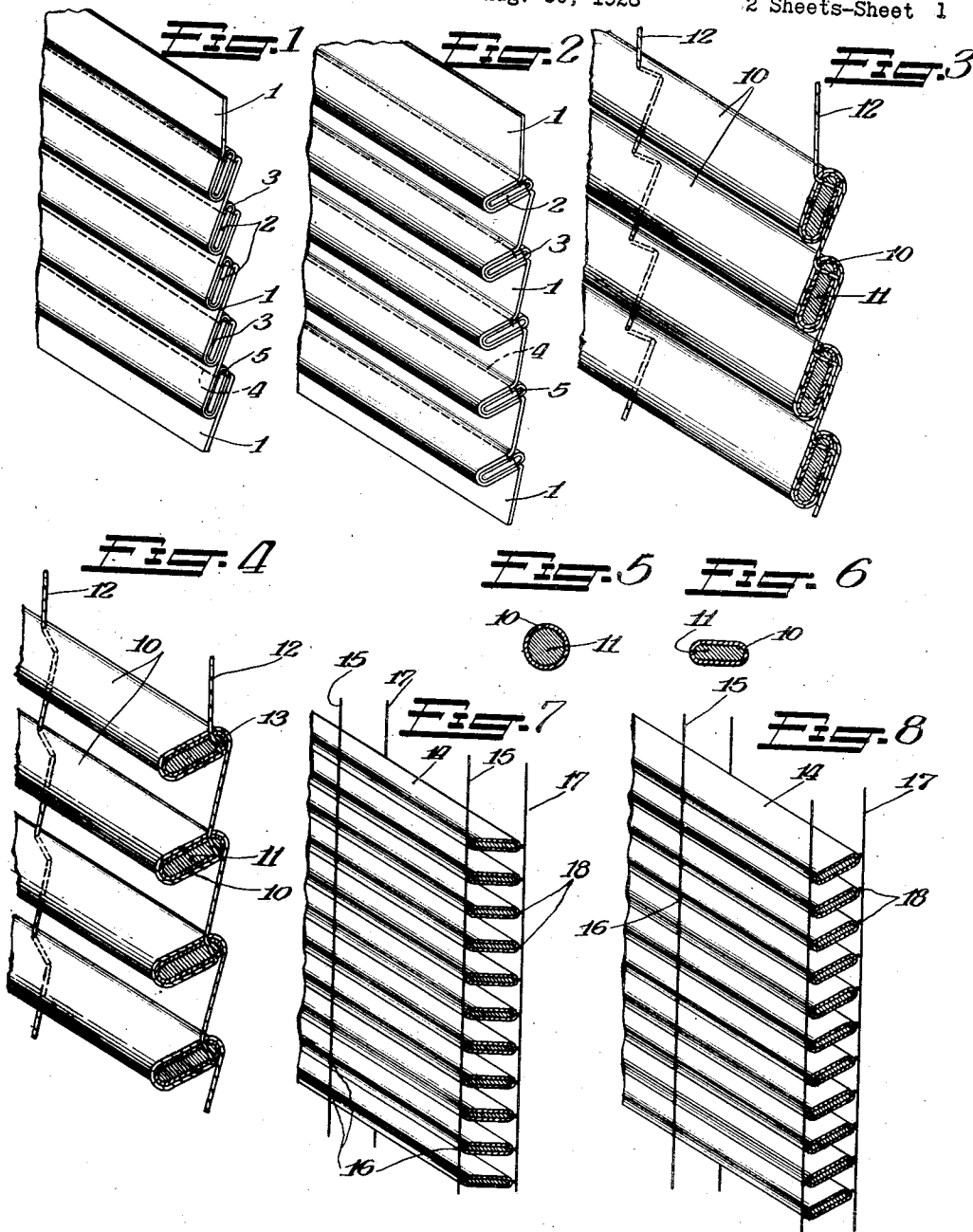
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1,937,342

