June 1, 1965 D. E. MYERS ETAL 3,186,473

MEANS FOR CONTROLLING THE LIGHT ENTERING A ROOM WINDOW

Filed Jan. 6, 1960 3 Sheets-Sheet 1

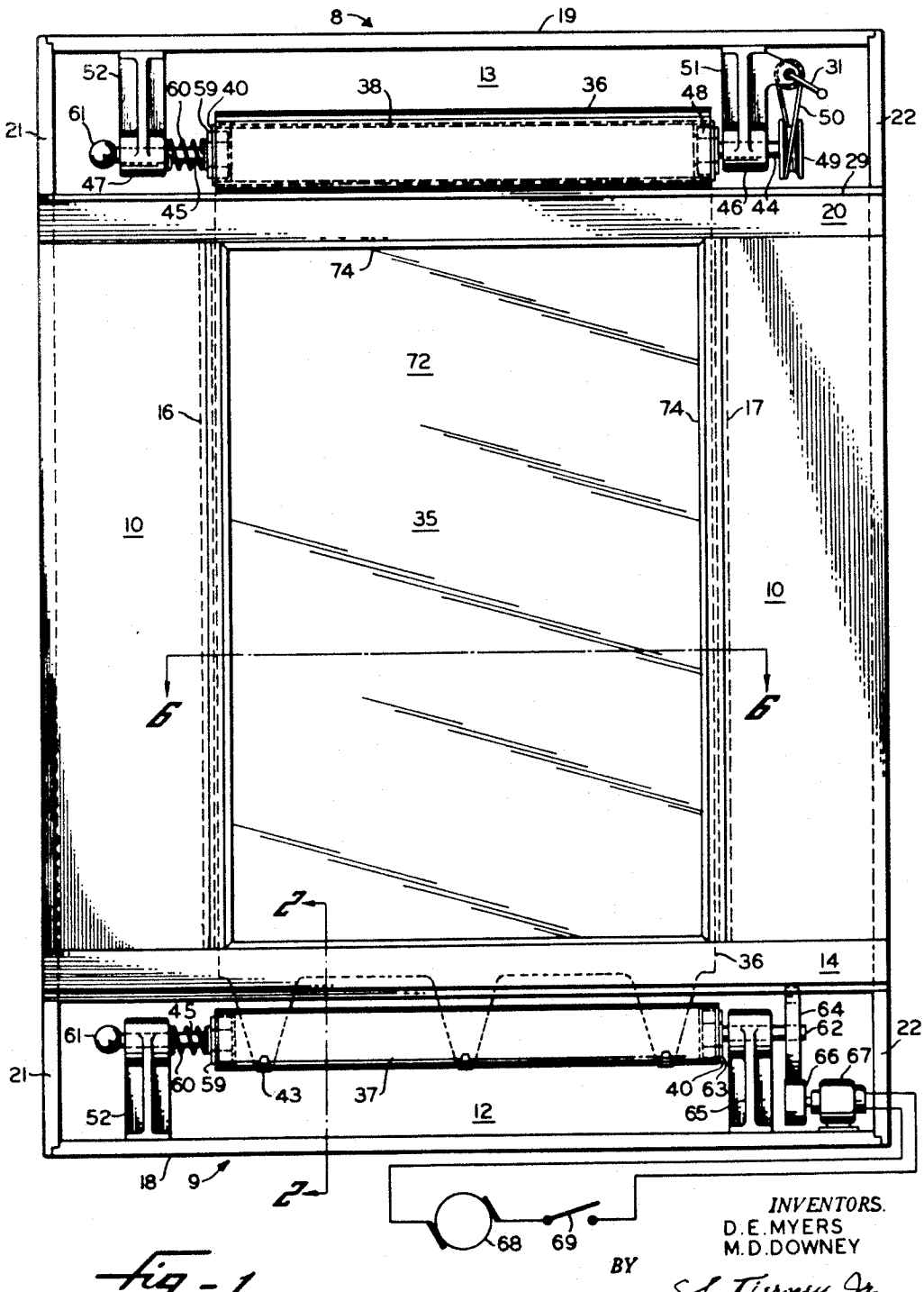


fig - 1

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MEANS