

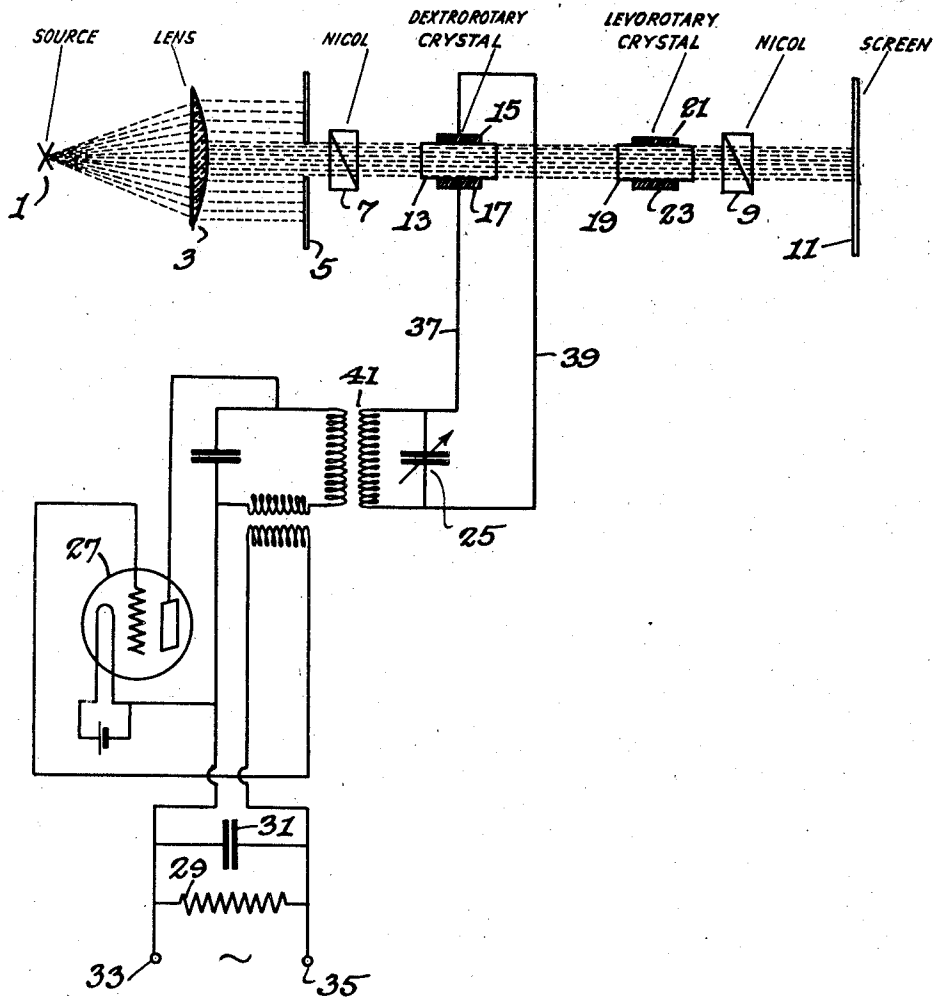
Feb. 17, 1931.

F. MICHELSEN

1,792,752

LIGHT CONTROL

Filed March 21, 1927



INVENTOR
FRITZ MICHELSEN
BY *Harold Adams*
ATTORNEY

UNITED STATES PATENT OFFICE

FRITZ MICHELSEN, OF BERLIN, GERMANY, ASSIGNOR TO GESELLSCHAFT FÜR DRAHT-
LOSE TELEGRAPHIE M. B. H. HALLESCHES, OF BERLIN, GERMANY, A CORPORATION
OF GERMANY

LIGHT CONTROL

Application filed March 21, 1927, Serial No. 177,204, and in Germany March 23, 1926.

A method for controlling light which is based upon the theory of passing polarized light through an anisotropic substance, and causing the latter to start vibrations for controlling purposes, is known. This method is associated with an action upon the polarized condition of the light which, in well-known manner, is used for altering the intensity of the light issuing from an analyzer. The phenomenon of influencing the state of polarization of light by a vibrating crystalline substance or material is based both upon double refraction as well as upon rotational dispersion of the light, and it has been found that this latter phenomenon of rotational dispersion influences the intensity of the issuing light. This influence on the kind of the light is undesirable in many cases, for instance, where the transmission of fluctuations in the brightness of white light is concerned, for on account of rotational dispersion it is then impossible to obtain complete darkness by "crossed" Nicol lenses.

In my present invention I have disclosed an arrangement by the aid of which it is possible to neutralize and obviate the undesirable action of rotational dispersion. With this end in view, a second anisotropic substance is disposed in the path of the rays of light which are passed through the anisotropic substance that is caused to vibrate as, for example, an arrangement as disclosed by Alexander Meissner in Serial No. 117,583, filed February 28, 1927, with the result that the color dispersion of the light occasioned by the first substance is re-compensated by the second anisotropic body. For example, if the crystalline or piezo-electric material through which polarized light is passed from a light source and which, by electric oscillations, is caused to vibrate at its natural period, consists of a dextrorotatory quartz crystal or, in other words, a crystal having a clockwise rotational effect, then, according to this invention, a levorotatory quartz crystal or one to produce a counter-clockwise rotational effect is disposed ahead of the former, with the result that the second crystal neutralizes the rotation of the former, and that in normal state, mutual compensation of the anisotropy of the

two crystals is produced. If, then, one of the two quartz crystals is excited, the penetrating luminous rays after their passage through the second quartz crystal will be influenced only by the action of the double refraction due to the oscillations, whereas the phenomenon of rotational refraction is eliminated.

