

Aug. 10, 1937.

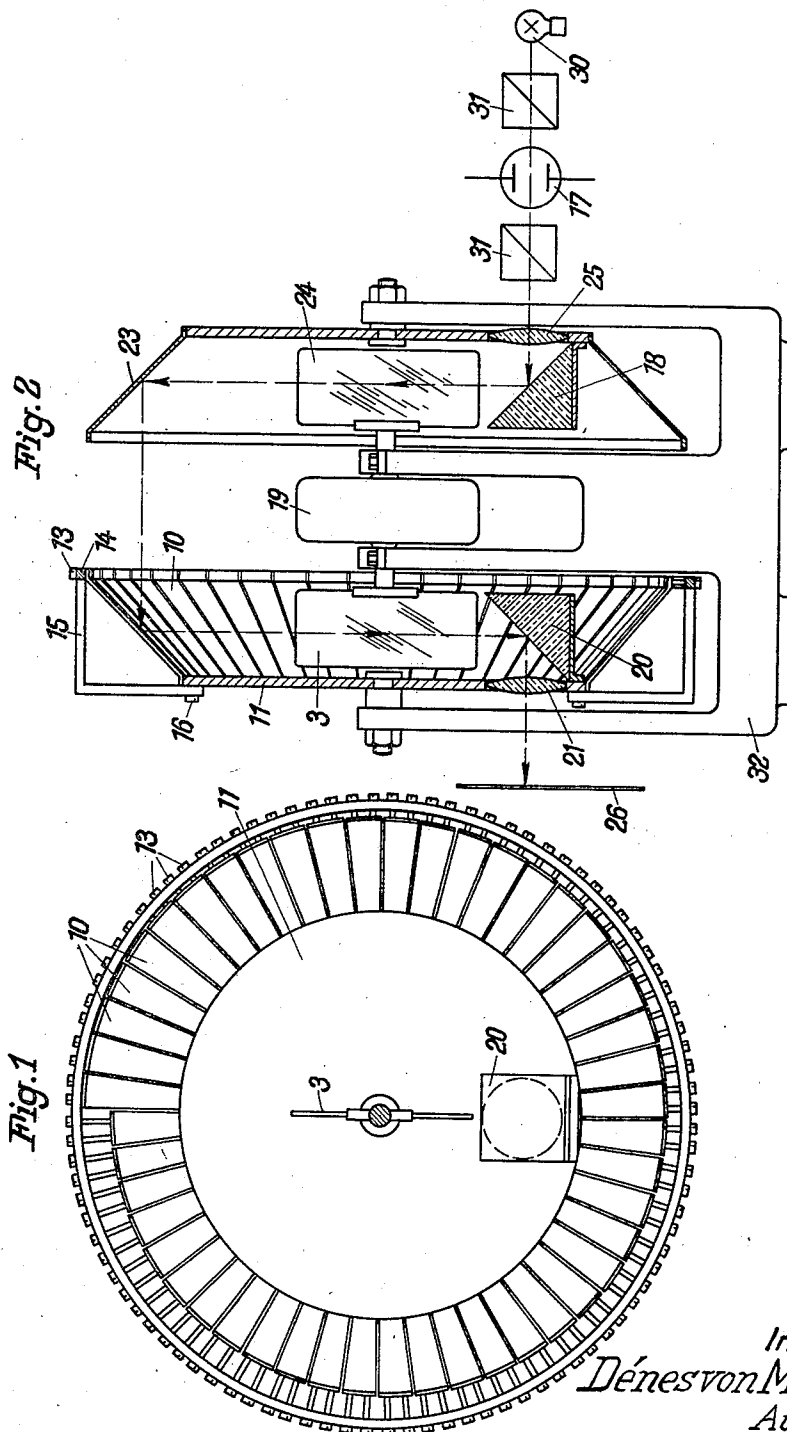
D. VON MIHÁLY

2,089,588

TELEVISION APPARATUS

Filed Nov. 23, 1933

3 Sheets-Sheet 1



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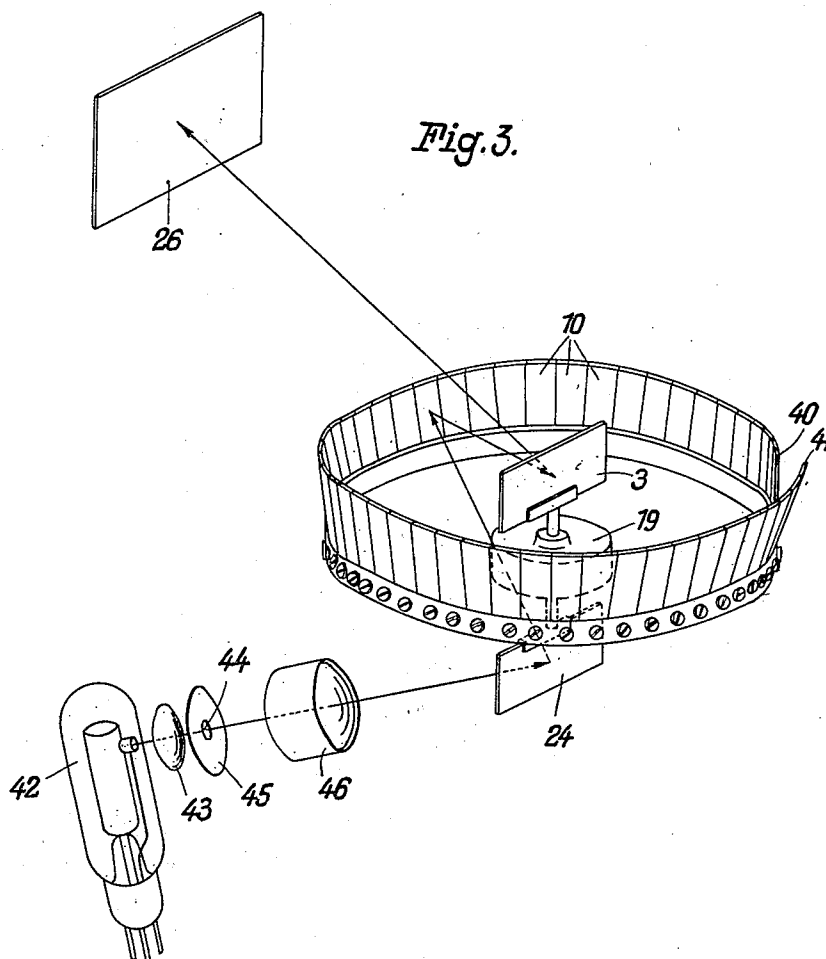
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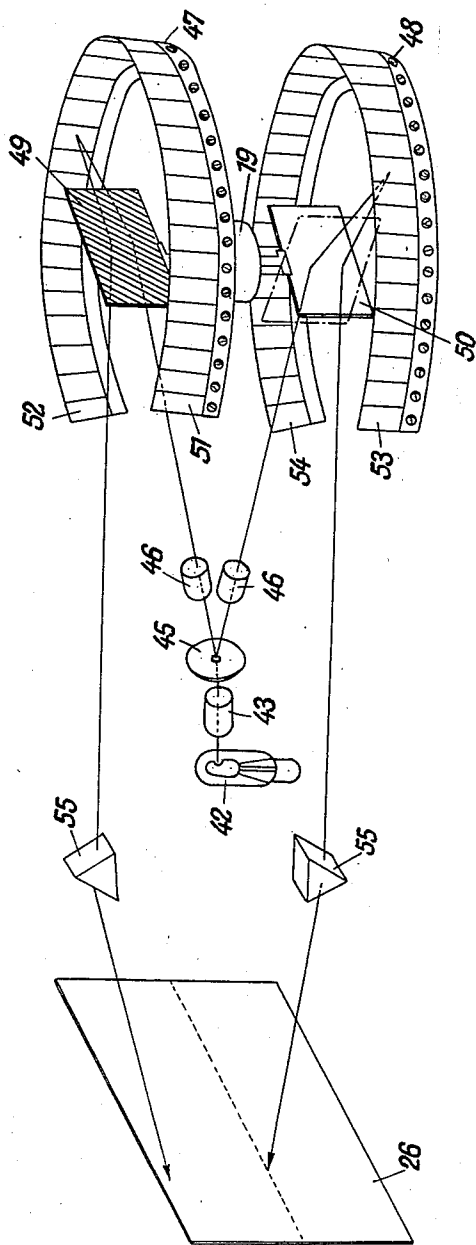
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Fig. 4.



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UNITED STATES PATENT OFFICE

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TELEVISION APPARATUS

Dénés von Mihály, Berlin, Germany

Application November 23, 1933, Serial No. 699,471

In Germany November 26, 1932

6 Claims. (Cl. 178—6)

My invention relates to a television scanning apparatus.

This application is a continuation in part of my former application Ser. No. 602,972 filed April 4th, 1932, entitled "Television apparatus".

An object of the parent application is to describe scanning apparatus comprising a stationary member provided with peripherally disposed scanning elements for analyzing or recombining an image, and a rotary reflector for projecting the image onto the analyzing member, or for receiving an image from the recombining member, as the case may be. With the apparatus there described the scanning member consists of a drum having a helical row of apertures being encircled by a circle-shaped or helical photocell or light relay. Another object of the parent application is to provide the scanning apparatus with a photocell or light relay of small dimensions arranged on the optical axis of it, in combination with a conical reflector surrounding the scanning drum, and with another conical reflector which by means of a second rotary mirror reflects the full light of the light relay to each single just acting aperture of the scanning drum.

