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E. H. LAND

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ADVERTISING DISPLAY DEVICE

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Fig. 1.

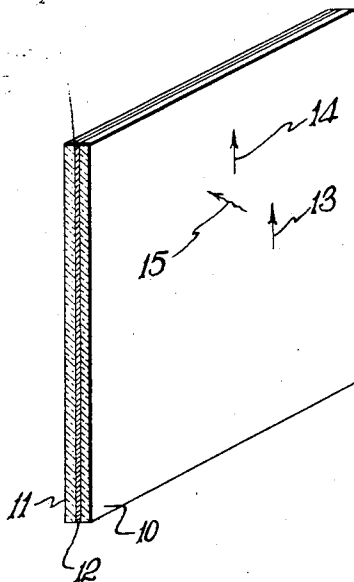


Fig. 2.

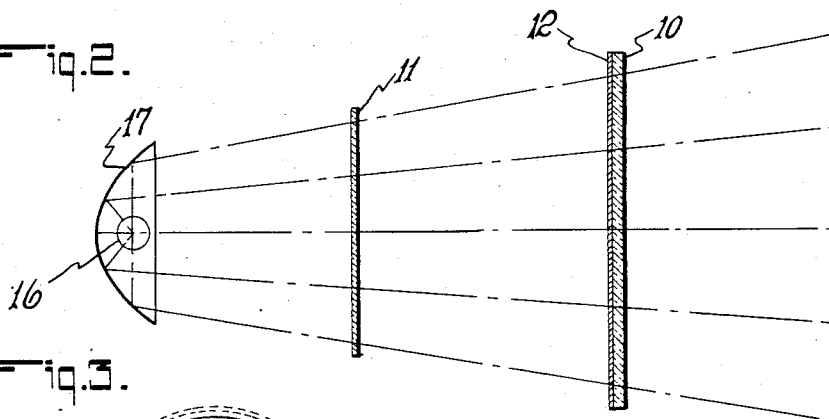
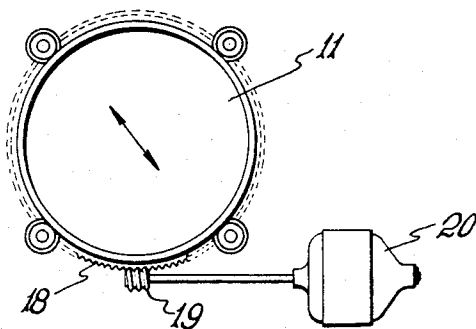


Fig. 3.



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ADVERTISING DISPLAY DEVICE

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6 Claims. (Cl. 240—10)

This invention relates to new and improved display devices, and more especially to an illustrated display device for advertising purposes, and to a process of controlling the color characteristic of light transmitted thereby.

An object of the invention is to provide a device adapted to utilize polarized light to give widely diverse and brilliant color effects.

A further object of the invention is to provide a device of the character described in which the color secured is dependent in part upon the angle at which the display face of the device is viewed.

A further object of the invention is to provide such a device adapted to impart varied color effects without the use of any moving parts as the angle at which it is viewed is altered.

A further object of the invention is to provide a device comprising a plurality of polarizing elements separated by double refracting material, and to provide means for causing relative movement of one or more of said elements with respect to the others so as to impart a changing color characteristic to transmitted light.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation and order of one or more of such steps with respect to each of the others, and the apparatus embodying features of construction, combinations of elements and arrangement of parts which are adapted to effect such steps, all as exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is an enlarged view partly in perspective and partly in cross section of a simplified embodiment of the invention;

Fig. 2 is a diagrammatic representation of another embodiment of the invention; and

Fig. 3 is an illustration of means which may be employed for causing rotation of a movable element in such apparatus as is shown in Fig. 2, to impart a changing color characteristic to the transmitted beam of light.

The invention contemplates a display device which is adapted to impart a color characteristic to light transmitted thereby, the characteristic being controlled not only by the positions of the elements of the device itself, but by the angle

at which the transmitted beam is viewed by an observer.

The invention contemplates further the provision of such a device with means adapted to cause a relative alteration in the positions of the elements thereof so as to effect corresponding alterations in the color characteristic of the transmitted beam.