FOR CONTROLLING THE LIGHT ENTERING A ROOM WINDOW

Filed Jan. 6, 1960 3 Sheets-Sheet 2

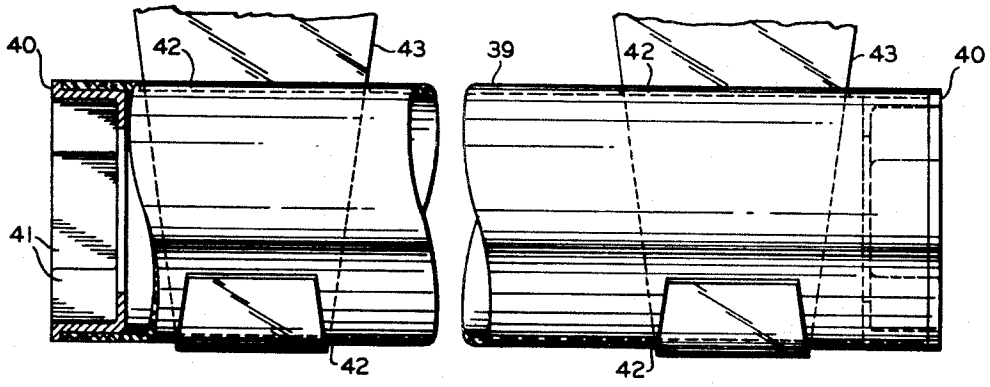


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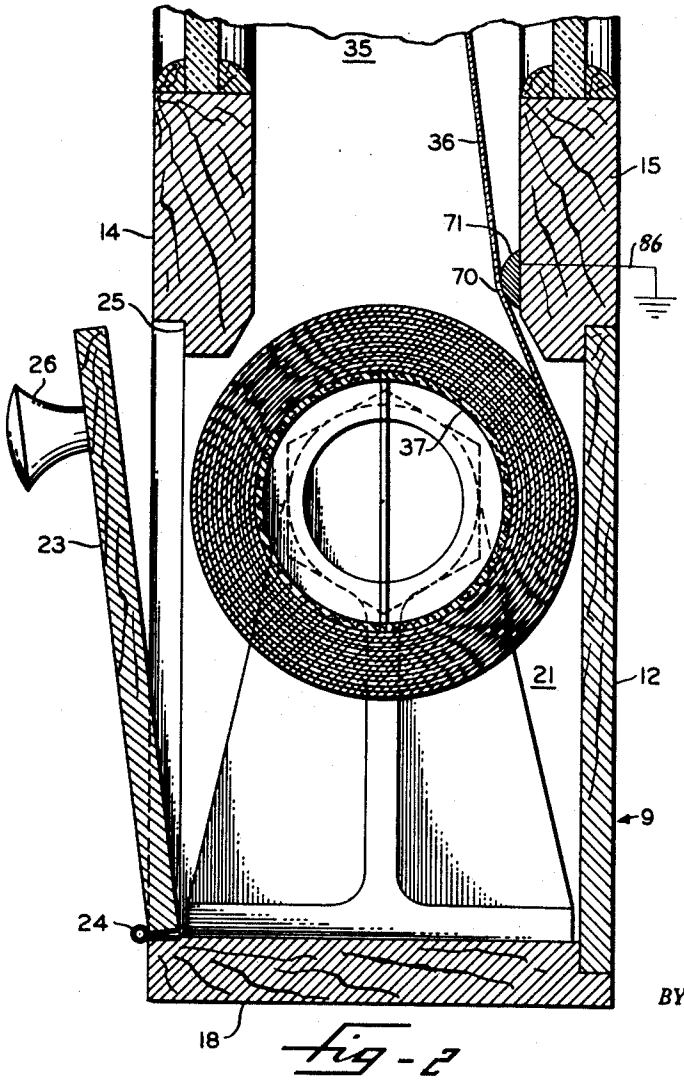


