

May 24, 1932.

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1,859,828

ELECTROOPTICAL SYSTEM AND METHOD OF SCANNING

Filed Dec. 17, 1929

Fig. 1.

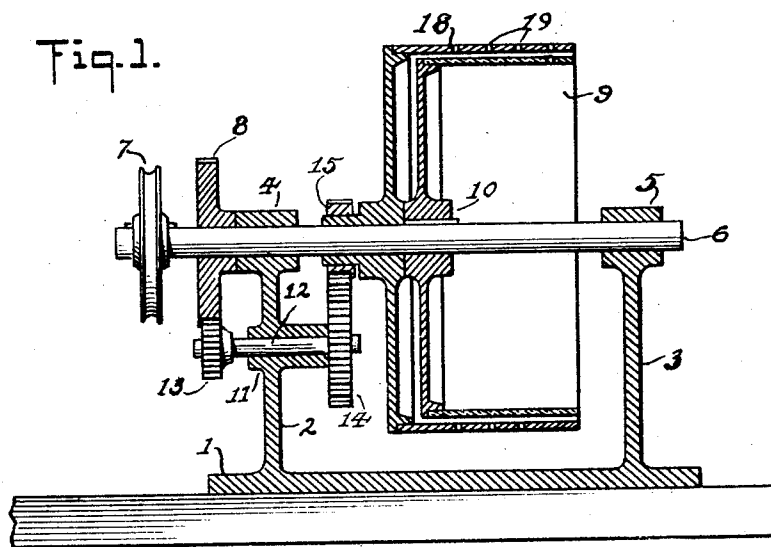


Fig. 2.

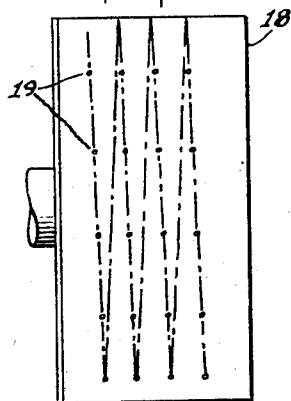


Fig. 3.

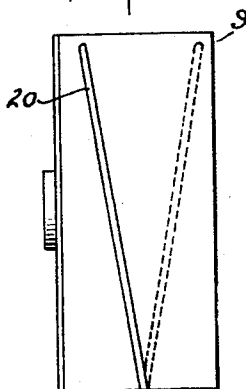


Fig. 5.

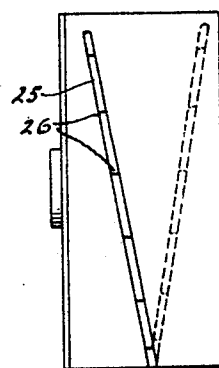
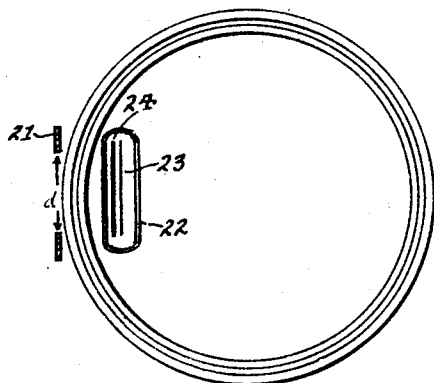


Fig. 4.

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ELECTROOPTICAL SYSTEM AND METHOD OF SCANNING

Application filed December 17, 1929. Serial No. 414,627.

This invention relates to electro-optical systems and with particularity to methods and means for scanning in television, picture transmission and similar systems.

Heretofore various means have been devised for analyzing and synthesizing an image, or other visual representation, employing rotating discs. For example, the Nipkow disc employs a series of perforations arranged in the path of a single turn spiral. However, this type of scanner is open to the objection that the scanning field is limited by the pitch of the spiral, and also the picture field is radially distorted.

In order to increase the size of the picture or scanning field it has been proposed to employ a first disc having the perforations arranged in a plurality of convolutions, and another disc rotating in front of the first disc to act as a shutter in rendering each convolution of the first disc successively effective. This arrangement is open, however, to serious objections. The disc having the convolutions of perforations must be very large in order to provide a reasonably large picture field. Furthermore, the perforations in successive convolutions being at different distances from the axis of rotation, the picture cannot be reproduced with uniform results since the edges of the picture will taper toward the common center of the discs.

