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TELEPHOTO MACHINE

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Fig. 1

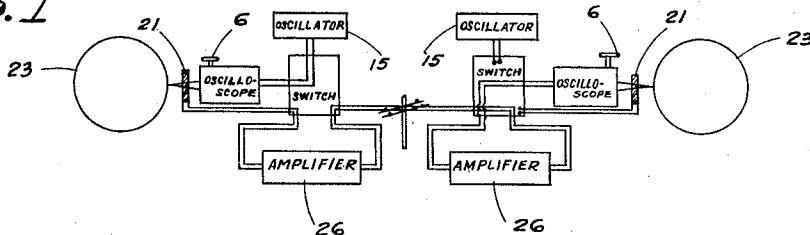


Fig. 2

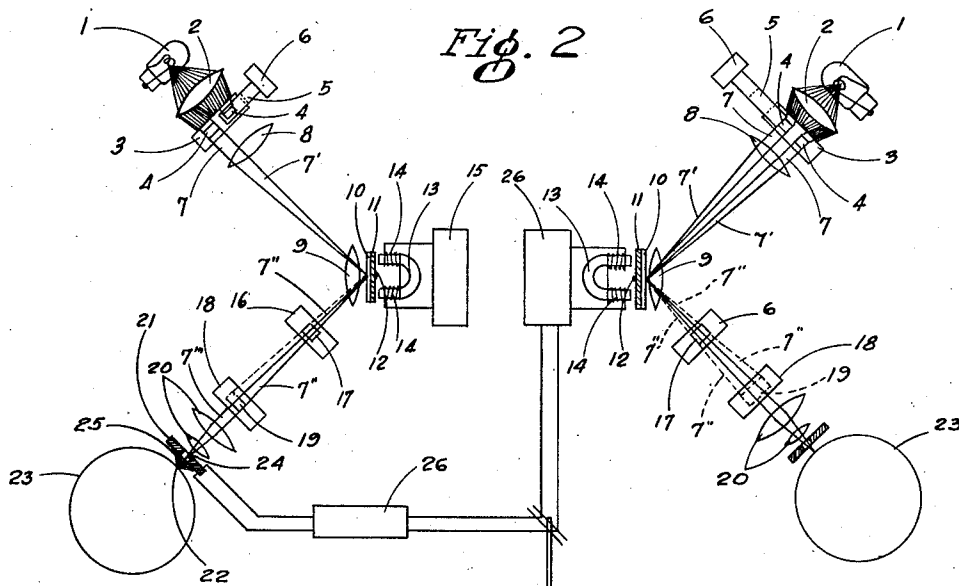


Fig. 3

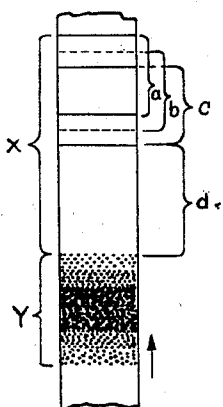
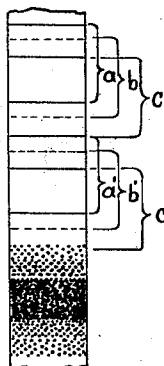


Fig. 4



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TELEPHOTO MACHINE

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12 Claims. (Cl. 178—6.7)

This invention relates to improvements in methods and apparatus for transmitting pictures between spaced points, and more particularly to a combination transmitter and receiver which may be used either to transmit or receive pictures.

Heretofore, in most instances, the transmission of pictures by wire or radio has required relatively bulky and complicated apparatus. Usually it required two separate sets of apparatus, one of which was used for transmission, and the other for receiving. Obviously such apparatus had to be a substantially permanent installation and was not capable of being readily transported from place to place. Still further disadvantages in the prior machines resided in the results. That is, the picture had undesirable pattern, which pattern was still further accentuated by the half-tone screen when the pictures were made into electroplates. The prior machines were also difficult to adjust, requiring trained operators, having a peculiar talent for operating this type of machine. Even with talented operators, there were many difficult adjustments. In the portable machines certain parts of the machines which were subject to delicate adjustments which if not properly effected rendered the machine inoperative. A machine, in order to be portable, had to be rugged, simple, and easily and quickly adjusted.

It is, therefore, among the objects of my invention to provide a machine wherein a great many of the deficiencies of the prior machines, as above stated, have been eliminated.

