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LIGHT CONTROL DEVICE

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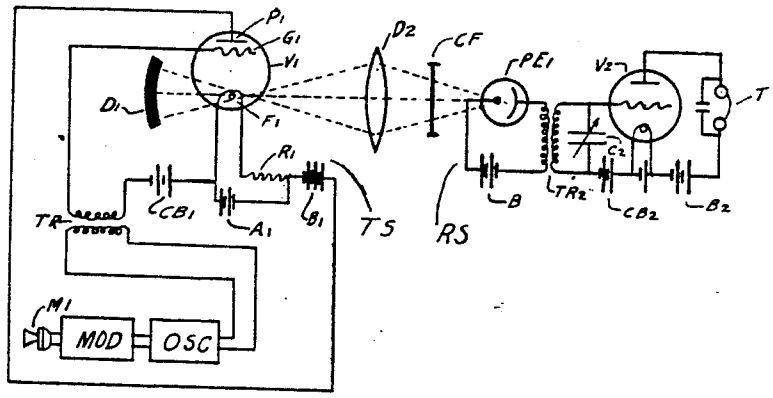
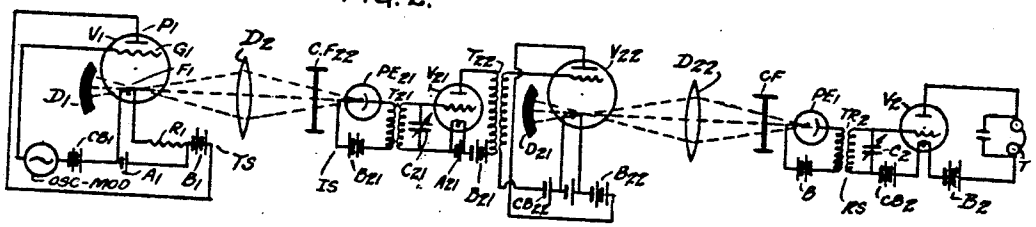


FIG. 1

FIG. 2.



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LIGHT CONTROL DEVICE

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13 Claims. (Cl. 250—7)

This invention relates to light control devices and more particularly to a means for signalling by high frequency light pulsations.

It has been proposed to use various forms of light chopping devices. One of the most promising systems is the one in which a Kerr cell is placed between two Nicol prisms, and a modulated carrier frequency impressed on the Kerr cell for the purpose of rotating a beam of polarized light.

Such systems all have decided disadvantages, such as low optical efficiency, high polarizing voltages, carrier frequencies of considerable magnitude and do not permit of the use of extremely high frequency carrier currents. The light produced by such devices normally covers a wide band of frequencies of the visible spectrum thereby making possible only limited color selectivity by color filters at the receiving station.

It is an object of this invention to provide a means of producing carrier frequency pulsations of light whereby the disadvantages above noted may not be present.

It is another object of this invention to provide a means of creating a carrier frequency rich in the infra-red end of the spectrum.

Another object is to produce variations in intensity of a light emitting source by varying the space charge around said source and utilizing said variations for signalling purposes.

Another object is to produce variations in the predominate frequencies given off by a light emitting source by varying the space charge around said source.

Another object is to produce large variations in amount of light emitted over a predetermined band of color frequencies only.

Another object is to illustrate a means of obtaining higher light frequencies from an incandescent body by placing a negative charge around said body to keep these frequencies from being dissipated in emitting electrons, with consequent injury to said incandescent body.

Another object is to produce carrier frequency variations in light by varying the number of electrons emitted by a source of light, the energy absorbed by the emission of said electrons varying the intensity of said source and consequently the light emitted by said source.

It is another object to illustrate means for utilizing variations in light given off by the filament of a vacuum tube having a plate, filament and grid, for light control purposes, the color of said light being controlled by the space current of said tube.

Another object is to illustrate means whereby weak variations in light may be amplified, and passed onto another station.

Other objects of this invention will become apparent from the following detailed description which is most readily understood by reference to the accompanying drawing in which:

Fig. 1 is a diagramatic illustration of one form of the invention.

Fig. 2 is a further illustration thereof in which a relay or intermediate station is illustrated.

Referring to Fig. 1, transmitting station TS is composed of three electrode vacuum tube V1 containing plate P1, filament F1, and grid G1. An "A" battery A1 heats filament F1. Resistance R1 prevents any substantial increase in filament current when the space current of the tube increases, since it is common to the negative "A" lead and "B" battery circuit. Battery B1 impresses a high positive potential on plate P1. "C" battery CB1 impresses a negative potential on grid G1, sufficient to block the space current thru tube VI when no signal is being impressed between G1 and F1 by oscillator OSC controlled by modulator MOD in response to microphone M1 thru transformer TR.

Reflector D1 directs the light from filament F1 on to lens D2 which in turn concentrates the rays on photo-electric cell PE1 thru color filter CF at receiving station RS. Since the light from filament F1 varies in accordance with the modulated carrier frequency of oscillator OSC, the electrical current variations in the circuit B PEI primary of transformer TR2, are similar in form to the modulated carrier frequency.