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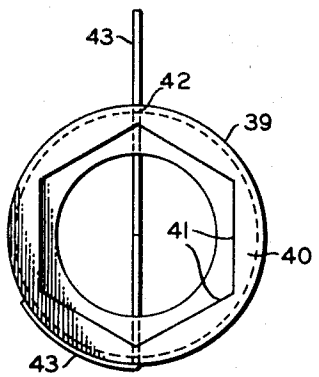


fig - 4

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MEANS FOR CONTROLLING THE LIGHT ENTERING A ROOM WINDOW

Filed Jan. 6, 1960 3 Sheets-Sheet 3

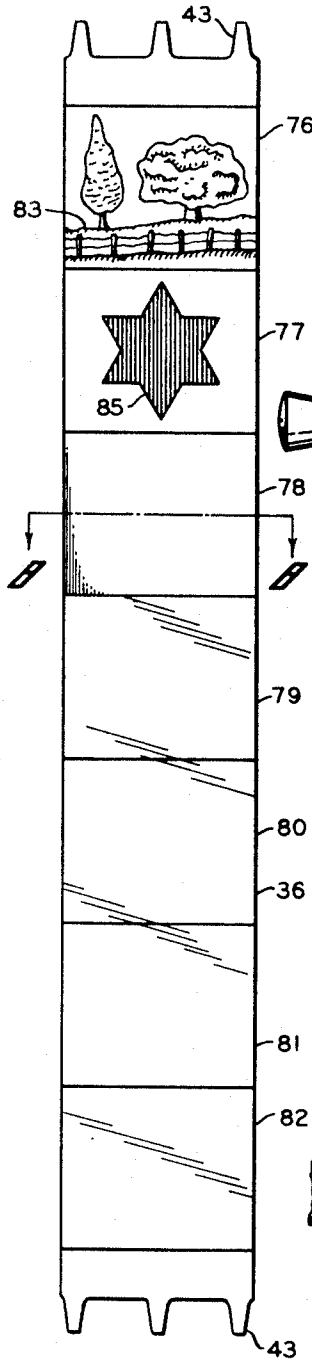


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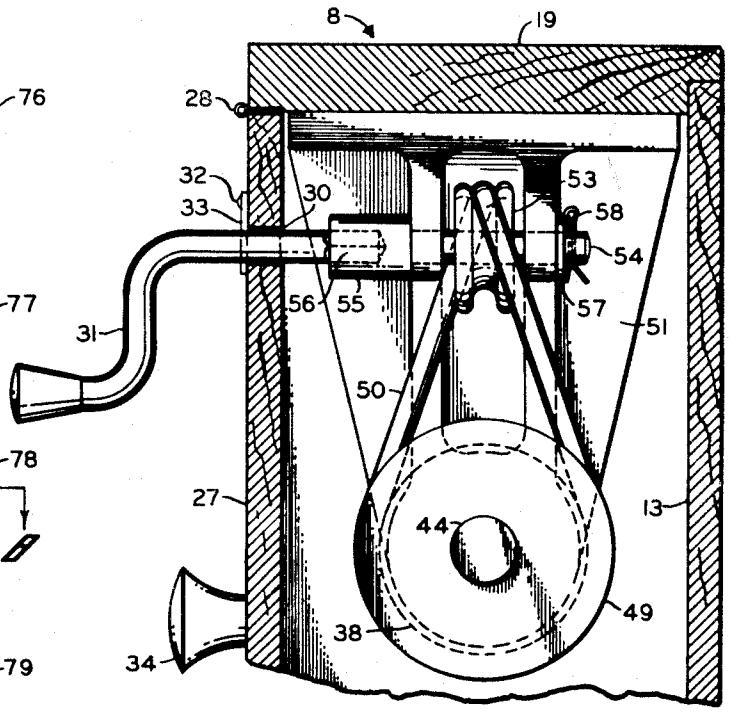


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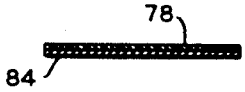


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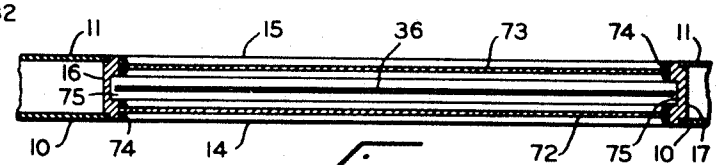


fig - 6

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3,186,473

MEANS FOR CONTROLLING THE LIGHT ENTERING A ROOM WINDOW

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6 Claims. (Cl. 160—26)

This invention relates to means for controlling the amount and color of the light entering a room through a large opening in a wall thereof.