Another object of this invention is to provide a new method of scanning a picture.

Another object of this invention is to provide a new and improved method of breaking up a scanning beam whereby the resultant current due to the conversion of the beam into electrical impulses can more readily be amplified.

Still another object of this invention is to provide a single machine which can quickly and easily be connected for either transmitting or receiving a picture.

Still other objects of the invention and the invention itself will become more apparent from the following description of an embodiment thereof which is illustrated by the accompanying drawing. Although the invention is shown as disclosed herein as using the telephone lines for transmitting the picture signals between stations, it is quite within the purview of the

invention to use any of the other well known communication channels.

Fig. 1 is a schematic view showing in block form the components of an apparatus employed in my invention;

Fig. 2 is a diagrammatic view of the optical systems of two of the combined transmitters and receivers, one of which is arranged for transmitting and the other for receiving;

Fig. 3 is a diagram which is used to illustrate what takes place when a picture is being scanned with the apparatus of my invention; and

Fig. 4 is a diagram used to illustrate what takes place when the sensitive film on a receiver is exposed by the method of my invention.

Throughout the drawing, like components have, in the main, been designated by like reference characters. In Fig. 2 I have illustrated diagrammatically the optical system for two apparatus, each of which will hereinafter be generally spoken of as a transceiver.

The optical system to the left of the figure is shown arranged for transmitting pictures, and that to the right for receiving the pictures, the two being connected by a telephone line. Referring more particularly to the left side of the drawing, the transceiver is shown as comprising a light source 1, the rays from which are collected and condensed by a condenser lens 2 which directs the collected rays upon a beam-forming mask 3. This beam forming mask, as well as the other masks, for the purpose of clarification, is shown in the drawing as being rotated at an angle of 90° to the actual position at which it is placed in the apparatus. The beam-forming mask is formed to provide a pair of apertures 4 therein which are so disposed that rays of light from the condenser may pass there-through, to provide a pair of separate beams. Due to the lens 2, these beams are spaced apart at the mask and gradually converge until they cross at predetermined distance therefrom. A shutter slide 5 is provided and is so arranged that it may be slid over one of the apertures 4 to block the same and hence provide a single beam when desired; an operating handle 6 is provided for the slide by means of which it may be moved into and out of the beam.

The light passes through the apertures 4 in the form of beams of light 7 of rectangular cross section, which beams pass through a lens 8. In the illustration, at the transmitter the slide 5 is shown as closing one of the apertures to provide a single beam of light which is the

arrangement used for scanning a picture when transmitting.

The rays of each individual beam converge as shown at 7' passing through, first the lens 8, and then a second lens 9, after which they strike the reflecting surface 10 of the oscilloscope mirror 11. The beam strikes the mirror at the point where the rays cross over, and is reflected back through the lens 9, the beam now being diverging rays of light. In the case of the receiving set-up, the two beams themselves are also diverging.

The oscilloscope mirror 11 is pivotally supported as indicated at 12 and is oscillated by the magnet 13, the windings 14 of which are connected to the output of an 1800 cycle oscillator 15. The oscillator swings the mirror and this in turn causes the reflected beam of light to swing at the frequency of the oscillator. The beam after leaving the oscilloscope mirror, passes through a spot-forming mask 16 which is formed with a single rectangular aperture 17. This aperture is of sufficient length to permit substantially full swing of the beam passing there-through. The beam, after leaving the spot mask, then passes to a shutter mask 18 which is provided with a relatively small aperture 19. The beam and shutter mask 18 are so correlated that during one-half of the swing cycle, the aperture is filled with the beam, while during the other half of the swing cycle the beam is interrupted by the mask 18.

The resultant beam (7'') after passing through the mask 18, is therefore a series of light pulses occurring when the beam is swung over the aperture, each pulse being half of the oscillator cycle or 1800 light pulses per second. The oscilloscope and the mask are so adjusted that the beam is moved during one-half of the maximum oscillator voltage cycle into the opening 19 and at zero level of the cycle the beam is in the position shown by the dotted lines; on the other half of the voltage cycle the beam is swung still further toward the edge of the mask or further away from the aperture.

