Description

The present invention relates to apparatus and method for forming a color image from an electrical signal and more particularly to improvements in electronic color imaging apparatus of the kind using an array of light valves.

U.S. Patent 4,229,095 discloses various embodiments of electronic color-imaging apparatus that utilize arrays of separately-addressable, pixel (picture element) sized, electro-optical means to effect multicolor exposure of panchromatic imaging media. One preferred kind of electro-optical means disclosed in that patent is a light valve comprising a panel of ferro-electric ceramic material, such as lanthanum-doped lead zirconate titanate (PLZT) sandwiched between crossed polarizers and activated to operate in a quadratic Kerr cell mode. Thus an array of such light valves comprises a panel of PLZT material with a plurality of interleaved electrodes formed on one major surface in a manner facilitating the selective application of discrete electrical fields transversely across (in a direction perpendicular to the direction of viewing) discrete surface areas of the plate. Upon application of such fields, the PLZT material becomes birefringent and rotates the direction of polarization of incident light by an extent dependent of the field magnitude. This results in the transmission of light through the PLZT panel and polarizers varying as a function of the electric fields. A color image is formed by selectively opening and closing such light valves in synchronization with pulses of red, green and blue light and according to the red, green and blue color information for the pixels of that image.

The above-mentioned patent discloses two preferred approaches for providing such successive pulses of different color light. In one approach separate radiation sources, such as separate elongated flash lamps with respective red, green and blue filters, are energized successively by a controllable power source. In the other approach a rotating member, having successive red, green and blue filter sectors is interposed between a single illumination source and the light valve array.

The above approaches are completely suitable for many electronic imaging applications; however, in certain electronic imaging applications they each have some undesirable features. The multiple-lamp approach involves three, instead of one, illuminating sources and thus some additional costs. Moreover, there are certain limits as to how fast these sources can be turned on and off and for higher speed imaging applications, this can present a problem. The rotating filter approach avoids both of the aforementioned potential difficulties; however, it involves precise synchronization of the filters' movement and thus involves the cost of precise servo-systems, as well as potential operational difficulties in higher speed applications.

In view of the foregoing, it is an object of this invention to provide a color control apparatus which is capable of producing, without resorting to the multiple light sources and precision synchronization systems which characterized similar prior art devices, the extremely short and well defined pulses of different colored light required by electronic color imaging systems of the type described above. The color control apparatus of the invention comprises a panel of discrete, electrically addressable, color modulators, one modulator for each of the different colors (e.g. red, green, blue) desired. When illuminated by plane polarized light emanating from a multicolor light source and addressed by a suitable electric signal, the panel is adapted to rotate the plane of polarization of a selected color (e.g. blue). Like the selected color, the remaining colors (e.g. red and green) are transmitted by the panel but their respective planes of polarization remain unaltered. Upon striking a polarizer having a plane of polarization which is crossed with respect to the plane of polarization of the light incident upon the panel, only the selected color is transmitted. Circuitry is provided for addressing the panel's individual modulators, one at a time and in a predetermined order to sequentially rotate the plane of polarization of a selected color at a time when the individual light valves of the electronic imaging array are electrically addressed with image information of the selected color.

The subsequent more detailed description of various exemplary preferred embodiments of the present invention refers to the attached drawings wherein:

Figure 1 is a schematic illustration, in exploded perspective, of one preferred embodiment of the present invention;

Figure 2 is a schematic cross-sectional view of an embodiment similar to that shown in Fig. 1;

Figure 3 is a schematic cross-sectional view of an alternative embodiment of the present invention; and

Figure 4 is a schematic cross-sectional view of another alternative embodiment of the present invention.

Figure 1 schematically illustrates one preferred embodiment of the color control apparatus of the invention, such apparatus being shown incorporated in an electronic color imaging system 10. Imaging system 10 generally comprises first and second electro-optic modulators 11 and 12 which share a common plane polarizing filter 14. As will become more apparent from the ensuing description, the primary function of modulator 12 is to control the intensity of each picture element of an image formed at an image plane (represented by a photosensitive medium M in the drawings), and the primary function of modulator 11 is to control the color of each of such picture elements. While color modulator 11 and its associated circuitry constitutes the subject matter of this invention, it has certain structural similarities with intensity modulator 12; hence, the following description is pertinent to both modulators.

