

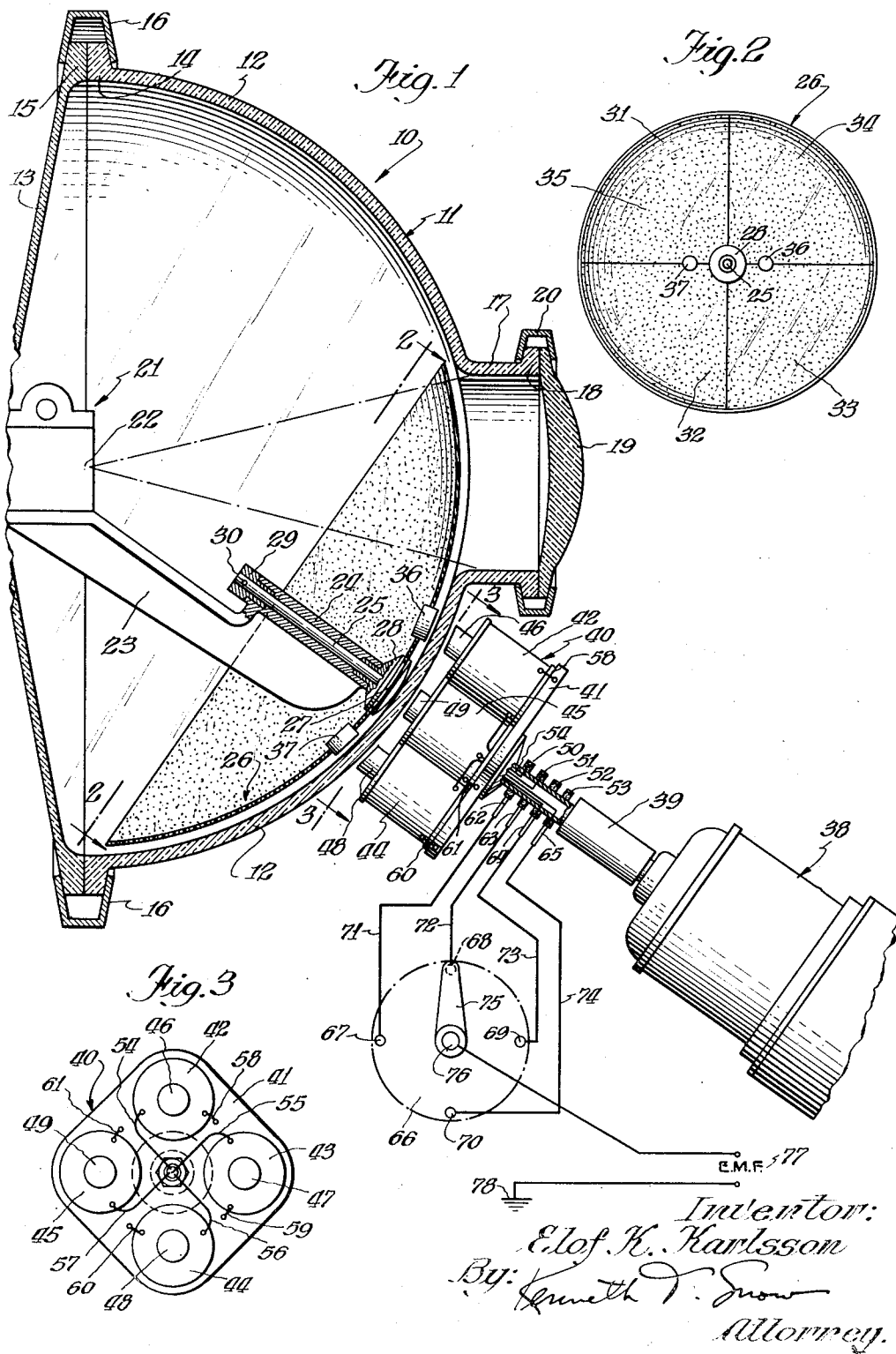
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CATHODE-RAY TUBE

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CATHODE-RAY TUBE

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This invention relates to a new and improved cathode-ray tube.