The pulsating light beam is then focused by the objective lens system 20 to a spot 22 on the surface of the picture, which picture may be secured in any of the usual manners upon a rotating drum 23. The drum may rotate and also move axially, or the drum may rotate and the optical system be moved axially relative to the drum by a suitable lead screw. The scanning beam, on leaving the objective lens system, passes through an opening 24 in a photocell element 21. The scanning beam having struck the surface of the picture is reflected back against the surface of the cell, as indicated at 25, where it is converted to an electric current. The resultant current is in the form of a series of current impulses having a frequency of 1800 cycles and an amplitude which varies according to the amount of light reflected.

The lenses 8 and 9 are of such character that the image of the aperture 4 is focused on the shutter mask 18. The spot mask 16 is so arranged relative to the objective lens system, that the image of the aperture 17 is focused through the objective system on to the surface of the picture.

The current from the photocell, as previously explained, is an amplitude varied pulsating direct current. In the amplifier 26 it is changed to a modulated 1800 cycle sine wave, the modulating being in accordance with the light and dark areas

of the picture being scanned. The picture amplifier 26 may include a band pass and/or band rejection filters to eliminate any harmonics present. It is there amplified and sent out on a telephone line by means of which it is transmitted to the receiving station. Although I have indicated the same as being a telephone line, it is within the purview of the invention, as previously stated, to use other facilities than telephone lines such as a radio transmitter to transmit the signal between stations.

In the receiving apparatus there is provided the same arrangement of parts as in the transmitter. The receiver, however, is adjusted by the slide 6 so that both of the openings 4 in the mask 3 are opened to provide double beams of light 7' which strike the oscilloscope mirror 10.

The oscilloscope, instead of being connected to an oscillator, is connected to a picture amplifier having another band pass and/or band rejection filters therein to remove any spurious frequencies or harmonics that may have gotten into the line in this amplifier, the 1800 cycle modulated current from the telephone line is amplified and applied to the oscilloscope. The signal which is the 1800 cycle amplitude modulated signal, oscillates the oscilloscope at 1800 cycles per second, the amplitude of the oscillations depending upon the amplitude of the signal. The double beam 7'' reflected from the oscilloscope through the spot mask 16, diverges so that the two beams originating at the mask 4 and controlled by the lens systems strike the shutter mask 18 on opposite sides of the opening 19. During no signal or zero amplitude periods, no light from the beams passes through the opening 19. Upon reception of the amplitude, varied signal the oscilloscope swings the beams alternatively into the opening 19, the amount of swing depending upon the amplitude variation of the signal; the beams of light then pass through the objective lens system and are focused to a spot on the sensitive film secured to the rotating drum 23.

The photocell may be, and frequently is, disconnected in this instance to render it inoperative. The light falling on the drum, exposes the emulsion on the film in the usual manner. Because of the two beams of light each alternately passing through the mask 19, instead of 1800 pulses of light, we now have 3600 pulses of light striking the film surface which affords a more desirable pattern for purposes of reproduction. This pattern is so fine and of such a formation as to provide more definition and a clearer picture.

In the general block diagram of Figure 1, the light source, masks and lens, which may be termed the optical system, including the oscilloscope are all disposed in the part marked oscilloscope. The oscillator, oscilloscope and picture amplifier with band pass filters, all connect into a switch box where, with suitable switching mechanism, the apparatus can be arranged to transmit or receive. That is, during the transmitting periods the oscillator connects through the switch box into the oscilloscope to swing the mirror at 1800 cycles. The photocell connects through the switch box into the amplifier where the current generated in the photocell is amplified and filtered; the output of the amplifier is connected through the switch box to the telephone line upon which the signal is placed. On the receiving end, as shown in Figure 1, the oscilloscope is connected to the telephone line through the picture amplifier; the oscillator and

photocell are disconnected during receiving periods.

I have purposely failed to show any synchronizing means for the two drums inasmuch as that forms the invention of another application, but many well known synchronizing means may be used.

It will thus be seen that I have provided a scanning system which can be quickly and simply adjusted to either transmit or receive by merely switching as shown in Figure 1 and closing one of the apertures in the mask 3 for transmitting, or opening both apertures for receiving. All of the mechanical means heretofore used for chopping the light beam, together with their inherent defects, are eliminated. It is thus possible to provide a transceiver which may be extremely light and portable, as well as very rugged.

