Sept. 4, 1945. E. J. QUINBY 2,384,259

VIEWING DEVICE

Filed July 9, 1942

Fig. 1.

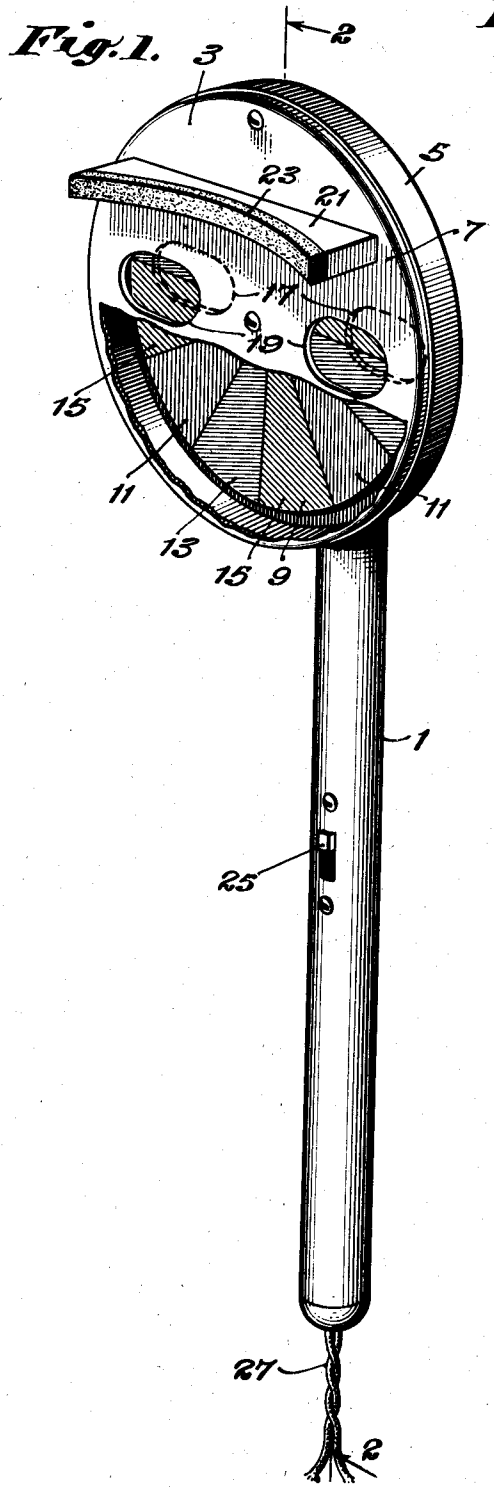
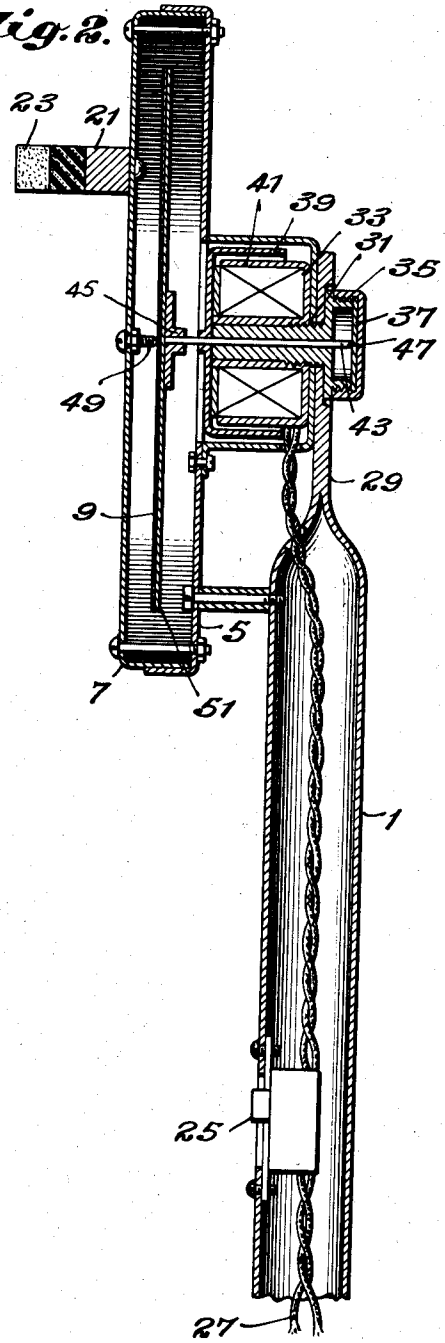


Fig. 2.



INVENTOR
Edwin Jay Quinby
BY H. E. Brower
ATTORNEY

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VIEWING DEVICE

Edwin Jay Quinby, Key West, Fla., assignor to Radio Corporation of America, a corporation of Delaware

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2 Claims. (Cl. 88—1)

This invention relates to viewing devices and, more particularly, to viewing devices suitable for reconstituting color images from a series of superimposed black and white reproductions where each reproduction of the series is representative with respect to intensity of a primary color. Such a device becomes particularly useful for color television systems of the kind described in the pending application of Alfred N. Goldsmith, Serial No. 420,629, entitled "Television systems."