An object of the invention is to provide a large translucent flexible sheet consisting of a plurality of panels each extending the full width of the sheet and the panels being of different colors, also a pair of rollers disposed within the wall opening and around which the ends of the sheet are wound so that as one of the rollers is rotated, the colored panels are successively made to substantially cover the wall opening to filter the daylight coming therethrough.

Another object is to provide in said sheet a panel made of transparent plastic which will pass white light into the room when this panel is brought opposite the wall opening and will permit a person in the room to see through it.

Another object is to provide in said sheet a panel made of opaque material which can be brought opposite the wall opening to block the passage of light into the room. According to the invention the inner face of this opaque panel is preferably painted, printed or otherwise marked with an artistic or pictorial design or pattern.

A further object is to provide in said sheet a panel made of transparent or translucent plastic which is marked with a colored design.

Another object is to provide in said sheet a panel whose inner face is covered with a thin film of bright metal which reflects incident light well. If desired this metal film can be made to serve as a large mirror to permit a person in the room to see his image therein.

A further object is to provide in said sheet one or more colored plastic panels in which the amount of colored pigment or dye progressively increases lengthwise of the panel so that one end of the panel transmits more light therethrough than the opposite end does.

Another object is to provide means for preventing dust particles floating around in the air near the wall from reaching and settling on the sheet.

Still further objects and different uses to which the invention can be applied will become apparent as the description thereof proceeds. For a better understanding of the invention, reference is made to the accompanying drawings, in which:

FIG. 1 is a front view of an assembly embodying the invention, two closure doors being omitted for clarity.

FIG. 2 is a cross section showing the lower portion of the assembly taken on line 2—2 of FIG. 1;

FIG. 3 is a front view of a roller used partly in section and two end tabs of a colored plastic sheet used;

FIG. 4 is an end view of the parts shown in FIG. 3;

FIG. 5 is an end view through the top of the assembly partly in section, showing the roller drive mechanism;

FIG. 6 is a partial section taken on line 6—6 of FIG. 1;

FIG. 7 is a front view on a reduced scale of a colored plastic sheet used to filter the light and;

FIG. 8 is a section through the plastic sheet taken on line 8—8 of FIG. 7.

The light control unit comprises a rectangular frame having an upper closed casing 8 (FIG. 1) and a generally similar lower casing 9 which are connected at their ends by two vertical strips 21, 22, at their inside by two vertical strips 10 and at their outside by two similar vertical strips 11 (FIG. 6). A pair of parallel vertical members

16, 17 connect casings 8 and 9 and also the inner ends of members 10 and 11 together (FIGS. 1 and 6). Lower casing 9 also comprises an outer strip 12, a base strip 18, a pair of parallel cross strips 14, 15 and a door 23. Door 23 is hinged at its lower end by a hinge 24 and when closed its upper end fits against a recessed portion or face 25 of strip 14, FIG. 2. Any suitable handle 26 may be attached to the door to move it.

Upper casing 8 comprises a top cross strip 19, an outer vertical member 13 and a pair of spaced cross strips 20 (only one being shown). A door 27 hinged to top cross strip 19 (FIG. 5) by a hinge 28 closes the top casing when its lower end abuts against a long contact face 29 on inner strip 20 (FIGS. 1 and 5). Door 27 has a suitable knob 34 and a circular bore 30 to pass the straight portion of an operating crank 31 and attached to the door by pivot pin 32 is a thin metal closure flap 33 which covers bore 30 when crank 31 is withdrawn as later described.

When the above assembly is fastened in a rectangular opening in the sidewall of a room, it will be clear that the two adjacent vertical faces of strips 10, the upper face of cross strip 14 and the lower face of cross strip 20 define a rectangular wall or window opening 35 of large area through which daylight is normally admitted into the room.

A flexible plastic sheet 36 (FIGS. 1 and 7) is used to control the light passing through window opening 35, the lower end of the sheet being wound around a long cylindrical roller 37 disposed in casing 9 and its upper end wound around a similar roller 38 disposed in casing 8. Each roller (FIGS. 3 and 4) has a long cylindrical tube 39 which may be made of inexpensive material, such as compressed cardboard or wood, the ends of the tube containing a pair of metal supporting caps 40, the interior wall 41 of each cap being hexagonal in shape. Tube 39 is provided with a plurality of narrow slots 42 to receive the securing or attaching tabs 43 provided on both ends of flexible sheet 36. From the above it will be clear that the ends of sheet 36 are attached to the rollers in the same way that the ends of a photographic film are attached to its feed and take-up spools.