A principal object of this invention is to provide means in a cathode-ray tube for receiving a true focused picture throughout its full scope making it feasible for direct viewing or projection.

An important object of this invention is the provision of means in a cathode-ray tube for receiving color impulses and transmitting therefrom a true color picture.

Another important object of this invention is to supply a cathode-ray tube with color filter means built therein.

A further important object of this invention is to provide a cathode-ray tube with a combination light filter and picture retentive phosphor surface.

A still further important object of this invention is the provision of color filter means in a cathode-ray tube and means externally of said tube for effecting rotation of said color filter means.

Another and still further important object of this invention is to provide a plurality of external magnetic means operable to clutch the drive of a synchronous motor with a color filter wheel disposed within a cathode-ray tube.

Still another object of this invention is to supply intermittently engageable magnetic clutch means for effecting synchronization of color impulse transmissions with a color filter wheel.

Other and further important objects will become apparent from the disclosures in the following specification and accompanying drawing.

In the drawings:

Figure 1 is a transverse sectional view of the cathode-ray tube of this invention.

Figure 2 is a plan view of the color filter employed in this invention and as viewed on the line 2—2 of Figure 1.

Figure 3 is an elevational view of the magnetic clutch of this invention and as viewed on the line 3—3 of Figure 1.

The reference numeral 10 indicates generally a cathode-ray tube used in television receivers or the like. The cathode-ray tube of this invention is adapted for use as a direct viewing video tube or a projection type video tube wherein the picture received may be projected on an auxiliary screen.

The cathode-ray tube 10 includes an envelope 11 of non-magnetic material. This material may be glass, ceramic material, or non-magnetic metal, such as brass or the like. The envelope 11 consists of a semi-spherical front portion 12

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and a back wall or neck end 13 of the tube 10. An annular flange 14 is disposed around the rear annular periphery of the portion 12 and abuts a similar annular flange 15 extending around the periphery of the forward portion of the back wall 13. A clamp 16 is arranged and constructed to join the flanges 14 and 15 in vacuum tight abutting relationship.

The semi-spherical front portion 12 of the envelope has a cylindrical projection 17 formed at the front end thereof. An annular flange 18 is provided around the circumference of the outer front end of the cylindrical projection 17 against which is placed a picture or light transmitting glass or projecting lens 19. A clamp 20 extends around the annular flange 18 and the circumference of the lens 19 to hold the lens in centered position over the end of the cylindrical projection 17 in sealing relationship.

An electron gun 21 is disposed at the rear of the cathode-ray tube 10 and is carried in the back wall or neck 13 of the tube. The center of the gun designated by the numeral 22 is the origin of an oscillating electron beam which is adapted to deliver the transmitted picture to a viewer. The center 22 constitutes the center of the semi-spherical front portion 12 of the cathode-ray tube.

A bracket 23 is clamped to the gun 21 and extends forwardly and downwardly as shown in Figure 1 terminating in a sleeve 24 for journally receiving a shaft 25 which is fixed to a color filter wheel 26 at its center 27 by a rivet type hub 28. The color filter wheel is dish shaped and is a perfect part of a sphere which is concentric with the housing or envelope sphere 12 and thus also has the same center 22 as the electron gun 21. A collar 29 is fixed to the shaft 25 by reason of a radially extending pin 30 and this assembly provides for the journal bearing of the color filter wheel within the sleeve 24.

The color filter wheel 26 includes a plurality of segments 31, 32, 33 and 34 designating the color filter portions red, green, blue and white respectively. These segments or sphere portions of the color wheel are best shown in Figure 2. Each of the color segments or portions is sufficiently large in itself to cover the front portion of the cathode-ray tube behind the picture glass 19 and inasmuch as the color wheel is a part of a true sphere and the center of the sphere is coincidental with the center 22 of the electron gun there is a true focus of the electron beam on all points of the color filter inasmuch as all points on this filter are equi-distant from the