Eliminating one of the beams of light in the transmitter and scanning with a single beam has a distinct advantage because it eliminates the necessity of a very delicate adjustment of the oscilloscope. Those versed in the art will recognize that it is very difficult to maintain two light beams of identical size and brilliancy to generate a carrier frequency where one beam forms one cycle and the other forms the succeeding cycle, which must, if the density of the picture remains the same, also furnish the same amplitude of sine wave as that produced by the first beam. It also eliminates the necessity of complicated and delicate mechanism for maintaining two beams of identical size and brilliancy.

In the reception end of the transceiver, providing the two beams swinging vertically makes it feasible to use both halves of the modulated carrier, thus providing an increased frequency, which thus materially helps to reduce the pattern ordinarily apparent in telephoto pictures, as well as affording greater fidelity of reproduction.

It is to be noted that in the drawing I have shown the various masks connected with formation of the images or spots as having openings of rectangular or square cross-section. I have found that openings shaped as shown provide a very satisfactory type of scanning and reproduction. The invention is not, however, to be limited to such particular openings, as it may be found advisable under certain circumstances to use rhombic or circular openings.

It should also be noted, as best can be seen from Figure 2, that the scanning drum and the scanning beam, together with the optical control elements, are so arranged that the beam falls on to the drum coming from the top of the mask 18 into the opening 19. In other words, the picture is scanned from a vertical direction or parallel to the line of scanning rather than a horizontal or oblique direction and at right angles to the scanning line. With a scanning line of $\frac{1}{100}$ ths of an inch and scanning in a vertical direction, it is possible to so arrange the scanning so that there is no overlapping on adjacent side channels. This has an effect somewhat as follows: considering the beam as shown in Figure 2 in the transmitter as reciprocating from the point shown in the dotted lines to the point shown in the full lines where it passes through the optical system and falls on the picture being scanned, and referring particularly to Figure 3 which illustrates diagrammatically on a greatly enlarged scale that part of the scanning line of $\frac{1}{100}$ ths of an inch; the light beam starts from a point above the opening 19 and enters the edge of the opening 19 which causes a portion of the

beam to pass through the aperture onto the picture. Figure 3, which is to be considered as a diagrammatic of results, shows that during the first part of the scanning impulse; when the light starts to enter the aperture 19 there is not, as might be expected, a thin rectangular slit of light, but a square of light of low intensity; that is, the spot mask aperture is focussed on the picture as a square indicated at *a*, the light intensity of which is relatively low because the intensity of the beam is cut down, not all of it shining through the aperture 19. Therefore, there is light directed onto a moving surface moving in the direction of the arrow, which light is in the form of a square since it is an image of the spot mask 16. This square varies in intensity as the beam swings and moves into the opening 19. The square of light continues to increase in intensity as the beam moves toward the center of the aperture 19, and as the drum is rotating, until the beam fills the entire aperture 19 and the maximum amount of light falls onto the picture which high intensity square is illustrated at *b*. It will be noted that there is some overlap of the two squares. The beam then starts on its return or cut-off sweep and the intensity of the square of light decreases, terminating in substantially the same manner as it started, with a square of light of considerable less intensity at the point indicated at *c*. There then occurs the remaining portion of the cycle where no light shines on the picture, which portion is represented by a blank space, the light beam being blocked by the shutter 18. After this period, the second cycle of exposure or scanning commences. For the purpose of illustration, one complete cycle and a part of a second of the scanning line is shown in Fig. 3. The first cycle is indicated as including four phases: *a*—light of low intensity at the start of the cycle; *b*—light of maximum intensity at the peak of the cycle; *c*—light of minimum intensity at the close of the light cycle; and lastly, *d*, which represents a space of equal length to *a*, *b*, and *c* with a condition of no light. The complete cycle is indicated by the bracket X.

The succeeding portion Y of the diagram, for the purpose of illustration, is shown diagrammatically as being shaded in accordance with the intensity of the current generated in the photoelectric cell due to the light reflecting from the picture into the cell. This illustrates a similar cycle to that shown in cycle X. It is to be noted that during the start of the cycle the current is relatively low, while it increases to maximum at the mid-portion, and then decreases to the low current near the end. The current will, of course, vary somewhat depending upon the character of the particular picture being scanned, this particular illustration can be considered as the generating maximum current when white is being scanned, and obviously there will be some variation in the amount of current which will move the area of the dark portion or greatest current upward or downward, or spread it out into somewhat different forms, depending on whether the picture happens to be rotating from a light to a dark portion, or vice versa.

