

Oct. 5, 1937.

R. HARDING, JR

2,094,983

TELEVISION SYSTEM

Filed Jan. 29, 1934

2 Sheets-Sheet 1

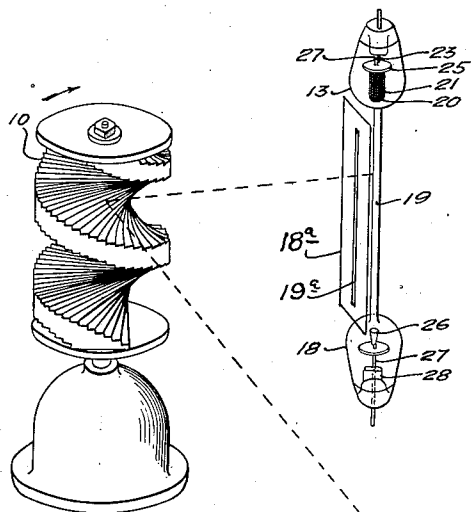


Fig. 1.

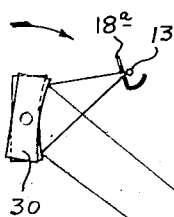


Fig. 2.

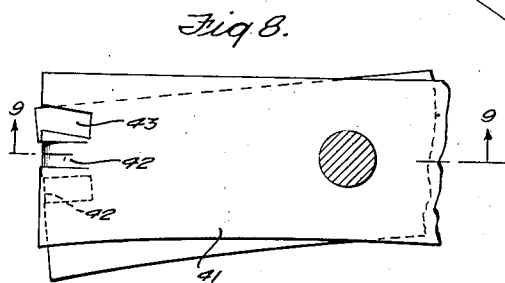


Fig. 8.

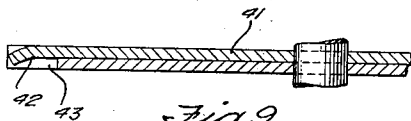


Fig. 9.

INVENTOR

Robert Harding Jr

Oct. 5, 1937.

R. HARDING, JR

2,094,983

TELEVISION SYSTEM

Filed Jan. 29, 1934

2 Sheets-Sheet 2

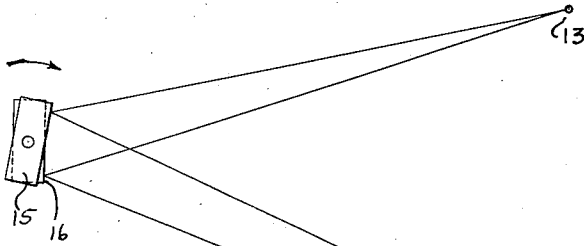


Fig. 3.

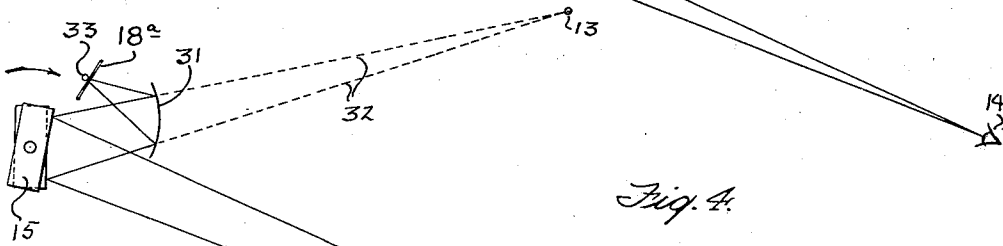


Fig. 4.

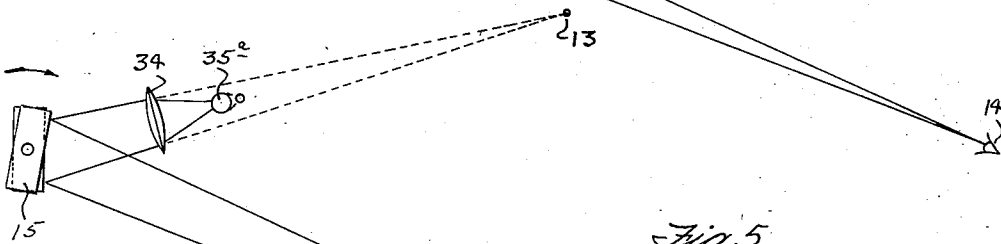


Fig. 5.