It has been found, however, that it is rather difficult to concentrate the whole available light on each aperture having an area of say 1/100 square millimeter so that considerable light losses could not be avoided with the above described arrangement.

One object of my present invention is to improve the light efficiency of the scanning apparatus described in the parent application.

Another object is to replace the drum having a helical row of apertures of this scanning apparatus by a stationary mirror-ring consisting of a number of mirrors equal to the number of lines into which the image has to be scanned, the mirrors of this ring being faced towards the centre rotary mirror. With this arrangement the light has to be concentrated on each mirror having an area of several square centimeters instead of the 1/100 square millimeter of an aperture, so that this concentration can be obtained by much simpler and cheaper optical means. Further, the mirror ring itself can also be produced much easier than the drum with the extremely small apertures; moreover, here the conical mirrors and the second rotary mirror are rendered unnecessary.

The mirror ring may consist of plane mirrors being inclined under different angles to the axis of the ring, whereat the scanning of the images into lines is dependent upon the inclinations of

the single mirrors with respect to each other and to the axis of the ring.

In the accompanying drawings apparatus embodying my invention are illustrated diagrammatically by way of example.

Figs. 1 and 2 show a scanning apparatus provided with a mirror ring consisting of plane mirrors.

Fig. 3 is another embodiment of my invention showing an improved form of the apparatus shown in Figs. 1 and 2 and

Fig. 4 shows a further improved form of the apparatus according to Fig. 3.

Referring now to Figs. 1 and 2, the scanning device consists of a mirror ring formed by plane mirrors 10 which are mounted between the edge of a disc 11 and a ring 14 by screws 13. The ring 14 is secured to the disc 11 by arms 15 and screws 16 and has a larger diameter than the disc 11, so that the mirrors 10 are inclined to the axis of the ring. The angle of this inclination of each single mirror can be adjusted by the screws 13, and the mirrors are so arranged that, going in clockwise direction, each mirror is somewhat more or less inclined to the axis than the foregoing mirror. For scanning an image f. e. into 48 lines there are 48 mirrors, one of them being inclined to the axis at 45°, the inclination of each following mirror being about 12' less than of the foregoing mirror.

The light beam originating from the source of light 30, after having been polarized by the Nicol prisms 31 and modified by the Kerr-cell according to the impulses of the transmitted and received picture currents, falls through the lens 25 upon the angle mirror 18 where it is projected to the rotary mirror 24 driven by the motor 19. From the rotary mirror the light beam is reflected by way of the conical mirror 23 to the mirrors 10 which project it on to the rotary mirror 3. By this rotary mirror the light beam is reflected to the angle mirror 20 where it is projected through the lens 21 onto the screen 26 upon which the single picture elements thus projected will apparently be assembled to the whole image. The entire scanning device is mounted upon a frame 32.

Owing to the use of the fixed angle mirrors 18, 20, and of plane rotary mirrors 3, 24 instead of the rotary angle mirrors shown in the parent application the correcting prism which has been necessary with the apparatus according to the parent application for erecting the image can be omitted, and therefore is not shown.

Fig. 3 shows a further embodiment of my in-

vention in which also the last angle mirror is removed, so that the light losses are even more reduced.

This scanning device consists also of a mirror ring having differently inclined mirrors 10, like the apparatus shown in Figs. 1 and 2, but here the motor is placed in the centre of the mirror ring and the two rotating mirrors 3 and 24 are placed somewhat outside of the mirror ring. This mirror ring is formed so that one of its mirrors 40 is parallel to the axis of the ring and each subsequent mirror in counterclockwise direction is inclined a little more to the axis of the ring so that the mirror 41 being next to the mirror 40 in clockwise direction has the maximal inclination.

The light of the modulated light source 42 is concentrated by the lens 43 upon the aperture 44 of the mask 45, said aperture having the area of one picture element. The image of this brilliant aperture is thrown by the lens 46 upon the rotary mirror 24, then reflected upon one of the mirrors 10 of the mirror ring, and therefrom back to the other rotary mirror 3 which projects it to the screen 26. It is obvious that, owing to the double sided mirrors 3 and 24, during one revolution of these mirrors each mirror 10 will be illuminated twice so that the whole image will appear also twice on the screen in the same period. Thus, if the mirrors rotate with $12\frac{1}{2}$ revolutions per second, the whole image will be projected onto the screen 25 times per second.

Since the brightness of the picture appearing on the screen 26 is partly dependent upon the area of the mirrors 10 these mirrors should be made as large as possible. On the other hand, however, increasing the area of the mirrors means also increase of the diameter of the mirror ring, and, in consequence thereof, increase of the length of the way of the light rays within the apparatus whereby the light losses are increased again.