MATERIAL FOR CONTROLLING ILLUMINATION

Filed Aug. 30, 1928

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

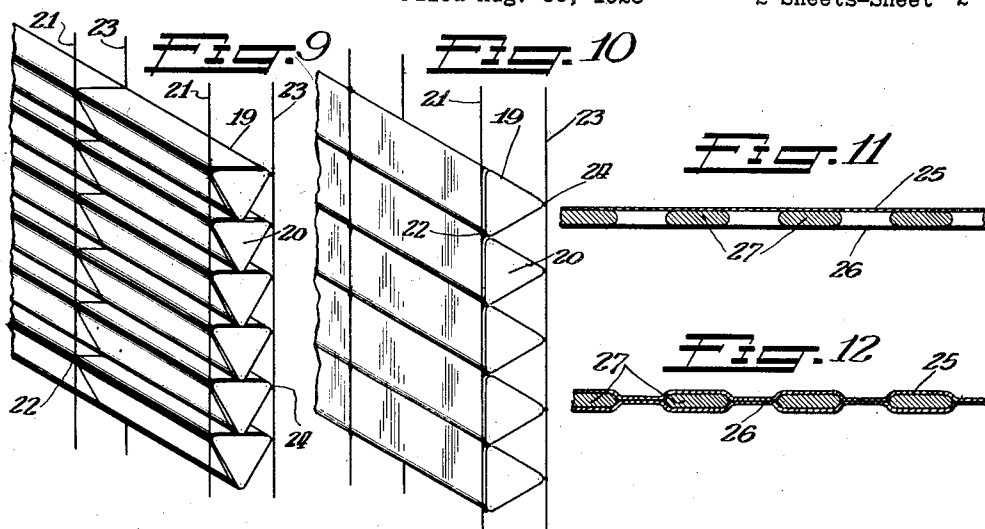


Fig. 13 Fig. 14 Fig. 15 Fig. 16

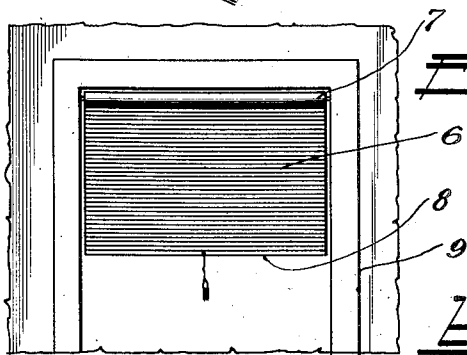
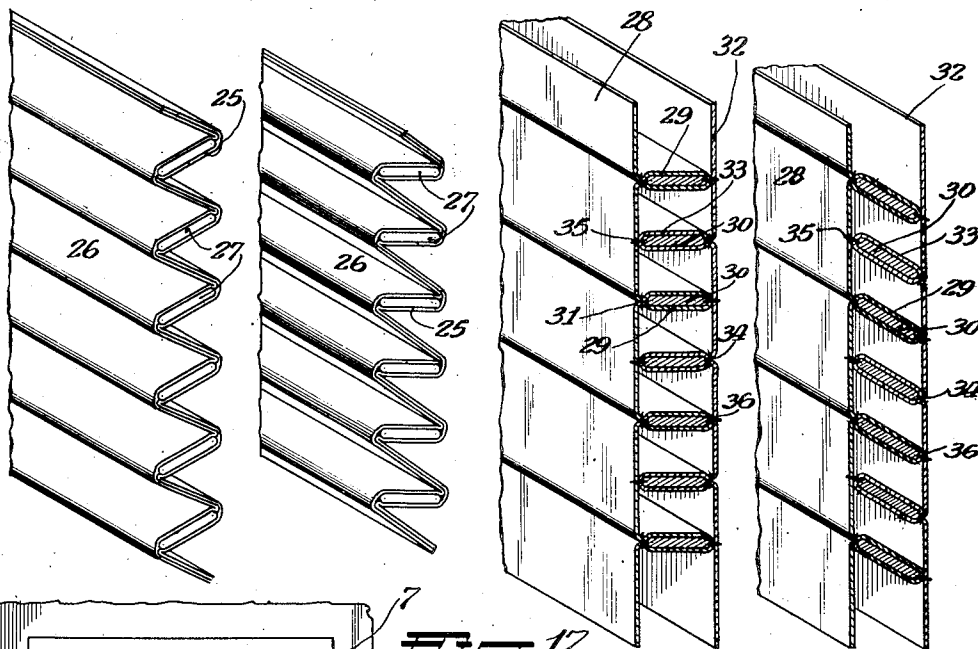