Fig. 6.

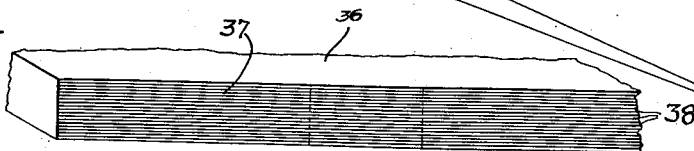
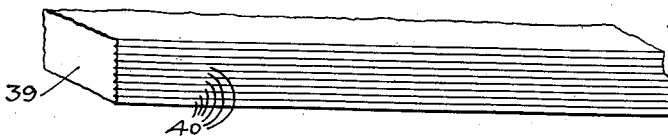


Fig. 7.



INVENTOR

Robert Harding Jr.

UNITED STATES PATENT OFFICE

2,094,983

TELEVISION SYSTEM

Robert Harding, Jr., Elmsford, N. Y., assignor to
National Television Corporation, Wilmington,
Del., a corporation of Delaware

Application January 29, 1934, Serial No. 708,747

3 Claims. (Cl. 178—6)

This invention relates to a television system and particularly to one which makes use of moving reflecting surfaces.

One of the objects of the invention is to provide a simple and inexpensive reflecting surface for a television scanning apparatus.

Another object of the invention is to provide a television scanning apparatus in which the parts may be more compact and the reproduced picture brighter.

Another object of the invention is to provide a television scanning apparatus using rotating reflectors with means to position the light source closer to the reflectors.

Still another object of the invention is to provide a television scanning drum which is less expensive to construct than those heretofore used.

Other objects of the invention and objects relating to the method of constructing the various parts and the assembly thereof will be apparent as the description of the invention proceeds.

Several embodiments of the invention have been illustrated in the accompanying drawings in which:

Fig. 1 is a perspective view of a television receiving apparatus incorporating the invention;

Fig. 2 is a diagrammatical plan view of the arrangement of Fig. 1;

Fig. 3 is a diagrammatical plan view of a known receiving apparatus similar to that of Figs. 1 and 2 but having a different curvature for the reflectors;

Fig. 4 is a diagrammatical plan view of a modified form of the invention using the same drum as shown in Fig. 3;

Fig. 5 is a plan view similar to that of Fig. 4 showing a modified means of producing the same result;

Fig. 6 is an enlarged fragmentary perspective view showing a portion of one of the reflectors used in the invention;

Fig. 7 is an enlarged fragmentary view of a modified form of the reflecting surface; and

Figs. 8 and 9 are a plan and a side elevational view, respectively, of two plates showing one way of obtaining the correct angular spacing.

Referring now more specifically to the drawings the invention is shown with a helical mirror drum 10 mounted on a suitable shaft 11 driven by a motor 12. A light source 13 is positioned a short distance away from the drum and the reflection of this light is picked up in the drum by the eye 14 in a manner to be hereinafter described.

The drum 10 is similar to that described in the

application of Arno Zillger, Serial No. 626,579, filed July 30th, 1932. The drum of this application comprises a plurality of plates 15 (Fig. 3) preferably rectangular in shape and provided with a hole at the center thereof so that a stack of plates may be mounted upon a shaft there being one plate for each line of the picture to be produced. One edge 16 of each of the plates is polished to form a high reflecting surface and the plates are arranged with equal angular spacing around the shaft so as to form a helix which passes once around the shaft. In other words, when the shaft is rotated in front of the eye the reflecting surfaces will cross the line of vision in succession each plate passing once for one complete rotation of the shaft.

The light source 13 may be any modulatable source creating a line of light, or any source associated with an optical system for producing the same effect. I prefer to use the gaseous discharge lamp described and claimed in the application of John W. McKay, Serial No. 628,321, filed August 11, 1932, which comprises a pair of spaced apart bulbs 17 and 18 connected by a relatively small diameter tube 19 which is fused to each of the bulbs and forms with them a gas-tight envelope. The bulbs 17 and 18 may be about the size of a No. 24 type radio tube and the connecting tube 19 may have an outside diameter of $\frac{1}{4}$ inch. In the bulb 17 I position the cathode 20 which is preferably formed of a strip of nickel mesh about nine inches long and about an inch wide and wound around a support rod 22 to which one end of the mesh may be welded. The roll of mesh should not be too tight and may be prevented from unrolling by spot welding the outer edge. The support rod 22 may be welded to another support rod 23 sealed in the press 24 which is formed integral with the bulb, the rod 24 forming the lead-in wire for the lamp. A disc of mica 25 may be positioned at the end of the cathode where it joins the support rod 23 to protect the press from the discharge.