center of the electron gun 21. The color filter wheel not only performs the function of filtering out certain of the colors to produce a color picture but it also performs the function of receiving the picture. A phosphor coating 35 is provided over the interior of the dish shaped color wheel and provides for the retention of a picture projected thereon by the electron gun 21 sufficiently long so that the viewer is able to properly see a complete picture. The color wheel is relatively thin and the coating of phosphor directly on this extremely thin color wheel eliminates almost entirely diffracted light which has heretofore accompanied all television picture tubes. The color wheel of this invention is adapted to receive the picture directly on the several phosphor coated segments thereof in succession in the order that the color impulses are transmitted from the transmission station. The picture is then viewed either directly through a front viewing glass or may be projected onto a screen through a lens 19 whereupon the picture can be enlarged many times and because of the inherently accurate focusing and true optical paths of the picture light there is obtained a projected and considerably enlarged picture without loss of any detail.

The color filter wheel 26 is provided with a magnetically chargeable button 36 and is shown in Figures 1 and 2. The button 36 is fastened to the dish shaped wheel at a position spaced from the center of the wheel which carries the shaft 25 about which the wheel rotates. A second button 37 of non-magnetic material is fastened to the color filter wheel 26 at a position diametrically opposed to the magnetically chargeable button 36 and is employed for the purpose of balancing the color wheel. This completes the various elements that are disposed within the vacuum cathode-ray tube. It should of course be realized that the color filter wheel of this invention may be driven by motor or other means within the tube but in the more desirable location the source of power is located without the tube so that it may be easily serviced.

As best shown in Figure 1 a synchronous motor 38 drives a shaft 39 at a uniform speed. A magnetic clutch 40 is fastened to the motor driven shaft 39 through the medium of the frame structure 41 of the clutch 40.

A plurality of solenoids 42, 43, 44, and 45 are fixed to the rotating frame structure 41 in a circular path therearound. Each of the solenoids 42 to 45 inclusive includes an iron core or the like 46, 47, 48, and 49 respectively projecting from the solenoids toward the cathode-ray tube envelope 11 of this invention. The cores 46, 47, 48 and 49 are positioned closely adjacent the non-magnetic semi-spherical envelope housing 12 and are in alignment with the magnetically chargeable button 36 and also the non-magnetic button 37.

Slip rings 50, 51, 52 and 53 are longitudinally spaced apart and are fixed to but insulated from the motor driven shaft 39 at a position closely adjacent the magnetic clutch 40. A lead wire 54 is adapted to run centrally of the driven shaft 39 for the purpose of joining the slip ring 50 with the solenoid 42. Similarly the wires 55, 56, and 57 join the slip rings 51, 52, and 53 with the solenoids 43, 44, and 45 respectively. All of the lead wires 54 to 57 inclusive run centrally of the shaft 39 and are insulated one from the other. Similarly lead wires 58, 59, 60, and 61 join the solenoids 42, 43, 44, and 45 with the circuit ground which in the present instance is the frame struc-

ture 41 of the magnetic clutch 40. All of the lead wires 54 to 61 inclusive are shown in Figure 3.

As best shown in Figure 1 electrical brushes 62, 63, 64, and 65 engage the slip rings 50, 51, 52, and 53 respectively. An insulating material plate 66 having circumferentially spaced electrical contact points 67, 68, 69, and 70 is provided adjacent the synchronous motor 38 and with the aid of connecting wires 71, 72, 73, and 74 each of the contact points 67, 68, 69, and 70 is joined with the electrical brushes 62, 63, 64, and 65 respectively. As previously stated each of these brushes engages one of the slip rings 50 to 53 inclusive. A rotary switch arm 75 is pivoted at 76 on the plate 66 and is capable of being rotated therearound to engage any one of the circumferentially spaced electrical contact points 67 to 70. A source of electro-motive-force is adapted to be imposed on the electrical circuit of this invention as shown at 77. The circuit is grounded at 78.