Fig. 17

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UNITED STATES PATENT OFFICE

1,937,342

MATERIAL FOR CONTROLLING
ILLUMINATION

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Application August 30, 1928. Serial No. 303,008

9 Claims. (Cl. 82-60)

This invention relates to improvements in material for controlling illumination and method of using the same, and more particularly to material highly desirable for window shades or the like of such construction that the same may be varied as circumstances warrant to distribute or diffuse light entering an enclosure through any suitable light admitting means, although the invention has many and varied uses as will be apparent to one skilled in the art.

In the past, many and varied devices have been utilized for distributing or cutting out all or part of the light entering an enclosure through a window, and among these devices was that which was commonly known as a venetian blind. Louver windows and louver-boards have also been used frequently where it was desired to permit the free passage of air and sound and yet give full protection from the elements. It is now becoming more and more recognized that venetian blinds are inherently more desirable devices for diffusing and distributing light than what are known ordinarily as window shades, since the venetian blinds provide adjustable means for controlling the amount and distribution of natural light available at window openings and the like, and entering the enclosure adjacent thereto. However, venetian blinds, due to their own peculiar structure, fail to reach the desired extent of utilizing natural light. As is well known, venetian blinds have not materially changed in structure since their origination, and consist of spaced parallel slats of wood adjustable so as to reduce the glare from the windows by preventing direct rays of the sun from entering the room. These blinds, however, have proven highly objectionable in that they intercept and throw back outside a great portion of the light striking a window opening even when it is desired to have that light enter the enclosure and at such times a greater portion of the light is uselessly disposed of. In other words, venetian blinds and the like, only reduce the illumination entering an enclosure through a window and do not sufficiently distribute the illumination or increase it at critical points within the enclosure. Further, venetian blinds, due to the width and thickness of the slats incorporated therein, the necessary large spaces between the slats, and the relatively large means for actuating the slats, are rendered objectionably bulky and unwieldy, take up an undesirably great amount of space, and are extremely difficult to keep properly clean.

Louver windows are obviously objectionable

in that they aid in no material way in providing proper illumination within an enclosure. The ordinary roller shade is also objectionable in that it merely excludes a portion of the light, leaving that part of a room nearest the window exceedingly bright and other points of the room relatively dark.

The present invention has been designed to overcome the above noted defects and objections in the provision of a material highly desirable for window shades and the like, which not only reduces the intensity of the light adjacent the window but, instead of reflecting a portion of the light back in the general direction from whence it came, reflects the light in such a manner that normally relatively dark portions of the enclosure may, when desirable, be illuminated to the same intensity as that portion nearest the window.

The present invention also seeks the provision of a window shade which may be adjusted to vary at will the distribution of light within an enclosure, even to the extent of rendering that portion of the enclosure farthest from the light admitting means, more intensely illuminated than that portion of the enclosure adjacent the light admitting means.

Another object of the present invention is to provide an adjustable material for so directing and diffusing light entering an enclosure through a window or the like that every portion of the enclosure may be illuminated to substantially the desired intensity.