Fig. 4 shows a possibility for increasing the area of the mirrors 10 without a corresponding increase of the diameter of the apparatus.

The mirror-ring is here subdivided into two parts 47 and 48, each part comprising half as many mirrors as picture lines are wanted. Both mirror rings are illuminated by the same source of light 42 and project the light upon the same screen 26 in such manner that the light coming from the ring 47 illuminates the upper part and the light coming from the ring 48 illuminates the lower part of the screen.

In order to avoid the simultaneous action of the two mirror rings the two rotary mirrors 49 and 50 are silvered only on one side, i. e. on opposite sides. Accordingly the inclination of the mirrors of the mirror ring is such that, beginning with the mirror 51 each subsequent mirror of the upper mirror-ring is inclined somewhat more, up to the mirror 52, from which the increase of the inclination is continued with the mirror 53 of the lower mirror-ring, up to the last mirror 54 of this ring.

If both rotary mirrors 49 and 50 are simultaneously illuminated by the glow-lamp 42 then each of them sweeps the light say once round the respective mirror ring during one half revolution. Considering, that only one side of the rotary mirrors is silvered, during one full revolution of these mirrors all mirrors of both mirror-rings will be illuminated once, firstly those of the upper ring and then those of the lower ring.

They reflect the light to one of the prisms 55 which conduct it to the corresponding half of the picture area on the screen 26.

Of course it is also possible to use this arrangement for transmitting pictures in two zones if each rotary mirror is cooperating with a separate glow-lamp. In this case it is advantageous to use rotary mirrors being silvered on both sides, in order to increase the number of pictures per second.

Having now particularly described and ascertained the nature of my invention and in what manner the same is to be performed, I declare that what I claim is:

1. Television apparatus, comprising a rotary reflecting means comprising a reflecting surface which is substantially parallel to its axis of rotation, and a plurality of stationary mirrors circumferentially spaced around the axis of said reflecting means and cooperating therewith for scanning, said stationary mirrors being inclined to the axis of said rotary reflecting means at different angles and their number being equal to the number of lines into which the image to be transmitted is scanned, said reflecting surface lying within the space defined by the two planes of the edges of said mirrors.

2. Television apparatus, comprising two rotary reflecting means adapted to be rotated together about the same axis, and a plurality of stationary analyzing elements for analyzing and recombining an image circumferentially spaced about the axis of said means, said elements comprising plane-faced mirrors facing said reflecting means and cooperating therewith for scanning, said mirrors being arranged in two rings encircling said two rotary reflecting means, said mirrors being inclined to said common axis of said rotary reflecting means, the angle of inclination of said mirrors increasing continually by the same value from the first mirror of the first set of mirrors to the last mirror of the same set, then from said last mirror of the first set to the first mirror of the second set and on to the last mirror of the second set.

3. Television apparatus, comprising two rotary reflecting means adapted to be rotated together about the same axis, and a plurality of stationary analyzing elements for analyzing and recombining an image circumferentially spaced about the axis of said means, said elements comprising plane-faced mirrors facing said reflecting means and cooperating therewith for scanning, said mirrors being arranged in two rings encircling said two rotary reflecting means, said rotary reflecting means comprising two mirrors silvered on opposite sides and cooperating with a common source of light.

4. Television apparatus, comprising two rotary reflecting means adapted to be rotated together about the same axis, and a plurality of stationary analyzing elements for analyzing and recombining an image circumferentially spaced about the axis of said means, said elements comprising plane-faced mirrors facing said reflecting means and cooperating therewith for scanning, said mirrors being arranged in two rings encircling said two rotary reflecting means, said rotary reflecting means comprising two mirrors silvered on both sides and each cooperating with a separate source of light.

5. Television apparatus comprising a stationary substantially circular member having spaced about it peripherally a plurality of mirrors relatively positioned for scanning, and means includ-

ing reflecting means mounted to rotate about an axis substantially parallel to the axis of said member and having every element of the reflecting surface extending in the direction of the axis
5 substantially linear and parallel to said axis, to provide by reflections from said reflecting means optical paths progressively established between contiguous areas of a scanned field and said mirrors in succession as well as between said mirrors
10 and light source.

6. Television apparatus comprising a stationary substantially circular member having spaced about it peripherally a plurality of mirrors rela-

tively positioned for scanning, and means including reflecting means mounted to rotate about an axis substantially parallel to the axis of said member and having every element of the reflecting surface extending in the direction of the
5 axis substantially linear and parallel to said axis, to provide by reflection from said reflecting means optical paths progressively established between contiguous areas of a scanned field and said mirrors in succession as well as between
10 said mirrors and a photoelectric cell.

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