To overcome certain of the disadvantages of the latter system it has been proposed to employ a drum having slots in the wall thereof, and a perforated shutter disc having a plurality of convolutions of perforations. This latter system likewise possesses serious disadvantages, which it is the purpose of the present invention to overcome. One of the main disadvantages is that the disc must rotate in a plane tangential to the drum periphery. Consequently the disc in moving across the picture field produces a foreshortening effect in the light beam. Thus, considering the tangential point of relation between the drum and disc, the disc perforations are of the same effective width as the drum slots. However, as the drum rotates, because of the divergent paths of the drum wall and disc, the light is partially cut off so

that the effective cross section of the reproducing light beam is different at the edges of the picture from the cross section at the center of the picture. Also, the disc must be mounted on a separate shaft, usually at right angles to the drum shaft, requiring an expensive gearing and complicated driving arrangement.

Accordingly it is one of the principal objects of the present invention to provide a system of scanning wherein the above noted and other disadvantages are overcome. It is proposed to achieve this object by providing two concentric scanning members in the form of circular drums or cylinders one within the other and adapted to be driven at different speeds.

A feature of the invention resides in a two-drum scanner. One drum having a plurality of convolutions of scanning elements and the other drum having a slot or transparent helical strip acting as a shutter for the first drum.

Other features and advantages not specifically enumerated will be apparent after a consideration of the following detailed descriptions, and the appended claims.

Referring to the drawings:

Figure 1 shows a sectional view of a scanning device embodying the invention;

Fig. 2 is a view of one of the scanning drums of Fig. 1;

Fig. 3 is a view of the other scanning drum of Fig. 1;

Fig. 4 is a plain schematic view showing the relation between the light translating device and the scanning drums; and

Fig. 5 shows a modified form of scanning drum.

Referring more particularly to Fig. 1, numeral 1 represents a suitable supporting frame comprising the vertical standards 2 and 3, which are provided with respective bearings 4 and 5 for the main shaft 6. Shaft 6 has attached thereto a pulley 7 adapted to be driven at the proper speed from any source of motive power, such as is well known in television systems. A main driving gear 8 is keyed to shaft 6 and a drum or cylinder 9 has its hub portion 10 likewise keyed to shaft

6, so that drum 9 rotates at the same speed as shaft 6. The upright 2 is provided with a bearing 11 through which passes the counter shaft 12. Shaft 12 at its left end is provided with a spur gear 13 cooperating with gear 8, and at its right hand end carries a large gear 14 cooperating with another spur gear 15 attached to the hub of a drum 18 which is mounted for rotation around shaft 6, preferably in an anti-frictional manner as by ball bearings or the like. The gear train 8, 13, 14 and 15 is so designed as to maintain proper ratio of angular speeds between the drums 9 and 18.

Referring to Fig. 2, it will be seen that the outer drum 18 is provided with a series of scanning elements or preparations 19 arranged in the path of a helix around the periphery of drum 18. The perforations 19 are preferably spaced radially apart a distance corresponding to the width of the picture field to be scanned, as indicated by the letter *d* Fig. 4. While Fig. 2 of the drawings show the perforations 19 arranged in four complete convolutions around drum 18, it will be understood that any other number of convolutions may be employed. The number of perforations and the spacing therebetween, as well as the spacing between successive convolutions will, of course, depend upon the size of the drum and the number of linear elements along which the picture or image is to be scanned. For example, if the picture field is to be scanned in forty-eight (48) successive linear elements, then the perforations 19 may be arranged in four (4) convolutions with twelve (12) perforations in each convolution. Thus each convolution of perforations scans a corresponding strip of the picture field. In order to prevent more than one perforation 19 from being exposed in the picture field at a time there is provided the drum 9, and for this purpose drum 9 is provided with a continuous spiral light transmitting slot 20 which cooperates with the successive perforations 19. In other words the drum 9 acts as a shutter for the drum 18 and successively renders each convolution of perforations in drum 9 effective in scanning the picture field. Inasmuch as the entire picture field is scanned by a single revolution of drum 9 while the picture field is scanned by four revolutions of drum 18, it will be seen that the latter drum must be driven at four times the speed of the drum 9. Because of the relative pitches of the convolutions in drum 19 and the slot 20 in drum 9, the picture field is exposed to only one perforation 19 at a time, it being understood that the drum 9 is driven in the same direction of rotation as the drum 18. For the purpose of defining or limiting the width of the picture field a suitable aperture plate 21 is provided.