A further object of the present invention is to provide a window shade incorporating means therein having a high light reflecting value, the shade being adjustable so as to properly distribute the reflected light within the enclosure, whereby only a minimum part of the light entering the window is lost and very little or practically none is thrown back out of the window.

Still another object of the present invention is to provide a window shade or the like which is easily adjustable to diffuse the light entering the window, in any desired manner, and yet is sufficiently flexible to be wound on a roller or otherwise furled when not in use.

A still further object of the present invention is to provide a window shade which is easily adjustable to properly distribute the light over the enclosure on the inside of the window or to throw a desired quantity of the light back out of the window, the inherent resiliency of the shade causing the same to assume an initial or prede-

terminated position of adjustment when the adjustment means are released.

While some of the more salient features, characteristics, and advantages, of means embodying the present invention have been above pointed out, others will become apparent from the following disclosures.

The invention includes there and other features of construction and combinations of parts hereinafter described, and shown in a preferred form in the drawings, as more particularly indicated by the claims.

On the drawings:

Figure 1 is a fragmentary perspective view of a sheet of material embodying the present invention.

Figure 2 is a perspective view similar to Figure 1, showing the sheet in a different position of adjustment.

Figure 3 is a fragmentary vertical sectional perspective view of a different form of material embodying the present invention.

Figure 4 is a view similar to Figure 3, showing the material in a different position of adjustment.

Figure 5 is a cross-sectional view of a portion of the structure shown in Figures 3 and 4, in an initial period of development.

Figure 6 is a cross-sectional view of the material shown in Figure 5, after the same has been flattened for use.

Figure 7 is a fragmentary vertical sectional view of another form of material embodying the present invention.

Figure 8 is a view similar to Figure 7, showing the material in a different position of adjustment.

Figure 9 is a fragmentary perspective view of another form of material embodying the present invention.

Figure 10 is a view similar to Figure 9, showing the material in a different position of adjustment.

Figure 11 is a fragmentary cross-sectional view of a sheet of another form of material in an initial process of making the same.

Figure 12 is a view similar to Figure 11, showing the sheet ready for use.

Figure 13 is a fragmentary perspective view of a sheet of material made as indicated in Figures 11 and 12.

Figure 14 is a view similar to Figure 13, showing the material in a different position of adjustment.

Figure 15 is a fragmentary vertical sectional perspective view of still another form of material embodying the present invention.

Figure 16 is a view similar to Figure 15, showing the material in a different position of adjustment.

Figure 17 is a reduced fragmentary elevational view showing one way in which material embodying the present invention may be utilized as a window shade.

As shown in the drawings:

Various forms of material embodying the present invention have been arbitrarily selected for the purpose of illustrating embodiments of the present invention, but these forms are obviously not the only ones which may be developed. It is equally obvious that the structure shown and described herein may be of any desired size, but it has been found desirable to utilize a size much smaller than that disclosed in the drawings, the drawings being greatly enlarged for the purposes of adequately illustrating the various structures. By making the material on a smaller scale than is shown in the drawings, a window shade may be provided which can be wound upon a roller or

furled in any desired manner so as to occupy a very small space.

The embodiment disclosed in Figures 1 and 2, comprises a single continuous sheet 1 of transparent, semi-transparent, or translucent material, cellulose or a nitrated cellulose product such as "cellophane" or a cellulose ester product for example, which is looped or folded about a plurality of spaced transverse elements. The transversely disposed elements or strips may be of any desired material having a high light reflecting value, and I have found it desirable to form these elements of thin strips 2 of relatively stiff material such as cellulose, celluloid, metal or any desirable material which carry therearound a layer 3 of any desired substance for example magnesium carbonate, having a high light reflecting value, or for example, the strips and substance used may be the same as that more fully described in my Letters Patent No. 1,767,285 for Reflecting material, issued June 24, 1930. The sheet 1 substantially loops around the transverse elements and is preferably stitched thereto by two offset lines of stitching 4 and 5, respectively, the stitching 4 being disposed further from the edge of the transverse elements than the stitching 5. The offsetting of the two lines of stitching together with the inherent resiliency of the sheet 1 provided by the forming of the sheet into the desired shape causes the structure as a whole to assume the position shown in Figure 1 as an initial and natural position. In the position shown in Figure 1, the transverse elements slightly overlap and, being substantially opaque, would exclude practically all light when mounted before a window or the like.