Upper roller 38 is rotatably supported in casing 8 by a pair of short shafts 44, 45 which are journaled for rotation in a pair of bearings 46, 47 formed in two castings 51, 52 which are secured to cross strip 19. Shaft 44 has a hexagonal portion 48 on its left hand end which has a free sliding fit in hexagonal portion 41 of a cap 40 and a belt pulley 49 is secured to the right hand end of the shaft. Pulley 49 (FIG. 5) is driven by a belt 50 which passes over drive pulley 53 which is secured to a short shaft 54 also journaled in casting 51. The inner end 55 of shaft 54 is enlarged and at its center is provided with a square bore in which the square end 56 of crank 31 may be inserted. Shaft 54 is prevented against inward movement by a washer 57 and cotter pin 58. At its right hand end shaft 45 has a hexagonal end 59 having a sliding fit against hexagonal face 41 of cap 40, a compression coil spring 60 biasing shaft 45 toward the right. A small knob 61 is formed on the left end of shaft 45. From the above it will be clear that roller 38 may easily be put in operative position in casing 8 when door 27 is open by pulling knob 61 toward the left (FIG. 1), slipping the right hand end of the roller over hexagonal end 48 of shaft 44, moving cap 40 at the left hand end of the roller into alignment with hexagonal end 59 of shaft 45 and releasing knob 61, spring 60 moving shaft 45 into operative roller-supporting position.

The left hand end of lower roller 37 is supported by means similar to that of upper roller 36 so these parts are given the same reference numerals in FIG. 1. At its

right hand end, roller 37 is supported by a shaft 62 whose left hand end 63 is hexagonal to fit into hexagonal portion 41 of end cap 40 and whose right hand end carries driven friction wheel or pulley 64. Shaft 62 is journaled in a support bracket 65 mounted on base strip 18. A drive friction wheel 66 carried by the shaft of an electric motor 67 engages wheel 64 to rotate it and lower roller 37. Current is supplied to motor 67 by a generator 68 through the circuit shown when switch 69 is closed. It is clear that lower roller 37 may easily be put in operative position when door 23 is open in the same manner as that above described for upper roller 38. In order to prevent sheet 36 from rubbing against lower casing 9 (FIG. 2) a metal rub-strip 70 may be attached to cross strip 15, this strip engaging sheet 36 throughout the full width of sheet 36 and the convex face 71 of the strip being smooth and hard as, for example, a chromium layer plated onto a brass or steel bar. A similar rub-strip (not shown) may be mounted in upper casing 8 if needed to prevent chafing of sheet 36. If the material of sheet 36 is of a type which causes a charge of static electricity to build up, this may be drawn off by grounding strip 70 by a ground connection as indicated at 86 (FIG. 2). Should there be a gradual small settlement of dust particles on sheet 36, these may be picked up by strip 70 by making it of felt. In cases where static electricity is not generated on sheet 36, rub-strip 70 may be made of rigid or somewhat flexible plastic resin.

Rectangular sheets 72, 73 of rigid transparent material, such as glass, Lucite or other clear plastic may be mounted between strips 20, 14, 15 and vertical members 16, 17 (FIGS. 1 and 6) to close in the portion of plastic sheet 36 extending between rollers 37 and 38, small retaining strips 74 secured to the surrounding members holding the glass in place. It will be clear that glass 73 prevents dust particles in the air outside the room from entering and settling on sheet 36 while glass 72 prevents the entrance onto sheet 36 of dust particles within the room. In FIG. 6 it will be noted that the vertical edges of sheet 36 extend into vertical grooves 75 which extend the full length of members 16 and 17. This construction assures that all the light entering window opening 35 must pass through sheet 36 when a transparent or translucent portion thereof is opposite opening 35.