In the bulb 18 is positioned the anode 26 which may be a small nickel cup welded to the top of the support rod 27 sealed in the press 28 of the bulb and forming the anode lead-in wire. A disc 29 of mica may be attached to the support rod between the anode and the press to protect the press similarly to the disc 25 for the cathode.

The lamp 13 may be filled with an ionizable gas such as one of the monotomic gases, neon, argon, helium, krypton, and xenon, and preferably a small amount of metal vapor is mixed with the gas. This metal vapor may be that

of mercury or one or more of the metals of the alkaline group. The pressure of the gas should be in the neighborhood of 10 mm. of mercury although this pressure is not critical. The preferred form of lamp contains about 10 mm. of neon and a small drop of mercury and operates at about 300 volts with a current of 100 milliamperes.

If such a lamp is spaced from the drum 10 as shown in Fig. 1 and is modulated in accordance with the television signal the reflection of a small portion of the tubular portion 19 of the lamp will appear to an observer who is looking at the drum on one of the reflecting surfaces and as the drum is rotated in a clockwise direction the spot of light will move from left to right across the reflecting surface. Whether or not the observer will see the reflection of the light in one or more of the reflecting surfaces at any given instant is determined by the size of the drum, the distance the light is away from the drum, and the distance the observer is away from the drum. A drum similar to that used in the above application composed of 60 plates 25 each having a thickness of $\frac{1}{16}$ th of an inch, making the total height of the drum six inches, and with a length equal to 7.2 inches, has its plates spaced six degrees apart.

With this arrangement I have found that with 30 the observer ten feet from the drum he will see the light in only one plate at a time if the light is about 48 inches away from the drum. Bringing the light nearer will cause the observer to see the light in more than one surface at the same time and will thus cause him to see a foreshortened picture and a portion of another picture. If the light is placed too close he may see three or four pictures. This positioning of 35 the lamp is not critical but the distance has to be maintained in order to get the correct effect. Obviously the nearer the light is to the drum the brighter will be the picture produced and hence one of the objects of the invention is to get the light nearer to the drum. This may be 40 done by providing concavely curved reflecting edges on the plates instead of straight edges. This construction is shown in Fig. 1 and is illustrated diagrammatically in Fig. 2 where the curved plates 30 permit the light to be moved up 45 to within a few inches of the drum thus gaining enormously with respect to the brightness of the picture.

In Fig. 4 another means is shown to accomplish the same purpose. In this figure the plates 15 of 55 the drum are similar to those of Fig. 3 having a straight edge while a curved mirror 31 is positioned adjacent the drum in the path of light rays 32, indicated by the dot and dash lines, which would normally come from the source 13 60 if it were positioned in the normal place shown in Fig. 3. The mirror 31 is given the proper curvature so that a light source 33 positioned adjacent to it will have its rays bent in the same direction as the rays 32 but the source 33 will be 65 very much nearer the drum and the picture will be therefore very much brighter.

In Fig. 5 in place of the mirror 31 I provide a lens 34 and the light source 35 is positioned on the opposite side of the lens from the drum. 70 The curvature of the reflecting edges of the drum shown in Figs. 1 and 2 may be somewhat different from the curvature of the mirror of Fig. 4 and the curvature of the lens in Fig. 5. Where the curved surfaces are provided on the 75 drum itself a truly cylindrical curve may be

found satisfactory. However, the curved mirror 31 of Fig. 4 may be given a parabolic curve so that the distance from the light source to the surface of the drum will remain constant as the drum rotates. The lens 34 of Fig. 5 may also be 5 cylindrical to give the correct results.