Assuming now that the material has been formed into a window blind 6 (Figure 17) mounted upon a roller 7 and disposed on the inner side of a window 8 admitting light into an enclosure defined by a wall 9, and more light is desired within the enclosure, it is simply necessary to exert tension upon the lower portion of the sheet 1 whereupon the material will assume a position of adjustment similar to that shown in Figure 2, the angular positions of adjustment of the transverse elements being directly proportional to the amount of tension applied on the lower portion of the sheet 1. When in a position of adjustment, as indicated in Figure 2, light entering the window, may readily pass through those portions of the sheet 1 disposed between the transverse elements, and the light striking the transverse elements will be reflected by the substance 3 into the room or enclosure, in a quantity depending upon the angle of adjustment of the transverse elements. By properly adjusting the shade, light may be distributed throughout the room in a desired degree of intensity, and portions of the room farthest from the window 8, may be illuminated with the same or greater intensity than portions adjacent the window, the light being thrown back into the room by the reflecting substance 3. Similarly, if so desired, by adjusting the shade to more nearly approach the position of Figure 1, a greater amount of the light may be thrown back out of the window by the reflecting surfaces. As soon as the tension on the strip 1 is removed, the material will automatically assume the position shown in Figure 1, due to the inherent resiliency therein, if the tension had been applied to the lower portion of the strip as is usual when the roller or support is at the top of the sash. If with a different mounting, tension had been exerted at the top of the strip, then the weight of

the transverse elements would aid in the assumption of initial position. Of course, if so desired, the material may be so bent that it will assume a position with the transverse elements disposed at a different angle.

The embodiment shown in Figures 3 to 6, inclusive, includes a plurality of transverse elements, in this instance, in the form of tubes 10 preferably formed of the same or similar material as the sheet 1 previously described. The tubes 10 are, for convenience and efficiency, originally formed in the shape shown in Figure 5 and filled with a substance 11 of high light reflecting value, such as magnesium carbonate for example, after which the tubes are flattened into the shape disclosed in Figure 6. The tubes are next connected by a plurality of strings or threads 12, the threads being in spaced relationship to provide, in this instance, adequate ventilation when the transverse elements are angularly adjusted to a position similar to that shown in Figure 4. At least one of the threads 12 passes through a tube as indicated at 13, then winds around this tube or transverse element and is similarly connected to each succeeding element. When this material is made up in the form of the blind 6, to vary the distribution of light within the room, it is simply necessary to angularly adjust the transverse elements or tubes by exerting tension on the thread 12 passing therethrough and looped therearound. Due to the fact that a plurality of threads pass through the tubes, the inherent resiliency of the structure aided by the weight of the transverse elements and by their peculiar suspension, will cause the elements to assume the closed position as indicated in Figure 3, when the tension is removed.

The embodiment disclosed in Figures 7 and 8, comprises a material including a plurality of transverse elements or tubes 14 similar to the tubes 10 and connected on one side to a plurality of spaced vertical threads 15 by individual stitches 16, and on the other side to spaced vertical threads 17, by individual stitches 18. This type of material also provides ventilation for the room, when formed into a blind 6. In normal position, the transverse elements 14 are substantially horizontal as shown in Figure 7, and when it is desired to adjust the blind to properly distribute the light entering the window 8, tension is exerted on either of the groups of vertical threads 15 or 17 depending upon the desired intensity of illumination. For instance, if it is desired to slightly darken the room, tension may be exerted on the threads 15 to slope the transverse elements outwardly as indicated in Figure 8, and if more illumination is desired, tension may be exerted on the threads 17 to slope the transverse elements in the opposite direction.

