March 31, 1931. G. VALENSI 1,798,963

OPTICAL DEVICE FOR DISTANT VISION

Filed July 15, 1927

Fig. 3.

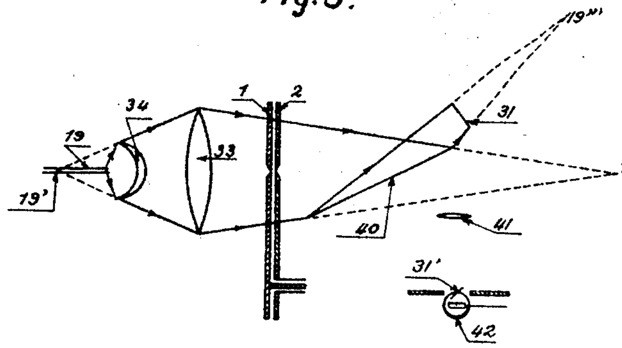


Fig. 4.

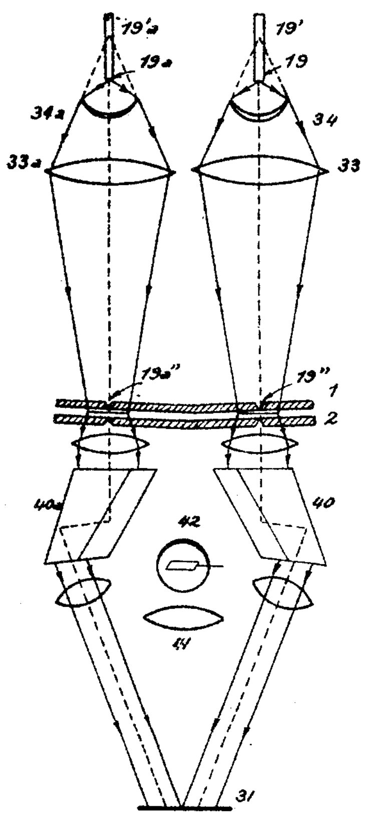


Fig. 1.

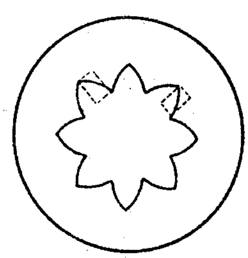
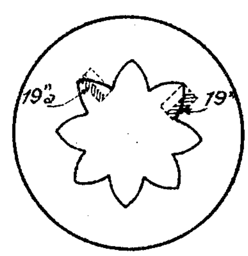


Fig. 2.



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UNITED STATES PATENT OFFICE

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OPTICAL DEVICE FOR DISTANT VISION

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This invention relates to an illumination sending scanning device for television (or telephotography or telecinematography or the like) using one or two scanning discs provided with transparent lines (or slots or perforations). These discs are adapted to rotate at a high speed and in such a way that the point where said transparent lines or perforations register moves along the whole surface of the object or of the drawing to be seen at distance (in the case of the transmission) or of the image to be reconstituted (in the case of the reception).

Referring to the drawings in which like parts are similarly designated—

Figure 1 illustrates one of the scanning discs provided with arcuate slots.

Fig. 2 is a similar view showing the relation of two images to the slots of the discs.

Fig. 3 illustrates a manner of illumination, and

Fig. 4 a manner of intensive illumination of an object.

Figure 1 shows an example of such scanning disc provided with a slot made of spiral arcs whose equation in polar coordinates related to the center of said disc is linear. If two discs of this kind rotate around the same axis in opposite directions and with slightly different speeds, each square, such as the one represented by dotted lines on Fig. 1 corresponds to an image, said image being explored in this case in a continuous manner and at a uniform speed. The same discs permit consequently to explore at the same time several images, so that they may be used simultaneously for transmission and for reception, and also for television or telephotography of colors (with the three color process) and of relief (with the stereoscopic process) without increasing in any way the difficulties of synchronization between the corresponding stations.

Fig. 2 represents again the disc hereabove mentioned and shows in dotted lines two distinct squares corresponding to two images simultaneously scanned, each square being divided into two equal portions. It is clear that, when said scanning discs rotate as hereinabove described, the part of the first image corresponding to the portion 19″ (at the right of Fig. 2) is scanned point by point, and afterwards the part of the second image corresponding to the portion 19″*a* (at the left of Fig. 2) is scanned point by point. If, by means of suitable optical devices as described hereinafter, the two portions of images corresponding to 19″ and 19″*a* are juxtaposed (the other portions of the two squares of Fig. 2 which are not covered with lines being conveniently masked), it is clear that the scanning process will take place as if only one and the same image was scanned point by point in a continuous manner and at a uniform speed, although distinct and complementary portions 19″ and 19″*a* of the circumference of the scanning disc are used one after the other for said scanning process.

As it is well known in the television art, such scanning discs might be used in a sending television apparatus for illuminating point by point the object to be seen at a distance, the light emitted by the various points of said object successively illuminated acting on a photoelectric cell which translates into electrical variations the variations in light and shade of said various points of said object.

One way of performing such an illumination of the object to be seen at a distance is represented on Fig. 3.

The fixed, or moving, object 31 to be transmitted is placed in a dark chamber (not shown on the drawing) and its various points are successively illuminated. This result is obtained by means of an intense source of light 19 (for instance the incandescent end of the coal stick of a Garbarini electric arc, or the filament of a powerful incandescent lamp of the projector type) associated with a dioptric system constituted, for example, by the lenses 33 and 34. This dioptric system produces a luminous cone of small angle in which are inserted, at any suitable point, the scanning discs 1 and 2 and the object to be transmitted, 31. Because of the relative motion and the shape of the transparent lines of said scanning discs, a luminous point of constant brilliancy will explore the whole surface of the object 31 in a continuous manner and at a uniform speed if discs 1 and 2 are the same as shown in Figure 1.