Electro-optic modulators 11 and 12 preferably

are formed of electro-optic material (E, E', respectively) of the type which transforms from a non-polar, optically-isotropic state to a polar, strongly birefringent state when an electrical field is applied thereacross. PLZT ferroelectric ceramic of a kind known in the art (see, e.g., U.S. 3,612,656; U.S. 3,998,523 and U.S. 4,053,207) is a preferred class of material; however, there are various other well known materials which exhibit the desired electro-optic behaviour described above. The electro-optic material (E, E') is positioned between a crossed pair of plane polarizers. In Fig. 1, the crossed pair of polarizers which comprises modulator 11 is represented by plane polarizers 13 and 14, and the crossed pair of polarizers which comprise modulator 12 is represented by plane polarizers 14 and 15. To minimize light losses, polarizer 14 can be shared by both modulators. Alternatively, however, polarizer 14 may comprise two sheets of polarizing filters having their planes of polarization aligned; in this case, the contrast ratio has been found to be increased, albeit the optical losses are greater. The plane of polarization of each polarizer is designated by the dashed arrows. The polarizers can be selected from various known materials such as sheet polarizing materials which exhibit dichroism, e.g. Polaroid sheet polarizers. In certain applications other light polarizing techniques, such as Nichol prisms and Brewster mirrors, may be useful.

As shown in Fig. 1, modulators 11 and 12 are arranged along an optical axis A in a predetermined sequence and orientation. Specifically, color modulator 11 is shown as being located between modulator 12 and a multicolored light course 16; however, in the practice of the invention, color modulator 11 could be positioned between modulator 12 and the image plane (i.e. photosensitive medium M).

Usually it will be desirable to dispose the individual elements of modulators 11 and 12 in closely spaced relation; however, in certain embodiments other light directing optical elements e.g. such as mirrors and prisms can be interposed along the optical path. Thus, although the modulators need not be arranged in a straight line, they should be generally optically aligned. As indicated in Fig. 1, the polarization direction of the entrance and exit polarizing means 13 and 15 are the same and the polarization direction of the intermediate polarizing means 14 is orthogonal to those of the other polarizers.

The source of uniform, multicolor illumination 16 is located to direct light generally along axis A, illuminating the entire surface of entrance polarizer 13 uniformly. It is highly preferred that such illumination be substantially collimated in a direction normal to the major surfaces of the polarizers and modulators. At the opposite end of axis A, means are provided (e.g. roller 17 coupled to drive 18) for supporting a pan-sensitive recording medium M and moving it past an exposure station opposite exit polarizing means 15. It will be appreciated that suitable means, e.g. a lens, not shown, will be provided between polarizing means 15 and the image medium to image the light valve at the exposure station.

As shown in Fig. 1, the modulators 11 and 12 are divided into a plurality of independently addressable strip portions (R, G, B and P_1—P_5) by strip electrodes extending across their major surfaces in predetermined configurations. Referring first to intensity modulator 12, it can be seen that a plurality of linear electrodes 21 extend from a common line along the top of the modulator in a parallel spaced relation to the bottom of the modulator, and a plurality of addressing electrodes 22 extend in parallel spaced relation toward the top of the modulator, interleaved between electrodes 21. In one mode for address, the electrodes 21 can be coupled to a common source of reference potential, e.g. ground and the electrodes 22 selectively energized to an activating potential level. Thus zones (P_1—P_5) between adjacent pair of electrodes 22 form light-modulating strip portions transversely across the path of the recording medium M as it moves past the exposure zone.

The color modulator 11 shown in Fig. 1 has a slightly different electrode arrangment; however, it can also be formed like modulator 12 but with the strip portions in an orthogonal direction. Instead, in the illustrated embodiment, the color modulator 11 comprises a plurality of separately-addressable linear electrodes 24 extending horizontally across the modulator and coupled to an addressing source 27 adjacent the modulator. Electrodes 24 define three discrete strips on the surface of the electro-optic material E on which they are disposed, and three different color filters 26, which transmit red (R), green (G) and blue (B) light are optically aligned with such strips. To activate one of the three light-modulating strip portions (R, G, B), it is necessary that the adjacent electrodes 26 defining that portion be at different potential levels to form the activating electrical field thereacross. This can be done in an electrically efficient fashion, which will be described subsequently, for the preferred embodiment disclosed. The red, green and blue filters can be coated on the modulator portions or supported in appropriately aligned relation.