This energy is transferred to a tuned circuit comprising secondary of transformer TR2 and C2, which in turn is detected by "C" bias vacuum tube detector V2, the modulation frequency thereof appearing in translating device T.

The principles involved in varying an electron emitting light source by varying the space charge around said light source may be analyzed by the well known Einstein equation:

$\frac{1}{2} mv^2$ equals $(hf—P)$ equals Ve.

wherein;

m is the mass of an electron.

v is the velocity of its emission.

h is the Plank's constant.

f is the frequency of radiant energy, and

P is the energy lost by the electron in freeing itself from the surrounding atoms.

e is the charge of the electron.

V is the voltage thru which it falls.

Each time an electron is emitted a quantum of energy (hf) is absorbed. This absorbed energy is of the higher radiant frequencies present at filament F1. It is evident that the frequencies of radiant energy f present at filament F1 is dependent upon the space charge V (which in turn is governed by oscillator OSC), and that

for greatest variation of light emitted a high filament temperature is necessary, since the radiant frequencies present at filament F1 cannot be cut off by varying the space charge at a point lower than where *hf* equals P of the Einstein equation. Color filter CF has been selected so as to pass only the band of frequencies, over which the variation in amplitude of frequencies given off by filament F1 is most pronounced.

Fig. 2 is a further embodiment in which a relay or intermediate station IS is placed between transmitting station TS and receiving station RS. The functioning and designating characters at the transmitting and receiving station are the same as illustrated in Fig. 1. The varying light from filament F1 has been directed towards a relay station IS thru color filter CF22 onto a photo-electric cell PE21. The variations in the photo-electric cell circuit PE21, B21 primary of transformer TR21 are passed onto a tuned circuit comprising secondary of transformer TR21 C21; amplified by vacuum tube amplifier V21, the filament of which is heated by A21 and the plate of which receives current from B21 thru primary of transformer T22. The variations in plate current of V21 are impressed by the secondary of transformer T22 between the grid and filament of vacuum tube V22 similar in construction to V1. "C" battery CB22 and "B" battery B22 furnish proper potentials to the control electrode and anode of V22 respectively. The amplified variations in light of cathode V22 corresponding to the weak variations received by PE21 are reflected by D21 thru lens D22 onto color filter CF and from that point the functioning of the receiving station RS is the same as described for Fig. 1 above. It will be understood that the system is not limited to a single intermediate or relay station IS but that such additional ones may be utilized as may be necessary and desirable.

The forms of the invention described are illustrative of the principles involved, wherein fluctuations of light are produced by varying the space charge around an electron emitting surface, and the invention may take widely different forms without departing from the spirit thereof and the scope of the invention is to be limited only by prior art and as described in the following claims.

What is claimed is:

1. In a signal system, a generator of carrier current, a modulating device, controlled by a signal, for controlling said generator, light emitting controlling means, including an electron emitting light source, means for controlling the space charge around said source by said carrier current a light sensitive device, means for obtaining from said device a reproduction of said carrier, a second light emitting controlling means, including a second electron emitting light source, means for controlling the space charge around said second light source by said reproduction of said carrier current, a photo-emissive surface illuminated by said second light source, and means for obtaining from said surface a reproduction of said signal.

2. The combination with an electron emitting light source, means for producing variations in the intensity of said source, said means comprising means for generating a variable voltage, means for controlling the space charge in the vicinity of said source in accordance with said variable voltage, and means for generating an electrical current in accordance with said variations in intensity of said light source, a second electron emitting light source, means for producing variations in intensity of said second source, said last means comprising means for controlling the space charge in the vicinity of said second source in accordance with said generated electrical current, and means for generating a second electrical current in accordance with said variations in intensity of said second light source.

3. The combination with an electron emitting light radiating source of light, means for reducing frequencies given off by said light above a predetermined frequency, said means comprising means for varying the space charge in the vicinity of said source of light, an electron emissive device illuminated by said light, and means for generating an electrical current in said device corresponding to reductions in said frequencies given off by said source, a second electron emitting light radiating source, means for reducing frequencies given off by said second source above a predetermined frequency, said last means comprising means for varying the space charge in the vicinity of said second source in accordance with said generated electrical current, a second electron emissive device illuminated by said second source, and means for generating a second electrical current in said second device corresponding to reductions in frequencies from said second source.

4. In a light signalling system, a source of light comprising the cathode of a vacuum tube having an anode, and a control electrode, a source of anode current for said anode, means for varying the amount of energy absorbed from said cathode in the emission of the electrons of said anode current, said means comprising a source of signals for said control electrode, means for maintaining said cathode current virtually constant as said anode current increases, said last means comprising an impedance common to said anode and said cathode circuits, an electron emissive surface illuminated by said source of light, and means for obtaining from said surface a reproduction of said signals.