A suitable device embodying the invention may comprise a plurality of light-polarizing bodies with a double refracting material positioned therebetween. Such a device is shown, for example, in Fig. 1, in which 10 and 11 represent light-polarizing bodies and 12 represents a double refracting body. Any suitable light-polarizing means may be employed. Preferably, sheets of material adapted substantially to plane-polarize light, yet being relatively thin, are employed, for example, sheets of a light-polarizing body as described in the patent to Land and Friedman No. 1,918,848, or polarizing bodies of the type described in my copending applications Serial Nos. 434,833 and 651,953. A peculiar advantage of such polarizing bodies, when employed in the present invention, is that they polarize all light which they transmit, irrespective of the angle at which they intercept the beam, i. e., they possess an unlimited angular aperture. It follows that such polarizing bodies are adapted to transmit diffused light without other light loss than that lost in polarizing and in normal reflection losses. The polarizing elements familiar to the art do not possess this property. For example, a stack of glass plates will not polarize diffused light, since the polarization is dependent upon the angle at which the beam strikes the faces of the plates in the stack. A Nicol prism transmits only a very small portion of diffused light which impinges upon its surface, because its angular aperture is restricted. Crystals of tourmaline, while having a larger angular aperture than a Nicol prism, are not available in sizes large enough to be employed in apparatus of the type involved in this invention. They are furthermore usually thick, colored and inefficient polarizers. These polarizing bodies may comprise set suspensions of relatively small polarizing particles in suitable light-transmitting media, the polarizing axes of the suspended particles being oriented to substantial parallelism. A suitable polarizer may comprise such suspensions of particles of herapathite in cellulose acetate, or cellulose nitrate. The polarizing bodies employed may preferably comprise such suspensions of colloidal

particles, as the polarizers are then perfectly transparent.

This invention contemplates the use of a plurality of such polarizing sheets positioned with their polarizing axes at any desired angle. As shown in Fig. 1, the arrow 13 represents the direction of the polarizing axes of the sheet 10 and the arrow 14 represents the direction of the polarizing axes of the sheet 11. The two sheets are shown positioned with their polarizing axes parallel. This is considered to be one of the preferred relations.

Any suitable double refracting material may be employed, for example, mica, "cellophane", gelatin which has been strained stretched rubber membranes, suspensions of double refracting particles with uniformly oriented axes, etc. A suitable material which is readily obtained is commercial "cellophane". The double refracting material is preferably mounted between the polarizing bodies in such a way that neither of its axes is exactly parallel to either of the polarizing axes of the polarizing bodies. As shown in Fig. 1, the direction of an axis of the double refracting material, illustrated by the arrow 15, is at an angle to the polarizing axis of each of the polarizing bodies.

It may be desirable to employ a plurality of double refracting sheets. These may be superimposed on each other with their axes either parallel or angularly positioned to obtain a variety of color effects.

It will be obvious that various designs or lettering effects may be secured, either by altering the axes of the double refracting material over the area covered by the design, or by blacking out portions of the visible surface of the device, or by altering the thickness of the double refracting material over the surface of the design or in any other desired manner.

In operation, the device functions in the following manner:

A beam of light is directed against either of the faces of the device. It first passes through one of the polarizing bodies and is plane-polarized. It then passes through the double refracting material, and the plane-polarized beam may be said to be resolved into two components, one of which is retarded with respect to the other, so that the transmitted beam may be said in general to be elliptically polarized. The beam then passes through a second polarizing sheet, which removes more or less of the various wave lengths of the beam dependent upon the degree of retardation thereof effected by the double refracting material and the position of the polarizing axis of the polarizing sheet.

The retardation for any given wave length effected by the double refracting material depends upon the thickness of the double refracting material through which the beam has passed, as well as upon such other characteristics as the relative position of the axes of the double refracting material to the plane of polarization of the transmitted beam. It follows that where the device of the invention is viewed from an angle to the plane of the visible face of the device, the double refracting material may effect a different retardation than when the device of the invention is viewed normally to the visible face. Because of this, the color characteristic of the transmitted beam changes as the observer of the device moves past its face, or as the angle of the face is altered with respect to the position of the

observer. As a result, a constantly shifting, highly effective and brilliant color display may be obtained if the observer merely walks past a device of the character described, even though no moving elements or parts are employed in the device itself. The application of such a structure to advertising devices of various kinds is obvious.