The embodiment disclosed in Figures 9 and 10 comprises a material incorporating a plurality of transverse solid elements 19, in this instance, prismatic in form as indicated at 20. The elements are preferably formed from any desired transparent or translucent material as incorporated in the previous embodiments of this invention, which material may be formed in the shape of prismatic threads by passing the same through a die, or if so desired, in an equivalent manner. In this instance, the transverse elements 19 are connected on one side thereof by vertical threads 21 which are looped around each successive element and then knotted as at 22. The elements are joined on the other side thereof by vertical threads 23 secured thereto in the same

manner as the threads 21 and knotted as indicated at 24. When in normal position, the prismatic elements are disposed with their vertices downward, each vertex in abutment with the inverted base of the element next below as shown in Figure 9. When suspended as a window shade 6, the material may be adjusted by exerting tension on either respective group of vertical threads 21 and 23. For instance, if downward pull is exerted upon threads 21, the transverse elements 19 will assume a position similar to that shown in Figure 10, the angular change in the position of the elements depending directly on the amount of pull. When the tension is removed, the elements will return to their natural position as seen in Figure 9. The light entering the window 8 and passing through the prismatic transverse elements will undergo changes of directions as in a prism by refraction or reflection, thereby providing means for a very fine or delicate control of the distribution or diffusion of the light in the room.

In Figures 11 to 14, inclusive, I have shown still another embodiment of my invention wherein the material includes a pair of juxtaposed sheets 25 and 26, respectively, of transparent or translucent material, and is formed by placing a plurality of long narrow piles of reflecting substance upon sheet 26, laying sheet 25 upon the piles (Figure 11), flattening the latter into transverse elements 27 of high light reflecting value, and then pressing the sheets so that they will be substantially cemented together between the piles as seen in Figure 12. After the material is thus formed it is pleated into the shape disclosed in Figures 13 and 14. Obviously, the material will have inherent resiliency as a result of the pleating. This material, as is the case with every other illustrated embodiment of the present invention, may be made into the blind 6 and when so made, is adjusted to diffuse or distribute the light entering the window 8 as desired by exerting the requisite tension upon the lower portion of the blind to angularly adjust the transverse elements 27 of high light reflecting value, and when the tension is released, the transverse elements will assume a predetermined initial position depending upon the specific manner in which the material is constructed as is the case with the other embodiments herein described.

Still another embodiment of the present invention is disclosed in Figures 15 and 16 wherein material which may be made into the blind 6, is formed from two separate pieces. A continuous sheet 28 of substantially transparent or translucent material is formed so as to include a plurality of loops 29 each containing a substance 30 of high light reflecting value to thus form transverse elements. The open ends of the loops are sealed or closed by lines of stitching 31 or by cementing if so desired, and the loops are spaced apart twice the distance desired in the finished material. A second continuous sheet 32 of the same material as sheet 28, is similarly formed into loops 33 also containing a quantity of the reflecting material 30, the open ends of the loops being closed by stitching 34, and the loops being spaced twice the distance desired in the finished material. The two pieces are then placed together with the loops in staggered relationship and the loops 33 are stitched to the sheet 28 by lines of stitching 35 and the loops 29 are stitched to the sheet 32 by lines of stitching 36, thereby resulting in material with the loops spaced the desired distance apart. To angularly adjust the loops or

transverse elements, tension may be applied on the lower portion of either of the sheets 28 or 32 depending upon the adjustment desired. When the tension is removed the inherent resiliency of

5 the material will cause the transverse elements to assume a position substantially horizontal as indicated in Figure 15. Figure 16 discloses the loops in a position resulting from downward pull applied to sheet 32 with less or else no pull ap-
10 plied to sheet 28.