It should be noted that it is preferred in this embodiment of the present invention that the electric fields applied across strip portions R, G, B and P_1—P_5 be in a direction perpendicular to the optical axis A. Thus as used herein the phrase "transversely across" is used with respect to electric fields to distinguish this preferred field direction in contrast to the direction across the thickness of the element (i.e., in a direction parallel to the optical axis A). The significance of this aspect is that this mode of field application results in light modulation in the transverse or Kerr mode rather than in the longitudinal or scattering mode.

One preferred mode of operation for the above-described electronic color imaging apparatus will now be explained as it is effected by the related addressing and illuminating elements also shown schematically in Fig. 1. Thus, under the control of

clock 30, buffer memory 31 provides an output to addressing source 25 (e.g., a shift register) for intensity modulator 12 representing the pixel information for a particular color content of a line of image information, which it has received and stored from image signal source 32. During this same period color signal generator 35 produces an output to addressing source 27 (e.g., a shift register) for color modulator 11 representative of such particular color. Addressing source 27 also operates under the control of clock 30. Thereafter clock 30 initiates an address signal which causes the addressing sources 27 and 25 to energize electrodes 22 and 26 in accordance with the information clocked therein. At this stage the multicolor source 16 has been energized by power source 38 to effect uniform illumination of modulator 11, through its polarizer means 13, with panchromatic light.

Assuming the address sources to be loaded with information as shown (i.e., "V" — energize the coupled electrode; "O" — do not energize the coupled electrode), pixel regions P_1, P_4 and P_5 will be exposed to blue light. This can be explained as follows. In color modulator 11, only the electrodes defining strip B have a potential differential and thus an electrical field is present only transversely across strip B. Polarized light directed onto the surface of modulator 11 thus passes through strips G and R without modulation but such light passing through strip B is rotated 90° because that strip portion is now in its polar birefringent state. Upon exiting modulator 11, the light from strips G and R is blocked by cross polarizer 4, but the light exiting strip B (having been rotated 90°) passes polarizer 14 and forms an illuminating strip of blue light (orthogonal to strips P_1—P_5) on modulator 12. By virtue of their addressed activation, pixel regions P_1, P_4 and P_5 of modulator 12 are in the polar, birefringent state and rotate light passing therethrough 90°. Non-activated strips P_2 and P_3 do not rotate light falling thereon. Thus light passing activated strips passes polarizer 15 (which is cross relative to polarizer 14) and light passing non-activated strips is blocked by polarizer 15. Upon completion of the blue color imaging of the line, color signal generator 35 activates an input to addressing source for the color control modulator to energize a different color strip of modulator (e.g., by actuating the shift register 27 so that the first two elements thereof are "V"). New pixel region information for the green color imaging of a line is input to source 25 and the activation stage is repeated as previously described. Subsequent addressing of registers 27 and corresponding input to pixel regions of modulator 12 will provide red color exposure of a line.

At this stage is should be noted that at least two different approaches are possible for the sequence of line information addressed to modulator 12. First, the pixel color information addressed to modulator 12 during the successive R, G, B activations of modulator 11 can be for the same transverse line of the image medium. In this instance the optical means between polarizing means 15 and the exposure station would be designed to direct the spaced red, green and blue light strip portions which pass modulators 11 and 12 to a common line zone at the exposure station (e.g. anamorphic optics). In a second approach the buffer memory can include signal processing means which provide appropriate line delays to image color signals. Thus in a given activating sequence of sequential R, G, B pulses from color modulator 11, the pixel modulator 12 would be addressed with different image line information for each different color pulse. If it is assumed for the Fig. 1 configuration that the first exposed transverse line of medium M is line 1, then the pixel information applied to modulator 12 during the blue pulse would be e.g. for line 17, while the pixel information applied to modulator 12 during the green and red pulses of that sequence of color modulator 11, would be respectively for lines 18 and 19.

Considering the above-described structure and mode of operation, it will be appreciated that color modulator 11 comprises a color control apparatus that is capable of controlling the passage of particular light colors in response to addressing electrical signals. Similarly, it will be appreciated that modulator 12 comprises a light valve array for controlling light passage to a plurality of pixel regions, arranged transversely across the exposure station, in response to addressing electrical signals. Thus a complete color image can be electrooptically recorded on the medium as it moves past these cooperating modulators, if the addressing means activates strips P_1—P_5 of the light valve array in proper synchronization with the color strips (R, G, B) of the color modulator, i.e. so that valves P_1—P_5 are activated in accord with the color information that pertains to the light color then passing the color modulator.

Within the scope of the present invention, there are various configurations and operational sequencing that can be made to those just described. For example, as mentioned above, the positions of modulators 11 and 12 could be interchanged on the optical axis. Also, modulators other than the specific types described could be utilized.