Plastic sheet 36 is illustrated (FIG. 7) as having seven rectangular panels 76, 77, 78, 79, 80, 81, 82 of equal length, the length of each being somewhat greater than the distance between cross strips 14 and 20. Panel 76 is made of opaque plastic and its interior face has any type of pictorial scene, such as 83, painted, printed or otherwise marked on it. Or this scene may be on a paper photographic print secured by adhesive to the inside face of panel 76. Such a photographic print may be a black and white or colored enlargement of any original picture taken with a camera. When panel 76 is brought opposite window opening 35 in a manner to be later described, it serves to prevent the passage of outside light into the room through the window. At the same time the scene 83 as illuminated by light from any suitable source (not shown) within the room, presents a pleasing view.

Panel 77 may be made of transparent or translucent plastic of one color, such as blue, and may be decorated on its inside face with a thin transparent or translucent pleasing design 85 of a contrasting color here illustrated as red. Design 85 may be any one of a great variety which are aesthetically pleasing. When panel 77 is brought opposite window opening 35, it prevents the direct sun's rays from entering and the incoming light is filtered so that a person in the room sees a pleasing design of one color on a contrasting background of another color. The colors and design may be selected to give the appearance of a stained glass window of the type used in churches.

Panel 78 may be made of opaque or transparent plastic and its inside face is coated with a thin film 84 of any bright metal such as aluminum or other metal which reflects light well. Silver may be used if it is coated with a clear plastic or varnish to prevent its tarnishing. The metal film may be electro-plated on or applied to the plastic in any known manner, its thickness being much exaggerated in the drawing. When panel 78 is brought opposite window opening 35, it prevents the passage of light from outside into the room and metal film 84 serves as a mirror when artificial light is supplied by a light source in the room. Furthermore such interior light falling on metal film 84 is reflected back into the room to help increase the light intensity therein.

Panels 79, 80 and 81 are made of transparent plastic, the plastic of each panel being colored as by a dye or other coloring agent added during the manufacture of the panel. Panel 79 may be red, panel 80 yellow and panel 81 blue or any other three colors may be used according to the uses to which the inevntion is to be put. Also the order of the colors could be changed so that panel 81 can be red and panel 79 blue or yellow. With the assumed construction when panel 79 is brought opposite window opening 35, the daylight entering the window is filtered and only the red rays enter the room. When half of panel 79 and half of panel 80 are brought opposite opening 35, both red and yellow filtered light is passing into the room and when panel 80 is brought opposite opening 35 only yellow light is entering the room. Also when half of panel 80 and half of panel 81 are opposite opening 35, both blue and yellow light is entering and when panel 81 is brought opposite opening 35, only blue light rays are passed into the room. It will now be clear that by lengthwise adjustment of sheet 36, light of any one of several colors may be transmitted into the room from outside daylight or light of two colors only in which these colors are present in any desired ratio. By controlling the color of the light falling on an object, the color or colors of the light rays reflected by the object may be changed in such a way as to change or improve its appearance. This phenomenon is well known in connection with many oil paintings which appear greatly different under a yellow light source than when viewed in daylight.

Panel 82 is made of clear transparent plastic so when it is brought opposite window opening 35, daylight with all its component colors is entering the room. Also a person in the room can see out through the panel.

Assuming that most of sheet 36 is wound around upper roller 38 and that crank handle 31 has been withdrawn from member 55 and casing 8, it is clear that the closure of switch 69 will cause motor 67 to rotate wheels 66, 64 and lower roller 37 causing the lower portion of sheet 36 to be wound around this roller. The rotation can be continued until any desired panel or portions of two panels is opposite opening 35 ready to block or filter the light passing therethrough when switch 69 is opened. To move any panel upwards into position or to rewind most of sheet 36 onto upper roller 38, the flap 33 is swung about its pivot 32, the straight portion of crank 31 passed through hole 30 and its square end 56 inserted into receptacle 55. The crank is now rotated until the desired panel is in position. Since motor 67 is small, of fractional horsepower, it normally offers little resistance to the rotation of roller 37 while sheet 36 is being unwound therefrom. Any unusual resistance to rotation of the motor shaft would be accommodated by slippage between friction wheels 64 and 66.

The several panels may be made of many of the modern flexible high-molecular polymerized resins as, for example, polyethylene, polyester, polyvinyl fluoride, etc. Successive panels may be fastened together by adhesive, heat treating of their overlapped ends or other known means for fastening plastic sheets together. The thickness of each panel can be varied according to the amount of light transmission desired. If, for example, sheet 36 is short and has only a transparent panel and one red panel, its thickness may be .003 inch. Longer sheets can be thicker

and sheets even .030 inch thick will be suitable in certain installations. Also in any of the colored panels, more dye may be incorporated in one end of the panel than in its opposite end, the amount of dye in the palstic progressively increasing lengthwise so that one end of the panel passes more colored light than its other end.