5. The combination with an incandescent body, means for producing variations in the light colors given off by said body, said means comprising means for varying the electrical charge in the vicinity of said body, a photo-emissive surface illuminated by said light and means for obtaining from said surface variations in electrical current corresponding to said variations in said light colors, a second incandescent body, means for producing variations in light colors given off by said second body, said last means comprising means for varying the charge in the vicinity of said second body in accordance with said electrical current.

6. In an electrical circuit, an electron emitting light radiating source of light of a plurality of colors, means for changing the predominate color of the light given off by said source, said means comprising means for varying the space charge in the vicinity of said source, a light controlled device, and means for obtaining from said device an electrical current varying in accordance with changes in the color of the light given off by said source, a second electron emitting light radiating source of a plurality of colors, means for changing the predominate color of light given off by said second source, said last means comprising means for varying

the energy absorbed in electron emission from said second source, said last mentioned means comprising means for varying the space charge around said second source in accordance with said electrical current, a second light controlled device, and means for obtaining from said second device a second electrical current, varying in accordance with changes in the color of light given off by said second source.

7. The combination with a source of sound modulated carrier current, an electron emitting light radiating source of light, means for producing variations in the color of said light, said means comprising means for varying the space charge around said source in accordance with said current means for translating said color variations into voltage variations, a second electron emitting light radiating source, means for producing variations in the color of light of said second source, said last means comprising means for varying the number of higher frequency light quanta absorbed in electron emission from said second source in accordance with said voltage variations, and means for translating said color variations of said second source into sound.

8. In a light signalling system, means for producing a signal modulated carrier current, means for producing variations in intensity of an electron emitting light radiating source of light in accordance with said current, said means comprising means for varying the space charge in the vicinity of said source of light in accordance with said current, means for impressing said light on a light sensitive surface, means for obtaining a second signal modulated carrier current from said surface corresponding to said first signal modulated carrier current, means for selecting said second carrier, means for amplifying said second carrier, means for producing variations in a second electron emitting light radiating source of light in accordance with said amplified current, said last mentioned means comprising means for varying the space charge in the vicinity of said second source of light in accordance with said amplified current, means for impressing said light from said second source on a second light sensitive surface, and means for obtaining from said second surface a reproduction of said signal.

9. In a signalling system, a generator of signal modulated carrier current, an electron emitting light radiating source of light means for producing variations in the colors given off by said source over a predetermined range, said means comprising means for varying the space charge in the vicinity of said source in accordance with said current, means for impressing said variations on a light sensitive surface, including a color filter to pass light only over said predetermined range, means for obtaining a second carrier current similar to said first carrier current from said surface, means for selecting said second carrier, means for amplifying said second carrier, a second electron emitting light radiating source of light, means for producing variations in the colors given off by said second source, said means comprising means for varying the space charge in the vicinity of said second source in accordance with said second current, means for impressing said second variations in color on a second light sensitive surface, and means for obtaining from said second surface a reproduction of said signal.

10. In a light signalling system, a vacuum tube having a plate circuit, a grid circuit, and filament circuit, a source of electrical energy connected in said filament circuit, a source of space current in said plate circuit, means for varying the amount of energy absorbed from said filament by said space current, said means comprising a source of signal current connected in said grid circuit, means for preventing substantial increase of filament current as said space current increases, said last means comprising a resistance common to said plate and said filament circuits, said resistance being of sufficient magnitude to prevent said increase, a photoemissive surface illuminated by energy radiated by said filament, and means for obtaining from said surface an electrical current, corresponding to said signal current.

11. In a light signalling system, a vacuum tube, having plate, grid, and filament circuits, a source of current connected in said filament circuit, a source of space current connected in said plate circuit, means for producing variations of light quanta absorbed by said space current from said filament said means comprising means for producing variations in magnitude of said space current, said last mentioned means comprising a source of signal voltage connected in said grid circuit, means for preventing substantial increase in filament current as said space current increases, said last mentioned means comprising a resistance common to said plate and said filament circuits, said resistance being of sufficient magnitude to prevent said increase, a photo-electric device, and means for obtaining from said device a reproduction of said signal.

12. In an electric circuit, an electron emitting light radiating surface, means for producing light variations radiated by said surface, said means comprising means for varying the energy absorbed from said surface by electron emission, means for producing an electric current corresponding to said light variations, means for amplifying said electrical current, a second electron emitting light radiating surface, means for controlling the energy absorbed by electron emission from said second surface in accordance with said amplified current, and means for producing a second electric current in accordance with variations in light radiated by said second surface.

13. In a signalling system, a transmitting station, an electron emitting light radiating source at said transmitting station, means for producing light intensity variations in said source, said means comprising means for generating a variable voltage, means for controlling the space charge in the vicinity of said source in accordance with said variable voltage, means for directing said light variations towards a relay station, a photo-electric cell at said relay station for producing voltage variations in accordance with said light variations, a second electron emitting light radiating source at said relay station, means for producing variations in said second source, said last means comprising means for varying the light quanta absorbed from said second source in accordance with said voltage variations from said photo-electric cell, means for directing light variations from said relay station towards a receiving station, and means at said receiving station for changing said light variations received from said relay station into signals.

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