While the drums 9 and 18 may be made out of any suitable material, it is preferred to

make them out of light metal such as aluminum. However, in one embodiment that was found to produce satisfactory results the outer drum 18 was made of relatively thin aluminum while the inner drum 9 was of glass having a non-transparent covering such as blackened paper or the like around the periphery thereof, and with the spiral slot 20 cut out of the paper or covering, thus in effect producing the same results as a slotted metal drum. This avoids the mechanical difficulty of machining a metal drum with a continuous spiral slot. Mounted within the drums 9 and 18 in any suitable manner is a light translating lamp 22 which may take the form of an inert gaseous lamp, preferably one of the neon filled type, and having a pair of electrodes 23 and 24, electrode 24 serving as the luminous electrode and having dimensions preferably slightly greater than the dimensions of the picture or image to be reproduced or scanned.

While any desired shape of perforation may be used in the drum 18, it is preferred to employ one having a circular or rectangular light boundary. Furthermore the width of the slot 20 in drum 9 is preferably slightly greater than the width of the perforations 19 in order to allow for variations due to machining, wear, etc. When the device is to be used for reproduction the lamp 22 is connected to a source of currents having variations corresponding to the elemental areas of the image or other visual representation that is being reproduced. Since the drums 9 and 18 are rotating simultaneously before the stationary luminous electrode 24, and since the said drums are rotating at different rates of speeds in the same direction, and because of the different pitches of the slot 20 and the convolutions of perforations in drum 18, an observer looking at the drums through the opening in the aperture plate 21 sees the image or representation reproduced in the form of a moving spot of light in the manner well known in television reproduction.

As a result of this arrangement of scanning drums the image or representation is reproduced with uniformity since the exposed perforations 19 are always at the same distance from the axis of rotation.

If it is desired to employ a metal shutter drum in place of the glass drum 9 as shown in Fig. 5 the drum may be formed with a spiral slot 25 having integral bridge members 26 across the slot at suitable spaced intervals to provide the requisite rigidity to the drum. The strips 26 may be made sufficiently narrow so that they do not interfere with the reproduction due to the high speed of rotation of the drums.

While the invention has been described hereinabove as applied to a scanning mechanism for reproduction, it will be understood that it is equally well applicable for scanning

to effect transmission in which case the device 22 will be replaced by a photo-electric cell and the image or visual representation will be projected upon the front of the drums
5 through the aperture plate 21 in any well known manner.

While specific forms and arrangements of apparatus are disclosed herein, it will be understood that the invention is not limited
10 thereto. For example while the drum 9 is shown as rotating within the drum 18, it will be clear that drum 9 may be exterior to the drum 18. Other changes and modifications may be made without departing from the
15 spirit and scope of the invention.

What is claimed is:

1. A shutter for television in the form of a hollow transparent drum having a non-transparent covering with a spiral light transmitting slot in the peripheral surface thereof.
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2. A shutter drum for television scanning, comprising a glass drum having a non-transparent covering on the periphery and a helical light transmitting slot cut out of said covering.
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3. Means for scanning a picture field in successive elemental areas, comprising a first drum having scanning perforations therein arranged in the peripheral wall thereof in the path of a plural turn helix, a second transparent drum having a non-transparent covering with a light transmitting slot extending around the periphery thereof, means for rotating both said drums simultaneously across
30 the picture field, the perforations in the first drum and the slit in the second drum being so arranged with relation to the speeds of the respective drums that the picture field is exposed to only one elemental area at a time.

4. A television scanning member comprising a transparent rotatable member having a covering of nontransparent material thereon, and a spiral slot in said covering.
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In testimony whereof I have hereunto set
45 my hand.

CHARLES FRANCIS JENKINS.

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