It will be obvious that it is not necessary for the various elements of the device to be in contact in order for it to operate satisfactorily. For example, in Fig. 2 a device embodying the invention is shown in which one of the polarizing sheets 11 is positioned adjacent a suitable light source comprising, for example, a bulb 16 and a reflector 17. In such a device the transmitted beam passing through the polarizer 11 strikes the double refracting material 12, which may be mounted upon the second polarizer 10, as shown. Such a device possesses the advantage that one of the elements may be somewhat more readily rotated with respect to the others so as to impart a definite and striking color change to the visible transmitted beam, even should the observer remain immovable. Should he move, the effect of his motion past the device will be superimposed upon the effect secured by a rotation of one of its elements, and an added effect obtained.

Any means may be employed to rotate any of the elements of the device. As shown in Fig. 3, this may comprise any suitable gearing 18 mounted around the edge of the element and cooperating with a worm gear 19 driven in any suitable manner, as by a motor 20. Hot air rotors, pendulums and any of the familiar motion devices in changeable exhibitors may be employed if desired. It will be obvious that any element of the device may be rotated with respect to the others, or that a plurality of elements may be rotated with respect to each other and with respect to a stationary element, if desired.

Since certain changes in carrying out the above process and in the constructions set forth, which embody the invention may be made without departing from its scope, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In combination, a light source, means associated therewith and adapted to project a diverging beam, a plurality of relatively thin light-polarizing elements positioned in the path of said beam, double refracting material interposed between said polarizing elements and positioned with its axes at an angle to the polarizing axis of each of said elements, at least that polarizing element positioned farthest from said light source being adapted to transmit all of said diverging beam impinging upon its surface.

2. In combination, a light source, a plurality of sheets of light-polarizing material positioned in the path of a beam emanating from said source and comprising a set suspending medium having embedded therein a mass of light-polarizing particles with their polarizing axes oriented to substantial parallelism, a sheet of double refracting

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material positioned between said polarizing sheets with its axes at an angle to the polarizing axis of each of said sheets, at least one of said sheets bearing a design and being adapted to form an object screen, and means to cause the light traversing said sheets to diverge throughout a wide angle whereby said object screen may be viewed from a plurality of separated points.

3. A display device comprising a light source, and means interposed in the path of a beam emanating from said source and adapted to impart varying color characteristics to said beam, said means comprising a plurality of elements adapted to transmit only substantially plane-polarized light, and double refracting means of varying thickness positioned between said elements, the axes of said double refracting means being positioned at an angle to each of the polarizing axes of said elements, said elements being adapted to transmit any non-polarized diffused beam impinging thereon.

4. In a display device, in combination, a light source, means associated therewith and adapted to project a diverging beam, a plurality of sheets of material interposed in the path of said beam, said sheets comprising successively light-polarizing means, double refracting means, and light-polarizing means, and means to alter the position of the axis of at least one of said sheets with respect to the others, at least said second light polarizing means being of such size and character as to analyze any portion of said diverging beam impinging thereon.

5. In a display device, in combination, a light source, means associated therewith and adapted

to project a diverging beam, a light-polarizing body positioned in the path of the beam emanating from said source, a sheet of double refracting regenerated cellulose positioned in the path of the beam transmitted by said polarizing body, and a second light-polarizing body positioned in the path of the beam transmitted by said sheet of cellulose, said second light-polarizing body being adapted to analyze any portion of the diverging beam impinging thereon, the axes of the sheet of cellulose being positioned at an angle to the polarizing axis of each of said polarizing bodies, said device comprising an object screen, the colors of said object screen being dependent at least in part upon the interference of polarized light.

6. A display device comprising, in combination, a light source, means to effect divergence of the light emanating from said source, means to polarize said diverging light, said polarizing means transmitting and polarizing substantially all the diverging rays impinging thereon, double-refracting material interposed in the path of the beam traversing said polarizing means, a second polarizing element interposed in the path of the beams traversing said double-refracting material and adapted to plane-polarize substantially all of the rays impinging thereupon, said polarizing elements and double-refracting material being so positioned as to alter the color characteristic of the transmitted light, at least one element interposed in the path of beams emanating from said source bearing a design and being adapted to form an object screen.

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