It should be noted that with the beam coming onto the picture from a vertical position, the pick-up due to the reflected light is complete across the entire $\frac{1}{100}$ ths of an inch of scanning line, and merely varies in intensity from top to bottom or progressively along the line, but does not vary in intensity laterally of the center of the scan-

ning line. Furthermore, due to the arrangement of the shutter and spot, the complete $1/100$ ths square section of the picture is scanned at each instant. This provides a very desirable shape of current wave in the photocell output since, as distinguished from the scanning systems heretofore proposed, there is no exposure or pickup from one side of the scanning line of varying degree toward the center which would, and does, give a somewhat different characteristic to the current output of the cell. It also provides a better co-operating form of current for use with the receiver as will hereinafter more clearly appear.

In Fig. 4 I have diagrammatically illustrated the effect of my improved optical system for reproducing the picture signal transmitted by the transmitter onto a film. With a drum 9" in circumference rotating at 100 R. P. S. (revolutions per second) there is a circumferential travel of 15" of the surface of the drum per second. With the light beams directed onto the oscilloscope mirror and the oscilloscope being operated from the sending station, by the signal at the oscilloscope, which is an 1800 cycle amplitude modulated sine wave, the light beams are swung to and fro by the mirror across the shutter mask to provide a 3600 cycle pulsating light passing through the opening 19 of the shutter mask. The amplitude of the pulsations varies in accordance with the amplitude of the signal. These light pulsations are directed onto the sensitive film. There is thus 240 pulses of light falling on the film for each 1" of travel.

The exposing beam is controlled by the spot mask to be $1/100$ ths of an inch wide. The travel of the drum, however, causes the exposed portion to be $3.4/240$ ths of an inch long, but at no time does it exceed $1/100$ ths of an inch in width, nor does it become less than $1/100$ ths of an inch in width. When a beam of varying intensity is being thrown on the surface of the film covering the entire $1/100$ ths of an inch and extending through $3.4/240$ ths of an inch of travel of the drum, considering the beam from the aspect of the light falling on the film or emulsion rather than its effect to the emulsion, the resultant exposure is as shown in Fig. 4. That is, to start with, if the transmitter is transmitting white the exposure is a light square of varying intensity, being relatively weak during the first part at a, increasing in intensity to the greatest intensity at b, and again decreasing in intensity at c. In the case of the receiver, I do not have the alternating blank space since both halves of the signal wave are used: one first swinging one beam into and out of the aperture 19, and then the other half swinging the other beam in and out of both the top and bottom portions of the signal, thus utilizing the double beam, swinging first one beam into the aperture 19 of the shutter 18, and then the other beam into the aperture, so that with equal intensity of signal, each succeeding area is exposed in substantially the same proportion. In the illustration of Fig. 4, I have treated the succeeding one-half of the cycle the same as I treated the succeeding cycle in reference to the transmitting cycle. That is, I have indicated by shading in varying degrees of intensity, how the film is exposed greater toward the center of the scanning line space than it is toward the upper and lower edges which provide an area of greater exposure in the center, and lighter areas toward the upper and bottom edges.

It should be noted, however, that as in transmitting the full $1/100$ ths of an inch of the scanning line or exposure line is utilized because the beam enters into the picture from the upper edge of the mask in the same direction of travel of the drum rather than at right angles of the travel drum as has been the common practice, with the result that the complete scanning line is filled from edge to edge, and there is no overlapping between adjacent scanning lines. This results in a decidedly more desirable pattern formation, or rather lack of pattern formation, than has heretofore been possible. With this arrangement it is possible to reproduce the full density range and detail in the recorded picture which would otherwise suffer some loss due to transmission. Furthermore, since the picture is being scanned by a square of light and parallel to the line of travel of the drum, and is reproduced by a square varying in intensity according to the transmitted signal, the cooperation results of the two instruments will be clearly apparent.

Although I have described the beam as being swung by an oscilloscope and being reflected, the mirror could obviously be replaced with a prism and operated to provide substantially the same results, and in the case of the transmitter, the mirror or the prism could be operated by mechanism other than electrical means, and it is not my intention to limit my invention other than as defined in the appended claims.