It should be noted that the material hereinbefore described may be left in its natural color, bleached, or tinted, as desired, to acquire the necessary illuminative or decorative effect. It
15 should also be noted that the transverse elements may be made extremely small, for example, by running them through a die, and woven in the same manner as threads between vertical threads so as to form substantially a fabric which is, of course, adjustable to vary the distribution of
20 light. Further, any of the sheets of material herein described may be joined, so that the transverse elements of both sheets will work in unison if circumstances warrant.

It is obvious, too, that the material disclosed herein when made into a window shade or the like, affords a new and novel method for controlling the illumination of a room. When the
25 shade is once hung in its proper position, be it wound on a roller or otherwise furled, it is only necessary to cover as much of the window as is desired, lock the furling means with any simple expedient for so doing, and then by applying the proper tension to the proper part of the shade,
30 angularly adjust the transverse elements to produce the desired lighting effect in the room. As the natural light entering the window changes in intensity or character, the adjustment of the shade may be varied accordingly.

From the foregoing, it will be apparent that I have provided material usable for many purposes but highly desirable for use in window shades, which is so constructed as to be inherently resilient in such a manner that the material may be adjusted so as to reflect a maximum
45 quantity of the light entering the window into desired portions of a room, so that any desired lighting effect within the room may be obtained, portions of the room farthest from the light admitting means being illuminated to a greater intensity than portions adjacent the light admitting means, if so desired. Moreover, the present invention not only affords new and better means
50 and methods for providing adequate illumination within an enclosure, but on the other hand, is efficient in its action, durable, and may be economically manufactured.

I am aware that many changes may be made and numerous details of construction may be
60 varied through a wide range without departing from the principles of this invention and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. As an article of manufacture, a blind comprising a plurality of angularly adjustable trans-

verse reflecting members and material for securing the same together, said material having sufficient natural resiliency to hold said reflecting members in a predetermined position and adapted to move said members into various positions
80 of angular adjustment the degree of which is proportional to the tension exerted on said material.

2. Means for distributing light within an enclosure having light admitting means in a wall
85 thereof, said means including a plurality of transverse reflecting members, and resilient means engaging and connecting to each of said members whereby the angular adjustment of said members may be varied by tension exerted
90 on said resilient means and the resiliency of the structure as a whole will restore said members to the original position of adjustment when said tension is removed.

3. As an article of manufacture, a thin flexible substantially transparent material, opaque transverse elements having reflecting surfaces
95 thereon in said material, and means securing said elements to said material, whereby said elements are angularly adjustable in a plurality of 100 directions.

4. As an article of manufacture, a blind including a sheet of substantially transparent material having pleats therein, and spaced substantially parallel strips having high reflecting
105 surfaces secured in said pleats, said strips being angularly adjustable by exerting tension on said sheet.

5. As an article of manufacture, a fabricated sheet including a plurality of tubular portions
110 containing a substance of high light reflecting value, and a thread on each side of said portions connected to said portions adjacent the edges thereof, whereby said portions are angularly adjustable by tension exerted on either of said
115 threads.

6. As an article of manufacture, a fabricated material including a pair of juxtaposed substantially transparent sheets pressed into contact with each other at spaced intervals and having
120 a substance of high light reflecting value held by said sheets between the contact intervals.

7. As an article of manufacture, a flexible light distributing medium including a pair of transparent flexible sheets, and material of a
125 high light reflecting value interposed between said sheets.

8. As an article of manufacture, a flexible light distributing medium including a pair of transparent flexible sheets, and material of a high
130 light reflecting value interposed at intervals between said sheets to form reflecting strips.

9. As an article of manufacture, a semi-transparent shade of inherently resilient material arranged in folds, a plurality of transversely dis-
135 posed light distributing elements set into folds of said shade, whereby said elements are angularly adjustable by exerting tension on said shade and the inherent resiliency of said shade causes said elements to assume an initial position of adjustment when said shade is released.

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