In the referred to Goldsmith application there is described a color television system in which the pictures are reproduced by projecting a sequence of black and white images upon a viewing surface, each image of the sequence corresponding to the image taken through a filter whose transmission characteristic is such as to pass substantially only light of one of the primary colors. The light sequence of the filters is so chosen that the additive combination of them is the equivalent of white light. Such a combination, for example, would be red, green and blue. If the sequence of black and white images is then viewed through a suitable viewing device in which only light of one color is permitted to pass at any instant and the viewing device operates in synchronism with the production of the black and white images, the observer will perceive an image in which each of the elemental areas will have a color and intensity representative of the color and intensity of each elemental area of the original object. Such a viewing device, therefore, will comprise a disk having a plurality of segments arranged in sequence, each segment of the sequence having a predetermined spectral transmission characteristic and means for rotating the disk synchronously with the picture formation, together with masking means to limit the field of vision of the observer through the rotating disk. By my invention I have supplied such a viewing device.

It will be appreciated, of course, that it is essential that the viewing device, which is to be hand-held, must be light so that prolonged viewing does not entail any appreciable physical effort. Moreover, provision should be incorporated to steady the viewing device to keep eye-fatigue at a low level. Furthermore, provision must be made for phasing the disk properly since it is not only essential that the disk run synchronously with the picture formation on the viewing surface, but that the appropriate segment is in the field of view with its related image. Also, it is desirable that the viewing device produce a minimum amount of noise in order not to interfere with the accompanying sound reproduction of the images. It is further desirable that the viewing device be kept in a simple form, free from maintenance difficulties and to be robust enough to stand rough usage. All of these features are incorporated in my invention.

Accordingly, it is the main object of my invention to provide a new, novel and useful viewing device.

A further object of my invention is to provide a viewing device suitable for viewing an appropriate sequence of black and white images to provide multi-colored images for observation by an observer.

A still further object of my invention is to provide a viewing device suitable for use in a color television system in which the reproducing apparatus provides a sequence of black and white images.

Another object of my invention is to provide a viewing device suitable for use in reconstructing stereoscopic images from a succession of black and white images occupying the same viewing area.

Other objects of my invention will become apparent upon reading the following detailed description taken together with the drawing.

In the drawing I have shown in Figure 1 a cutaway perspective view of a viewing device embodying the principles of my invention, while in Figure 2 there is shown a cross-sectional view of the embodiment of my invention shown in Figure 1.

In Figure 1 a hollow handle 1 supports a disk housing 3 comprising a cylindrical container 5 and a cover 7, within which is a disk 9 having a plurality of sequences of filter segments 11, 13, 15, the segments being appropriately, for example, red, blue and green. Both the cylindrical container 5 and cover 7 are perforated with a pair of apertures 17 and 19, respectively, the apertures in the cover and in the container being in register with each other, and spaced approximately the interpupillary distance of the eyes. A head-rest comprising a curved support member 21 is affixed to the cover 7 and is lined with a suitable soft, mechanical shock-absorbing material 23, such as sponge rubber, for example. The shape of the support member 21 is such as to conform with the forehead of an observer and is of such height as to space the eyes from the apertures 19 at a suitable distance so that no eye-strain due to unsteadiness is introduced by placing the viewing device between the observer and the reproducing surface. The segments are so spaced that at any instant, the same color segment is in register with

both of the apertures, so that the right and left eyes of the observer always see the same colored fields in succession as the disk is rotated.

A switch 25 is mounted within the handle to open and close the circuit of the power line supplying energy to the driving motor through the cord 27. The switch 25 not only serves to turn the driving motor on and off, but it is also useful for phasing the disk with the reproduced fields. This is brought about by momentarily opening the circuit, which immediately introduces a slowing down of the motor so as to bring the disk in appropriate phase relation with the reproduced images.

The method of mounting the motor and disk is shown in Figure 2, in which figure there is shown the tubular handle 1 flattened at one end 29 and drilled to receive a threaded boss 31 affixed to the motor stator 33. A nut 35 engages the threaded boss to hold the motor stator integral with the handle 1 and a cap 37 covers the boss to prevent dirt from entering through the hollow section of the boss to keep the bearing surface clean.