Furthermore, although I have described my invention as my understanding of its operation, should it later be discovered that there are other unknown factors entering into its operation which I have not considered, I do not desire such description to operate as a limitation.

I claim:

1. An apparatus for facsimile transmission including a light source, means to convert said light from said source to a beam, means for swinging said light beam including an oscilloscope, a mask over which said swinging beam passes formed to provide an opening therein, said beam adapted to pass through said opening during part of its swing, a picture movably disposed in the path of said beam beyond said mask, and means for picking up and converting said light into electrical currents after having engaged said picture.

2. An optical system for facsimile transmission and reception including a light source, a mask interposed in the path of light from the source and formed to provide a pair of openings therein for converting said light from said source into a pair of beams, means swinging said light beams including an oscilloscope, a mask over which said swinging beams pass having an opening therein, said beams adapted to pass through said opening during part of their swing, a drum disposed in the path of said beams beyond said mask, and means for shutting off one of said beams for transmitting a picture and utilizing both of said beams for receiving a picture.

3. An apparatus for transmitting and receiving pictures comprising a light source, optical means for collecting said rays from said source and directing them in a predetermined direction, means interposed in said rays to confine them into beams comprising a mask having openings formed therein, means comprising a slide arranged for selective alternate movement into or out of one of said beams, means for reflecting said beams including an oscilloscope, means for driving said oscilloscope to swing said reflected beam in the direction of scanning, a spot form-

ing mask interposed in said beam path from the oscilloscope and having an opening therein through which the beam passes, a shutter mask disposed in the beam path beyond the spot mask and having an opening therein through which the beam may pass when swung and an objective lens, and means for holding a picture or a film, said lens system adapted to focus the image of the spot mask on the surface of the picture or film.

4. An apparatus for transmitting and receiving pictures including a light source, optical means for collecting said rays from said source and directing them in a predetermined direction, means interposed in said rays to confine them into beams comprising a mask having openings formed therein, means for blocking one of said beams comprising a slide arranged for selective alternate movement into or out of one of said beams, means for reflecting said beams including an oscilloscope, means for driving said oscilloscope to swing said reflected beam in the direction of scanning, a spot forming mask interposed in said beam path from the oscilloscope and having an opening therein through which the beam passes, a shutter mask disposed in the beam path beyond the spot mask and having an opening therein through which the beam may pass when swung and an objective lens system, and means for holding a picture or a film, said lens system adapted to focus the image of the spot mask on the surface of the picture or film, and means disposed to receive the light reflected from the picture and convert it into electric currents.

5. A scanning system for transmitting pictures, a drum for holding and rotating the picture to be scanned, an optical system for scanning said picture on the drum comprising a light source, a beam forming mask and an oscilloscope for swinging the beam from the light source, means for operating the oscilloscope to swing the beam comprising an oscillator, means interposed in said reflected beam to control the beam comprising a spot mask and a shutter mask and an objective lens system for focusing the image of the spot mask on the picture, photovoltaic means arranged to receive light reflected from the picture and convert it into electric currents of a frequency dependent on the frequency of the oscillator and amplitude depending on the amount of light reflected from the picture, said beam mask being focused by a lens system on the shutter mask and the image of the spot mask falling on the picture being unmovable and of constant size but of varying intensity.

6. A scanning system for transmitting pictures, a drum for holding and rotating the picture to be scanned, an optical system for scanning said picture on the drum including a light source, a beam forming mask and an oscilloscope for swinging the beam from the light source; means for operating the oscilloscope to swing the beam including an oscillator, means interposed in said reflected beam to control the beam comprising a spot mask and a shutter mask, an objective lens system for focusing the image of the spot mask on the picture, photovoltaic means arranged to receive and convert the reflected light from the picture into electric currents of a frequency dependent on the frequency of the oscillator and having an amplitude depending on the amount of light reflected from the picture, a first lens system, said beam mask being focused by said lens system on the shutter mask, a second lens system for directing the rays of the image of the

spot mask onto the picture, said image being unmovable and of constant size and of varying intensity.