Moving the light source nearer to the drum by any of the means described above has the effect of widening the spot of light picked up on the reflecting surfaces. To overcome this I make 10 the light source smaller in diameter or provide an aperture to decrease its width. Such a means is shown in Figs. 1, 2 and 4, where an opaque mask 18^a is provided with a slot 19^a just large enough to give the desired width of light. Another way of cutting the width of the light down 15 would be to use a glass rod 35^a about $\frac{3}{4}$ of an inch in diameter in front of the light source as shown in Fig. 5. The rod acts as a lens concentrating the light instead of reducing its intensity. 20

Inasmuch as a line of light is used with a receiver of this nature to reproduce the picture the trueness of the reflecting surface in a vertical direction or parallel to the axis of the drum is not important but the surface must be very 25 accurate lengthwise of the plate or transverse to the axis of the drum. This is to prevent the light reflection from being seen in more than one position at a time horizontally.

I have found that the surface may be composed of a large number of irregularities as long 30 as such irregularities lie in the same direction and do not interfere with the accuracy of the surface in that direction. If this condition is met the surface may be excellent for the purpose 35 at hand although it may appear to be a poor reflecting surface as far as looking at the reflection of some object is concerned. If a smooth surface is buffed in one direction only so that the buffing wheel makes fine scratches in one 40 direction on the surface it will be found to give good results without any grinding or lapping. In Fig. 6 a portion of a plate 36 is shown, the edge surface 37 of which has been first milled and then buffed so that the fine scratches 38 45 lie in one direction and that direction is parallel to the sides of the plate. The effect of such a surface may be to give a dull appearance when looking directly at it and of course there is some absorption, but as long as the surface is accurate lengthwise of the plate the reflection of light 50 from the line source will be correct for producing a television picture.

If desired the surface may be provided with ridges of a predetermined size which may be cut 55 into the surface with a milling machine or by any other method. In Fig. 7 a portion of a plate 39 is shown with ridges 40 cut longitudinally therein. These ridges may then be buffed which will give them a suitable finish for the purpose. 60 While the reflecting surfaces of the two plates 36 and 37 are shown as straight it is understood that they may be curved similar to the edges of the plate 30 or they may have any other curvature. 65

The effect of the particular type of surface on the plates is to increase the vertical angle of observation of the drum. In other words the surface made in this way tends to diffuse the light 70 vertically or transverse to the plate regardless of the point of observation. It has heretofore been found necessary to have a light source which is somewhat longer than the height of the drum so that the reflection of it will not be cut off from the lowermost and uppermost plates when the 75

head is raised or lowered. With the construction of the invention it is possible to get the same vertical observation range with a light even shorter in length than the height of the drum.

5 In Fig. 8 a means for accurately spacing the plates at the proper angle is shown. Here the plate 41 is shown provided at the ends with a downwardly bent tongue 42 and a slot 43 spaced six degrees from it. The tongue 42 engages the
10 slot 43 in the plate immediately beneath it when the plates are at the right angles. The slot and tongue may be accurately put in the ends of the plates in a punch press so that they will all fit together properly with a minimum of assembling
15 effort.

While the invention has been illustrated in connection with television receiving apparatus it is also applicable to television transmitting apparatus in which a light-sensitive cell would be
20 positioned in place of the lamp with means to project an image onto the cell. The invention is, therefore, intended to cover any system either transmitting or receiving in which the light or the light-sensitive cell is brought closer to the
25 drum.

Many modifications of the invention may be resorted to without departing from the spirit

thereof and I do not therefore desire to limit myself except as such limitations occur in the appended claims.

What I claim is:

1. A television drum comprising a plurality of 5 stacked plates, each plate having a definite angular relation with those next to it, and protruding means on each plate adapted to engage a portion of a plate next to it to maintain said plates in accurate angular relation. 10

2. A television drum comprising a plurality of stacked plates, each plate having a definite angular relation with those next to it, a reflecting edge on each of said plates, a member on each plate extending out from the plane of said plate, 15 and means on the plate adjacent to it to engage said member so as to lock each plate to a plate adjacent to it.

3. A television drum comprising a plurality of stacked plates, each plate having a definite angular relation with those next to it, a lug extending out from the plane of each plate at a point spaced from the center thereof, and means on an adjacent plate to engage said lug whereby each of said plates is locked to a plate adjacent to it. 25

ROBERT HARDING, JR.