The motor used may be suitably chosen from any of the synchronous motor types, but in the interest of keeping the motor size and power consumption at a minimum, I have found that the synchronous induction type motor, such as used in the Westinghouse electric clocks, is particularly useful. This motor comprises a stator having a stator winding and 12 poles, together with appropriate shading pole pieces to insure that the direction of the rotation is always the same. Fitting over the stator is a non-magnetic cup-shaped rotor 39 having a thin band of magnetic material 41 supported on the inner surface of the cup. Shaft 43 is passed through the rotor 39 with a force-fit and affixed to the shaft 43 at one end is a hub 45 to which is fastened the disk 9 bearing the filter segments. The shaft extends through the hollow core of the stator and is in contact with the bearing surface 47. A set-screw 49 having a rounded polished end passes through the cover 7 and makes light contact with the disk 9 at the center thereof to act as a front thrust-bearing to prevent lateral motion of the disk while rotating. The disk 9 itself may be suitably formed by affixing to a thin, transparent disk 51 the color segments of the filter portions corresponding to the segments 11, 13, 15 of Figure 1. The segments may be suitably affixed by the use of a proper adhesive or using pressure-sensitive adhesive strips.

Alternatively, the entire disk assembly may be molded from suitable plastic with the colored sectors being integral with supporting sections. The color sectors or segments can be given proper light transmission characteristics as is well known in the art, since plastic photographic filters have been available in the open market for some time.

It will, of course, be appreciated that the number of segments will be directly related to the number of poles of the synchronous motor, and, in fact, there must be one segment for each pole, since each pole corresponds to one field and each field must be viewed during its duration through the same color filter. Thus, in one modification, where a 12-pole 600 R. P. M. synchronous motor is provided, there are 12 colored segments, forming 4 groups, each group having a red and a green and a blue filter sector. If a 6-pole 1200 R. P. M. motor were provided, then there would be 6 sectors, forming two groups of primary color segments. It will also be appreciated that in view of the fact that the same color of filter sector must be in register with the apertures of the viewing device, and assuming that a 3-color system is being used, that the number of segments or poles cannot be less than 6 for viewing the image with both eyes. Thus, it would not be feasible to use a 4-pole motor, for it would then be impossible to have the required number of groups of filters to provide the same color sector in registry with the apertures without considerable modification of the drawing arrangement. This is a necessary feature for color reproduction in order to insure that both eyes simultaneously view the surface upon which the image is reproduced through the same color filter.

However, if the viewing device is to be utilized for stereoscopic image reproduction, then of course the above relationship no longer holds, since each group would consist of only two sectors, one transparent and one apaque, as described in the above identified Goldsmith application.

From a practical point of view it is ordinarily desirable to use a minimum number of poles in order that the sectors may have a maximum angular field coverage. This is desirable because as the number of segments is increased, the angular displacement of each sector becomes smaller. As a result, a point is reached where the transition time required, for one sector to pass out of registry with the apertures and the next sector to move into registry, becomes appreciable as compared with the total time during which the sector is in registry with the apertures. The effect causes some disturbance to the observer, since it will be appreciated that one sector with respect to the aperture is moving upward while the other sector is moving downward. By using a minimum number of poles the relative transition time becomes a minimum and so small that the eye does not perceive this effect and consequently enhanced image reproduction is afforded the observer.

It will be appreciated that while I have described my invention with respect to a three-color television system, the rotating disk need not necessarily be formed of color segments, but may be formed of alternate transparent and opaque segments so as to be useful for observing stereoscopic images. Again, color segments may be used that may be alternated with opaque sectors so that the viewing device will be suitable for use in a colored stereoscopic system, also described in the above identified Goldsmith application.

Having now described my invention, what I claim is:

1. A hand-held viewing device for color television image production and observation comprising a handle support member, a housing element having a pair of viewing apertures spaced from each other at substantially interpupillary separation, said housing element being supported by the handle, a color filter unit having at least a pair of series of color filter areas with each series including a filter element of each component-primary color of the image to be viewed, said color filter unit being so located within the housing that like color filter areas are aligned with each of the viewing apertures simultaneously and viewed there-through, a drive motor means supported from the handle for driving the color filter unit and bringing like color filter areas succcessively into registry with the viewing apertures, a phasing switch unit located within the handle element to control the said motor and thereby align like component-primary color filter areas substan-

tially instantaneously with the viewing apertures to synchronize filter rotation drive with the image production on an area to be viewed and a headrest element supported on the housing and adapted for resting against the forehead of an observer so as to locate the apertures at predetermined distances from the eyes of the observer.

7. A hand-held viewing device for color television image viewing comprising a handle support member, a housing element having a pair of viewing apertures spaced from each other at substantially interpupillary separation, said housing element being supported by the handle, a color filter disk unit supported for rotation on a drive shaft and having at least a pair of series of sectorially shaped color filter areas with each series including a filter element of each component-primary color of the image to be viewed, said color filter disk unit being so located within the housing that like color filter areas are aligned with each of the viewing apertures simultaneously and viewed there-through, a drive motor means supported from the handle and having its rotor element formed as a part of the disk drive shaft for rotating the color filter unit and bringing like color filter elements successively into registry with the viewing apertures, a phasing switch unit located within the handle element to control the said motor and thereby align like component-primary color filter areas substantially instantaneously with the viewing apertures to synchronize filter rotation drive with the image production on an area to be viewed and a headrest element supported on the housing to locate the apertures at predetermined distances from the eyes of an observer.

EDWIN JAY QUINBY.