7. A device for transmitting and receiving pictures comprising a drum for receiving and holding a picture to be transmitted or a film to be reproduced, means to rotate the drum, means for scanning a picture on the drum and for reproducing a picture on the drum comprising a light source, a condenser for collecting and controlling the light rays from said source, a beam determining mask interposed in said light source and formed with a pair of openings therein for forming more than one beam, means adjacent said mask adapted to be selectively interposed and removed from the light rays of one of said beams to control the number of beams passing through the mask, a second lens system interposed in the path of said beams and deflecting means interposed in the beam path at the point of convergence of the rays from said lens for deflecting said beam and means for moving said deflecting means including an oscillator and an amplifier, said oscillator causing said beam to be swung at a predetermined frequency a predetermined distance, said amplifier adapted to be connected to a source of picture signal to swing said beam at a predetermined rate an amplitude in accordance with the frequency and amplitude of the signal, and switch means for selectively connecting the oscillator and amplifier to swing said beam, a spot mask interposed in said reflected beam path and having an opening formed therein for allowing said beam to pass there-through, a second shutter mask interposed in said beam path and formed with an opening therein to allow said beam to pass therethrough during certain parts of its swing, and an objective lens system for receiving the beam passing through the shutter mask and arranged to focus the image of the spot mask on said rotating drum, and a photovoltaic cell formed to provide an opening therethrough to allow the passage of the beam onto the drum and picture and to pick up and convert light reflected from the picture to electric currents.

8. A device for transmitting and receiving pictures comprising a drum for receiving and holding a picture to be transmitted or a film to be reproduced, means to rotate the drum, means for scanning a picture on the drum and for reproducing a picture on the drum comprising a light source, a condenser for collecting and controlling the light rays from said source, a beam determining mask interposed in said light source and formed with a pair of openings therein for forming more than one beam, means adjacent said mask adapted to be selectively interposed and removed from the light rays of one of said beams to shut off or allow the beam to pass, a second lens system interposed in the path of said beams and deflecting means interposed in the beam path at the point of convergence of the rays from said lens for deflecting said beam in a vertical direction and means for moving said deflecting means including an oscillator and an amplifier, said oscillator causing said beam to be swung at a predetermined frequency a predetermined distance, said amplifier adapted to be connected to a source of picture signal to swing said beam at a predetermined rate an amplitude in accordance with the frequency and amplitude of the signal, and switch means for connecting either the oscillator or amplifier to swing said beam, a spot

mask interposed in said reflected beam path and having an opening formed therein for allowing said beam to pass therethrough, a second shutter mask interposed in said beam path and formed with an opening therein to allow said beam to pass therethrough during certain parts of its swing, and an objective lens system for receiving the beam passing through the shutter mask and arranged to focus the image of the spot mask on said rotating drum, and a photovoltaic cell formed to provide an opening therethrough to allow the passage of the beam onto the drum and picture and to pick up and convert light reflected from the picture to electric currents, said lens system between the beam forming mask and shutter mask arranged to focus the image of the beam forming mask on the shutter mask.

9. The method of scanning a picture which comprises generating light, controlling the light from said source to provide a beam, swinging said beam interposing an image source in said beam at one point and obstructing the beam to allow said beam to pass during only part of its swing and focusing said rays of the beam from the image source onto a picture to provide an interrupted image of the source of constant size and frequency and of varying intensity and converting the reflected light from said picture into electrical currents.

10. The method of transmitting pictures which comprises generating a source of light, refracting said light to provide a beam, masking said light

to control the shape of the beam, simultaneously reflecting and swinging said beam, interrupting the passage of said beam during part of its swing and using the portions of the beam intermediate its interruption to scan a movable picture and converting the light reflected from the picture into electrical currents.

11. The method of scanning for telephoto transmission which comprises generating a source of light, forming said light into a pair of beams, swinging said beams through an image forming means, interposing means in said swinging beams which allows passage of the beams only during a predetermined portion of their swing, focusing said image forming means on a film or picture to provide a non-movable spot of scanning light, which varies in intensity with the swinging of the beams through said interposing means.

12. The method of scanning or exposing a picture by projecting for telephoto transmission and reception intermittent spots of light of predetermined contour and size and varying intensity onto the picture which comprises generating light, forming the light rays into beams, swinging the beams, passing said swinging beams through an image forming means, interposing means in the path of said beams at the points of focus of the beam-forming means to shut off the light except during a portion of the swinging, and focusing the image-forming means onto a film or picture.

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