The arrangement hereinbefore disclosed is of especially great importance in connection with picture telegraphy and television.

The fundamental idea of this arrangement, without going here into details regarding the physical phenomena occurring within the crystalline material, is, therefore, that of passing the light rays through both an excited crystal and a second similar crystal, the latter, however, being of such a nature that it compensates for the color dispersion caused by the former crystal. When in unexcited state, the two crystals thus constitute, as it were, one anisotropic body.

The accompanying drawing shows diagrammatically one form which my arrangement may assume.

Referring now to the drawing, I have indicated the light source by the numeral 1 and light projected from the source is then passed through a lens 3 and a diaphragm 5 so as to strike a Nicol prism 7. The Nicol prism 7 polarizes the light from the source 1 in one plane and this plane polarized light beam is then passed through a crystal 13 which has dextrorotatory power. Electric current potentials are supplied to the crystal 13 by means of electrodes 15 and 17 connected by conductors 39 and 37 respectively to the oscillatory circuit 25 which is coupled by means of a transformer to a vacuum tube system 27. Signal pulses may be applied across the resistance 29 and the capacity 31 by connecting the same to the terminals 33 and 35.

After the electric potentials have been applied to the electrodes 15 and 17 of the crystal 13, the plane polarized light beam passing therethrough from the Nicol prism 7 is doubly refracted or elliptically polarized and is then passed through a second crystal 19 of similar properties to the crystal 13 except for the fact that the crystal 19 has levorotatory power and compensates for light

dispersion occasioned by light beam passing through the crystal 13. The crystal 19 is preferably supported by supporting members 21 and 23, and light after leaving the crystal 19 is then passed through a second Nicol prism 9 which may be termed an 'analyzer' in that the plane polarized beam as issuing from the Nicol prism 7 is polarized in a plane at right angles to the first plane of polarization and whatever light passes beyond the Nicol prism 9, in accordance with the potentials on the crystal 13, may be recorded upon the screen 11 in any desired manner.

Having thus described my invention, I am entitled to all modifications as fall fairly within its spirit and scope as defined by the appended claims, wherein I claim:

1. In a light control system, a piezo-electric body permeable to light, a light source for directing light to said body, means associated with said body for controlling the amount of light passing through said body, and a crystal in the path of the light issuing from said piezo-electric body for compensating for color dispersion produced in the light issuing from said piezo-electric body.

2. In a light control system, a light source, an electro-mechanical vibrator for controlling the light issuing from said source, and a light permeable crystal in the path of the controlled light issuing from said electro-mechanical vibrator for compensating for color dispersion produced in the light issuing from said electro-mechanical vibrator.

3. In a light control system, a light permeable crystal, a light source, means for directing polarized light to said crystal, means for controlling the polarized light passing through said crystal, and a second light permeable crystal in the path of the light rays issuing from said first crystal for compensating for distortional errors produced in said first crystal.

4. In a light control system, a light permeable crystal, a source of light, means for polarizing the light issuing from said source, means for directing said polarized light through said crystal, means associated with said crystal for doubly refracting said polarized light passing therethrough, a second permeable crystal in the path of the said doubly refracted light issuing from said first named crystal for compensating for color dispersion produced in the light issuing from said first named crystal, and means for polarizing the compensated light beam issuing from said second named crystal in a plane at right angles to the plane of polarization of said first named polarizing means.

5. In a light control system, a light source, a crystalline vibrator in the path of the light issuing from said source, means for directing and controlling the light passing through said vibrator, means associated

with said vibrator for supplying a varying frequency thereto whereby the said directed light is varied in proportion to the supplied frequency by doubly refracting said light passing through said vibrator, and a crystal in the path of the light issuing from said crystalline vibrator for compensating for color dispersion produced in the light issuing from said crystalline vibrator.

6. In a light control system, a light source, an electro-mechanical vibrator, a light polarizer positioned between said source and said vibrator for directing polarized light to said vibrator, means associated with said vibrator for varying the state of oscillation of said vibrator, whereby the effected intensity of the light passing therethrough is rendered variable in proportion to the said oscillation frequency of said vibrator, a light permeable crystal in the path of the light issuing from said electro-mechanical vibrator for compensating for color dispersion produced in the light issuing from said electro-mechanical vibrator, and a second polarizer in the path of the controlled rays of said crystal for polarizing the light issuing therefrom in a plane at right angles to the plane of polarization of said first polarizer whereby in the absence of oscillations on said vibrator no light will pass said second polarizer.

7. In a light control system, a light permeable crystal, a source of light, means for polarizing said light and directing said polarized light through said crystal, means for vibrating said crystal to control the plane of polarization of said light, said means introducing color dispersion in the light passing through said crystal, and a second crystal isolated electrically from any source of electromotive force in the path of the light issuing from said first named crystal for compensating for the color dispersion introduced in said crystal upon vibration of the said crystal.

Fritz MichelsSEN.