Figures 2—4 schematically illustrate some exemplary embodiments of different configurations which can be utilized according to the present invention. The device 40 shown in Fig. 2 comprises a lamp source 46, polarizers 43, 44 and 45 and layers of electro-optic material 41 and 42 having electrodes disposed thereon, all similar to those described with respect to Fig. 1. A filter array 47 is aligned with the respective strip formed by electrodes of electro-optic modulator 41. In this embodiment it is to be noted that the modulators 11 and 12 of Fig. 1 are formed as a unitary panel, and that the respective R, G and B line exposures occur at different locations along the path on which recording medium M is supported and moved through the exposure

station, e.g. by a vacuum platen 49. If the size of zone X on the recording medium is sufficiently small, the different color exposures for that zone will be visually integrated and the zone can be considered a line of pixels. If the zone is larger than will be integrated by the viewer, i.e. the subzones can be resolved, then it will be desirable to allow appropriate time delays between successive R, G, B line exposures to allow the movement of the recording medium to provide registration or to provide appropriate optical means, e.g. anamorphic optics between the polarizer 45 and the exposure station.

The device 50 shown in Fig. 3 shows another way to accomplish overlap of different color exposures of an image line. This device comprises illumination source 56, entrance polarizer 53, electro-optic modulator 51, color strip filter array 57 and intermediate polarizer 54 as described above. However, upon exciting polarizer 54, the different color light strips are all directed by anamorphic optics comprising e.g., cylindrical lenslet array 60, onto the same linear array 52 of discretely-addressable electro-optic pixels. The light passing array 52 enters an aligned strip polarizer 55 and is recorded on material M fed by drive means 59 past the exposure zone.

The device 70 shown in Fig. 4 represents another alternative embodiment. As shown, the device comprises linear strip polarizers 73a—c, 74a—c and 75a—c which are located along their respective optical axes in relation to linear modulators 71a—c and 72a—c in a manner similar to the other devices previously described. The separate light paths defined by these elements have respectively a red R, green G and blue B filter aligned thereacross. Modulators 71a—c have spaced horizontal electrodes (not shown) which define a single electro-optical strip. Modulators 72a—c have a plurality of linear electrodes similar to modulator 12 of Fig. 1 but only extending a single pixel height. Light from illumination source 76 is piped, e.g. by fiber optic means 78 to each of the separate optical axes. Addressing of the elements of the different axes can occur concurrently, e.g. red information for a line 3 being addressed to the "a" axis elements, while information for a line 2 is addressed to the "b" axis elements and information for a line 1 is addressed to the "c" axis elements. It will be understood that by suitable signal processing, the image information can be reformatted appropriately. Thus when line of the medium M reaches the b axis, its green information will be addressed to linear light valve array 72b and when it reaches the c axis, its blue information will be addressed to linear light valve array 72c.

Claims

1. An electronic color imaging apparatus of the type which includes (a) an array of electrically addressable light valves positioned between a multicolor light source and an image plane for selectively controlling the intensity of each of the picture elements of an image to be formed at the image plane, each of such light valves comprising, in optical alignment, a polarizer for plane polarizing light incident thereon and an electro-optic, light modulating material which is adapted to rotate the plane of polarization of polarized light incident thereon in response to having an electric field applied thereto, and (b) apparatus for controlling the color of each picture element of an image formed at said image plane, characterized in that said color control apparatus comprises:

(a) a panel of discrete, electrically addressable, color modulators (26) positioned either between said source and said light valve array, or between said light valve array and said image plane, each of said color modulators being adapted to selectively transmit light of a unique color upon being electrically addressed, each of said modulators comprising, in optical alignment, a pair of crossed polarizers (13, 14) having positioned therebetween a color filter (R, G, B) and an electro-optic light modulating material (E) which is adapted to rotate the plane of polarization of polarized light incident thereon in response to having an electric field applied thereto, and

(b) circuit means (30, 35) for electrically addressing said color modulators, one at a time and in a predetermined order to cause said color modulators to sequentially transmit light of different colors.

2. The apparatus as defined by claim 1 characterized in that said light-modulating material comprises PLZT ferroelectric material.