This invention can be used for a great many purposes, it being understood that plastic sheet **36** may contain only two panels or a greater number than that shown herein. A photographer can use the invention by moving clear panel **82** opposite window opening **35** to admit daylight into the room to do photography in the room by daylight. If he wishes to increase the proportion of blue rays in the light, he can move sheet **36** to bring the lower half of panel **81** opposite opening **35** so that both white light and blue rays are entering the room. When he wishes to develop film or prints, he can move red panel **79** into position opposite opening **35** so that only red light is entering the room. If he wishes to shut out all light to provide a dark room for loading cameras with film or plates, he can move panel **76** into position opposite window opening **35**.

Another use of the invention is in a store window where goods are on display which would be injured by the sun's direct rays. By filtering the light through a colored panel, the injurious rays may be eliminated. A similar use is found for the invention in homes where a floor carpet, fabric covered chairs or other colored articles are near a window which might pass the sun's rays directly onto the articles. Fading and deterioration can be prevented by suitable filtering of the sunlight coming through the window.

The invention is useful in rest homes especially those for elderly people where direct sun rays passing through a window cause burning and tanning of the skin. By interposing a suitable colored filter, the harmful heat rays which cause the burning may be substantially prevented from reaching the skin of a patient lying or seated near the window. At the same time the patient is receiving plenty of light and adjacent furniture is well lighted so that a cheerful atmosphere prevails.

The invention finds a use in greenhouses in which orchids, violets and other flowers or plants are grown and to which direct rays of the sun are very injurious. By selective colored filtering of the sunlight only those colored rays may be directed onto the plants, which are best for their growth. Similarly certain fungi which produce useful medicinal molds may be protected from the heat and light of the sun's rays and provided with that colored light which is best suited for their growth. Many other uses for the invention will become obvious to persons needing controlled light of different colors at various times.

Window opening **35** will ordinarily have an area of at least six square feet to admit sufficient light into the room and it may be of considerably greater area as the invention is practicable with a window **8** feet long and **6** feet wide or even larger. Also while the invention is illustrated in connection with the side wall of a room, it is equally applicable to a window in the ceiling wall, a skylight, and in the subjoined claims the term "wall" applies to the ceiling of a room as well as to a side wall thereof.

While casings **8** and **9** and their connecting members have been illustrated as being made of wood, they can be made of thin metal, such construction being especially suitable for installation in the walls of modern office and factory buildings whose frameworks are usually composed of metal columns, beams and rolled members.

Easy removal of the rollers **37** and **38** is also a merit of the invention. It is clear that the operator can start motor **67** to roll the entire sheet **36** onto the lower roller **37**. He then opens door **23** and removes this roller from casing **9** and then inserts another roller (not shown) similar to roller **37** but containing a wound-up plastic sheet having panels of different colors than those of sheet **36** and in which panels having designs different than those on panels **76** and **77** are incorporated. The outer end of this wound-up sheet can then be brought up past window opening **35** and attached to upper roller **38** by passing its tabs **43** through the slots **42** in the roller, or the entire sheet **36** can be wound onto upper roller **38** by rotating crank **31**, the crank removed from casing **8** and door **27** opened. The full roller **38** can now be removed and replaced by another roller carrying a plastic sheet having panels of different colors. The outer end of this new sheet is lead down past window opening **35** and attached to empty lower roller **37**. A number of different interchangeable rollers may thus be provided ready for immediate use, the plastic sheet on each roller containing panels different in number, color and/or decorative design than the sheets wound on the others.

It is to be noted that the assembly described can be prefabricated in a factory and shipped as a single unit ready for installation in the wall of any building. This makes for much lower cost than if the several component parts were to be made and assembled at the site of use by local carpenters or mechanics.

This invention may be embodied in other forms or carried out in other ways without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered as in all respects illustrative and not restrictive, the scope of the invention being indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are intended to be embraced therein.