In order to utilize all the luminous rays emitted by the incandescent point 19 (which are distributed over an angle of 180 degrees) use is made of the aplanetic spherical lens 34; the concave surface of said lens is a hemisphere of center 19 and consequently all the rays emitted by 19 are taken by said lens and give after refraction an image 19′ of 19 so located that the emergent luminous cone has only a small angle.

This luminous cone of small angle produced by lens 34 would give through the lens (or through a suitable dioptric system) 33 an image 19″ of point 19 if a mirror 40 (or a prism or other suitable optical device) did not deviate the luminous rays to make them converge at point 19″.

The object 31 to be transmitted is placed in the path of the rays converging in 19‴ and the scanning discs 1 and 2 are placed at a suitable point between the lens 33 and the object 31. Consequently the various points of said object are illuminated successively. The image 31′ of said object 31 through the lens (or photographic objective or optical device of suitable kind) 41 is formed inside a diaphragm on the window of the photoelectric cell 42.

The relative positions of mirror 40, discs 1 and 2 and object 31 may differ from those shown in Fig. 3. Mirror 40 could be placed after 19″ on the opposite part of the luminous cone converging at 19″.

Also if the source of light 19 has a uniform brilliancy on its whole surface it is convenient to form its image 19″ exactly between discs 1 and 2 and in order to increase the illumination of the object 31.

The object of the present invention is an illuminating sending scanning device in which, in order to increase as much as possible the illumination of the various points of the object successively, use is made of a plurality of sources of light at the same time, so located that their respective pencils of light fall on distinct and complementary portions of the circumference of discs 1 and 2; the luminous pencils produced by these different sources of light being juxtaposed exactly on the surface of object 31, which will be consequently highly illuminated.

For example, two sources of light 19, 19*a* are used simultaneously in a device according to this invention, and shown in Fig. 4, which is built up by juxtaposing two structures similar to Fig. 3. The lenses 34 and 33 give from source 19 an image located in 19″ between discs 1 and 2 and supposed to cover exactly the rectangle represented in 19″*a* on Figure 2. The optical means 40 embodying as reflecting surfaces mirrors or the sides of a prism give an image of the rectangle 19″*a* exactly on the right half of object 31. Similarly the lenses 34*a* and 33*a* given an image 19*a*″ of source 19*a* located between discs 1 and 2 and supposed to cover exactly the rectangle represented in 19″*a* on Fig. 2. The optical means 40*a* builds an image of the rectangle 19″*a* exactly on the left half of object 31. In front of, and very close to object 31 is placed the photoelectric cell 42 (for example associated with a lens 41 giving an image of object 31 on the window of said cell 42).

The advantages of the illumination sending scanning device according to this invention are—first, to concentrate a greater amount of light successively on the various points of the scanned object; because the pencils of powerful sources of light are juxtaposed on said object through distinct and complementary portions of the circumference of the same scanning discs; and, second, the placing of the photoelectric cell in front of said object, and as close as possible, in order to collect in said cell the greatest possible amount of the light reflected by said object.

I claim:—

1. Illumination sending scanning device for television comprising exploring means, a plurality of sources of light arranged to illuminate distinct complementary portions of said exploring means, a plurality of optical means to cause the beams passing one after the other through said exploring means to sweep one after the other separate portions of the object to be seen at distance, the whole surface of said object being swept by said beams in complementary areas successively, and a photoelectric cell mounted in front of said object and receiving reflected beams from said object.

2. Illumination sending scanning device, comprising in combination, separate sources of light, exploring means associated with each source, optical means for each source focussing the beams on juxtaposed areas of the object to be seen at distance, said exploring means sinuously exploring the respective juxtaposed areas in succession, and photo-electric cells mounted in front of said object and receiving reflected beams from said object.

3. Illumination sending scanning device for television in accordance with claim 1, comprising scanning discs, a plurality of sources of light each having a small surface of great and uniform brightness, a plurality of spherical lenses having concave surfaces in form of hemispheres said sources being located at the centers of said hemispheres, a plurality of optical means embodying reflecting surfaces, a photoelectric cell, said optical means focussing the luminous cones of small angle produced by said spherical lenses exactly on distinct complementary portions of said scanning discs, and further juxtaposing the luminous pencils on the object to be seen at

distance, said object being placed in front of said photoelectric cell.

4. A point by point sending device, comprising exploring means, a plurality of sources of light arranged to illuminate distinct complementary portions of said exploring means, a plurality of optical means to cause the beams from the exploring means to sweep one after the other separate portions of the object, the whole surface of the object being swept by said beams, and a photoelectric cell mounted in front of the object and receiving reflected beams from the object.

5. A point by point sending device, comprising exploring means, a plurality of sources of light to successively explore through said means different portions of an object, a plurality of optical means including reflecting surfaces through which the light passes to the object, the whole surface of the object being swept by each beam in complementary areas, and a photelectric cell disposed in front of the object and acted upon by the beams reflected therefrom.

6. In a distant vision installation, the combination with separate sources of light; of exploring means associated with each source, optical systems for each source focussing the beams on juxtaposed areas of the object, said exploring means sinuously exploring the respective juxtaposed areas in succession.

In testimony that I claim the foregoing as my invention, I have signed my name.

GEORGES VALENSI.