Patentansprüche

1. Elektronisches Farbabbildungsgerät mit (a) einer Anordung aus elektrisch ansteuerbaren Lichtventilen, die zwischen einer Lichtquelle für mehrfarbiges Licht und einer Abbildungsebene angeordnet ist, um die Intensität der einzelnen Bildelemente eines in der Abbildungsebene zu erzeugenden Bildes selektiv zu steuern, wobei jedes der Lichtventile einen Polarisator aufweist, der einfallendes Licht plan polarisiert, sowie, damit optisch ausgerichtet, ein elektro-optisches lichtmodulierendes Material, das bei Anlage eines elektrischen Feldes die Polarisationsebene des einfallenden polarisierten Lichts dreht, und (b) einer Vorrichtung zum Steuern der Farbe eines jeden Bildelements eines in der Abbildungsebene erzeugten Bildes, dadurch gekennzeichnet, daß die Farbsteuervorrichtung folgendes umfaßt:

a) eine Platte aus einzelnen, elektrisch ansteuerbaren Farbmodulatoren (26), die entweder zwischen der Lichtquelle und der Lichtventilanordnung oder zwischen der Lichtventilanordnung und der Abbildungsebene angeordnet ist, wobei jeder der Farbmodulatoren bei seiner elektrischen Ansteuerung selektiv Licht einer einzigen Farbe durchläßt und jeder der Modulatoren zwei gekreuzte Polarisatoren (13, 14) aufweist, die optisch mit ihm ausgerichtet sind und zwischen denen ein Farbfilter (R, G, B) angeordnet ist sowie

station, e.g. by a vacuum platen 49. If the size of zone X on the recording medium is sufficiently small, the different color exposures for that zone will be visually integrated and the zone can be considered a line of pixels. If the zone is larger than will be integrated by the viewer, i.e. the subzones can be resolved, then it will be desirable to allow appropriate time delays between successive R, G, B line exposures to allow the movement of the recording medium to provide registration or to provide appropriate optical means, e.g. anamorphic optics between the polarizer 45 and the exposure station.

The device 50 shown in Fig. 3 shows another way to accomplish overlap of different color exposures of an image line. This device comprises illumination source 56, entrance polarizer 53, electro-optic modulator 51, color strip filter array 57 and intermediate polarizer 54 as described above. However, upon exciting polarizer 54, the different color light strips are all directed by anamorphic optics comprising e.g., cylindrical lenslet array 60, onto the same linear array 52 of discretely-addressable electro-optic pixels. The light passing array 52 enters an aligned strip polarizer 55 and is recorded on material M fed by drive means 59 past the exposure zone.

The device 70 shown in Fig. 4 represents another alternative embodiment. As shown, the device comprises linear strip polarizers 73a—c, 74a—c and 75a—c which are located along their respective optical axes in relation to linear modulators 71a—c and 72a—c in a manner similar to the other devices previously described. The separate light paths defined by these elements have respectively a red R, green G and blue B filter aligned thereacross. Modulators 71a—c have spaced horizontal electrodes (not shown) which define a single electro-optical strip. Modulators 72a—c have a plurality of linear electrodes similar to modulator 12 of Fig. 1 but only extending a single pixel height. Light from illumination source 76 is piped, e.g. by fiber optic means 78 to each of the separate optical axes. Addressing of the elements of the different axes can occur concurrently, e.g. red information for a line 3 being addressed to the "a" axis elements, while information for a line 2 is addressed to the "b" axis elements and information for a line 1 is addressed to the "c" axis elements. It will be understood that by suitable signal processing, the image information can be reformatted appropriately. Thus when line of the medium M reaches the b axis, its green information will be addressed to linear light valve array 72b and when it reaches the c axis, its blue information will be addressed to linear light valve array 72c.

Claims

1. An electronic color imaging apparatus of the type which includes (a) an array of electrically addressable light valves positioned between a multicolor light source and an image plane for selectively controlling the intensity of each of the picture elements of an image to be formed at the image plane, each of such light valves comprising, in optical alignment, a polarizer for plane polarizing light incident thereon and an electro-optic, light modulating material which is adapted to rotate the plane of polarization of polarized light incident thereon in response to having an electric field applied thereto, and (b) apparatus for controlling the color of each picture element of an image formed at said image plane, characterized in that said color control apparatus comprises:

(a) a panel of discrete, electrically addressable, color modulators (26) positioned either between said source and said light valve array, or between said light valve array and said image plane, each of said color modulators being adapted to selectively transmit light of a unique color upon being electrically addressed, each of said modulators comprising, in optical alignment, a pair of crossed polarizers (13, 14) having positioned therebetween a color filter (R, G, B) and an electro-optic light modulating material (E) which is adapted to rotate the plane of polarization of polarized light incident thereon in response to having an electric field applied thereto, and

(b) circuit means (30, 35) for electrically addressing said color modulators, one at a time and in a predetermined order to cause said color modulators to sequentially transmit light of different colors.