Having thus described our invention, what we claim as new and useful and desire to secure by Letters Patent is:

1. A prefabricated structure for controlling the light passing through a large wall opening of a room, comprising: a rectangular frame constructed to fit in said wall opening, said frame including a pair of stationary spaced apart vertical members the centers of whose adjacent faces are provided with aligned grooves of substantial depth; a pair of opaque closed casings disposed at the opposite ends of said vertical members and connected thereto, said casings having a pair of long aligned narrow openings therein in alignment with said grooves; a first roller pivotally supported within one of said casings; a second roller parallel to said first roller and pivotally supported within the other casing; a long thin sheet of flexible plastic passing through said narrow openings and having its ends wound around said rollers, the edges of said sheet extending into said grooves, said sheet comprising a plurality of rectangular panels of different colors, the length of each panel being longer than the distance between said opaque casings and each panel having an area of at least 6 square feet; and gearing disposed entirely within one of said casings for rotating one of said rollers.

2. A prefabricated structure for filtering the sunlight entering a large rectangular wall opening of a room, comprising, in combination: a rectangular frame having two spaced apart long vertical members, the width of each of said members being much greater than its thickness; a base strip connecting the lower ends of said vertical members and a top strip connecting their upper ends, the width of said base strip being much greater than its thickness and the width of said top strip being much greater than its thickness, the four outer faces of said vertical members, base strip and top strip providing four surfaces of large area constructed to fit and seat against the marginal wall of said wall opening; a pair of spaced apart parallel vertical members carried by said rectangular frame and each being provided with a large rectangular window opening therethrough, said window openings being in alignment with each other; a pair of detachable rollers supported for rotation within said frame at the opposite ends thereof and in a plane between said window openings; a long thin sheet of flexible transparent plastic having end portions wound around said rollers; and gearing disposed entirely within said rectangular frame for rotating one of

said rollers to wind said sheet onto said one roller as it unwinds from the other roller, said plastic sheet comprising two rectangular panels each having an area larger than that of either of said window openings, the transparent plastic in one of said panels being of a different color than that in the other panel whereby the color of the filtered sunlight entering the room through said window openings may be selectively controlled.

3. Light controlling means as claimed in claim 2, in which said sheet has an additional rectangular flexible plastic panel of large area attached to the end of one of said colored panels, the inner face of said additional panel consisting substantially of an opaque film of bright light-reflecting metal which forms a flat mirror in response to the placement of said additional panel between said window openings by rotation of said gearing.

4. Light controlling means as claimed in claim 2, in which said sheet has an additional flexible rectangular translucent colored plastic panel having an area somewhat greater than that of said window opening and attached to the end of one of said colored panels, the inner face of said additional panel being marked with a translucent pictorial design of large area, said design being made in a color which contrasts with that of said additional panel.

5. A prefabricated rectangular structure whose four outer faces are wide and constructed to fit and seat against the four marginal faces of a large rectangular wall opening in a room, said structure comprising, in combination: two hollow rectangular closed casings disposed in vertical alignment with each other, each casing including a horizontal cross member and the adjacent ends of said casings having a pair of long aligned narrow openings therein; a pair of spaced apart parallel frames connecting the adjacent ends of said casings, said cross members and frames having two aligned rectangular window openings of large area therethrough; a first detachable roller pivotally supported within one of said casings; a second detachable roller parallel to said first roller and pivotally supported within the other casing, the inner walls of said casings being provided with doors which are longer than said rollers to permit the easy entry of the rollers into the casings upon the opening of said doors; a long thin flexible sheet of transparent plastic passing through said narrow openings and having its ends wound around said rollers, the width of said plastic sheet being greater than the width of said window openings and said sheet comprising a plurality of rectangular plastic panels of different colors,

each panel being transparent and thin enough to permit a person to see through the panel, the length of each panel being slightly longer than the length of said window openings and the area of each panel being at least 6 square feet; gearing disposed entirely within one of said casings connected to rotate the roller in said one casing; and a sheet of rigid transparent material attached to the outer of said parallel frames and covering the window opening therein to prevent the passage of dust particles in the outside air onto said flexible sheet.

6. A structure as claimed in claim 5, in combination with speed reducing gearing disposed entirely within the other of said casings and connected to rotate the other roller; and an electric motor also located entirely within said other casing and connected to rotate said speed reducing gearing.

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