2. The apparatus as defined by claim 1 characterized in that said light-modulating material comprises PLZT ferroelectric material.

Patentansprüche

1. Elektronisches Farbabbildungsgerät mit (a) einer Anordung aus elektrisch ansteuerbaren Lichtventilen, die zwischen einer Lichtquelle für mehrfarbiges Licht und einer Abbildungsebene angeordnet ist, um die Intensität der einzelnen Bildelemente eines in der Abbildungsebene zu erzeugenden Bildes selektiv zu steuern, wobei jedes der Lichtventile einen Polarisator aufweist, der einfallendes Licht plan polarisiert, sowie, damit optisch ausgerichtet, ein elektro-optisches lichtmodulierendes Material, das bei Anlage eines elektrischen Feldes die Polarisationsebene des einfallenden polarisierten Lichts dreht, und (b) einer Vorrichtung zum Steuern der Farbe eines jeden Bildelements eines in der Abbildungsebene erzeugten Bildes, dadurch gekennzeichnet, daß die Farbsteuervorrichtung folgendes umfaßt:

a) eine Platte aus einzelnen, elektrisch ansteuerbaren Farbmodulatoren (26), die entweder zwischen der Lichtquelle und der Lichtventilanordnung oder zwischen der Lichtventilanordnung und der Abbildungsebene angeordnet ist, wobei jeder der Farbmodulatoren bei seiner elektrischen Ansteuerung selektiv Licht einer einzigen Farbe durchläßt und jeder der Modulatoren zwei gekreuzte Polarisatoren (13, 14) aufweist, die optisch mit ihm ausgerichtet sind und zwischen denen ein Farbfilter (R, G, B) angeordnet ist sowie

* C L M S *

ein elektrooptisches, lichtmodulierendes Material (E), das bei Anlage eines elektrischen Feldes die Polarisationsebene des einfallenden polarisierten Lichts dreht, und

b) Schaltungsmittel (30, 35), mit denen jeweils einer der Farbmodulatoren in einer bestimmten Reihenfolge angesteuert wird, so daß die Farbmodulatoren nacheinander Licht unterschiedlicher Farben durchlassen.

2. Gerät nach Anspruch 1, dadurch gekennzeichnet, daß das lichtmodulierende Material aus einem ferro-elektrischen PLZT-Material besteht.

Revendications

1. Un appareil électronique de formation d'une image en couleurs comprenant a) un réseau de vannes optiques électriquement adressables positionnées entre une source de lumière multicolore et un plan-image pour contrôler sélectivement l'intensité de chacun des éléments d'une image à former au plan-image, chacune de ces vannes optiques comprenant en alignement optique, un polariseur pour polariser dans un plan la lumière incidente et un matériau électro-optique de modulation de la lumière qui est adapté pour faire tourner le plan de polarisation de la lumière polarisée incidente en réponse à un champ électrique qu'on lui applique et, b) un appareil pour contrôler la couleur de chaque élément d'une image formée sur ledit plan-image, caractérisé en ce que ledite appareil de contrôle de la couleur comprend:

a) un panneau de modulateurs individuels de couleur (26) électriquement adressables placé soit entre ladite source et ledit réseau de vannes optiques, ou soit entre ledit réseau de vannes optiques et ledit plan-image, chacun des modulateurs de couleur étant adapté pour sélectivement transmettre la lumière d'une seule couleur quand il est adressé électriquement, chacun desdits modulateurs comprenant, en alignement optique, une pair de polariseurs croisés (13, 14) séparés par un filtre couleur (R, G ou B) et un matériau électro-optique (E) de modulation de la lumière qui est adapté pour faire tourner le plan de polarisation de la lumière polarisée incidente en réponse à un champ électrique qu'on lui applique et

b) des circuits (30, 35) pour adresser électriquement lesdits modulateurs de couleur, un à fois et dans un ordre prédéterminé afin que les modulateurs de couleur transmettent de manière séquentielle la lumière de différentes couleurs.

2. Appareil tel que défini dans la revendication 1 caractérisé en ce que le matériau modulant la lumière comprend un matériau ferroélectrique du type zirco-titanate de plomb dopé au lanthane.

* C L M S *