In the operation of this invention the cathode-ray tube is actuated by the electron gun 21 receiving transmitted impulses and delivering these impulses by oscillation of the gun across the receiving picture color filter designated by the numeral 26. In the operation of tube in the delivering of purely black and white pictures the white segment 34 of the color wheel 26 is maintained in the position over the field of travel of the electron beam delivered by the electron gun 21 and that portion of the tube immediately behind the picture glass 19. The white or transparent portion of the color wheel or the color filter wheel 26 is provided with the phosphorescent coating 35 as are all of the segments of the color filter wheel. Inasmuch as the segment 34 of the picture receiving wheel 26 is spherical in shape and all the points thereof are equi-distant from the center 22 of the electron discharging gun 21 there will be imposed on that segment a true-non-distorted picture which may be directly viewed or which may be projected through the picture glass or light transmitting lens 19 to a receiving screen. The picture thus projected and enlarged will be a true reproduction of the picture transmitted by reason of the lack of distortion of the picture prior to projection.

In the operation of the device as a color receiving cathode-ray tube the color filter wheel 26 is rotatably driven by reason of the synchronous motor 38 and the magnetic clutch 40. One of the solenoids 42, 43, 44, or 45 is energized with electrical energy whereby the core 46, 47, 48, or 49 of the particular solenoid projects a magnetic field which passes through the non-magnetic shell or envelope 12 and charges the magnetically chargeable button 36 whereupon the motor driven magnetic clutch 40 will drag the color filter wheel 26 around its shaft 25. The shaft 25 lies on the same axis as the motor driven shaft 39 and thus there is a free rotational movement of the color filter wheel 26 by the synchronous motor 38 through the medium of the magnetic clutch 40. The filters of the color filter wheel should be identical with the filters employed in the transmitting of the color impulses and further the receiver filters must be positioned in timed relationship with the transmission of the corresponding color pictures. In other words the red color filter 31 must be in a position to receive the picture as discharged by the electron gun 21 at that moment when the red filtered picture is being transmitted and similarly the green and blue

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filtered pictures must be received by the corresponding filters 32 and 33 of the tube of this invention simultaneously with the transmission of the picture filtered for those particular colors. Thus the color filter wheel must be rotated at a constant speed identical with the speed of rotation of the color filter wheel of the transmitter. The synchronous motor 38 of this invention is designed and constructed to operate at such a constant speed which is identical to the speed of rotation of the color filter wheel employed at the transmitting studios. In order to synchronize the color filters of this receiving tube with the color filters of the transmitter the rotary switch arm 75 is moved to any one of the electrical contact points 67, 68, 69, or 70 to effect an energizing of a different one of the solenoids 42, 43, 44, or 45. Thus it is within the power of the operator of this device to actually effect a stopping of the color filter wheel for the space of one segment or four segments as desired by alternately energizing the several solenoids and thus it is possible and very easy to accomplish a synchronizing of the transmitted color picture with the received color picture. In any event the energized solenoid, which ever one it may be, will send out a magnetic line of force causing a drag on the magnetically chargeable button 36 to pull the color filter wheel 26 around on its shaft 25. It should be understood that the color filter wheel 26 may simply be composed of three segments for the three basic colors red, green and blue or may be divided into six segments or any number of segments in order to accomplish the desired results depending upon the color picture that is being transmitted. It may be desirable to have two series of the three basic colors that is red, green, blue, red, green, and blue. In the color pattern of the filter wheel 26 as shown it is possible to leave the switch arm 75 off of any of the contact points 67 to 70 and thus hold any of the several filter segments in position over the electron gun 21 whereby any single color picture may be provided on the viewing screen whether it is a direct view or projected screen.

The cathode-ray tube of this invention produces an image with a high degree of definition with the result that the image can be projected and enlarged without any blur whatsoever. Further there will be no color or rainbow fringes or overlapping of colors because the color filter constitutes a part of the phosphor coating and this lack of space between the filter and the picture receiving phosphor coating prevents these undesirable occurrences. The apparatus of this invention is relatively small and can be housed in any of the present day conventional television cabinets.

Numerous details of construction may be varied throughout a wide range without departing from the principles disclosed herein and I therefore do not propose limiting the patent granted hereon otherwise than as necessitated by the appended claims.

I claim:

1. A cathode-ray tube comprising an envelope, a picture glass at one end of said envelope, an electron gun at the opposite end of said envelope, means arranged and constructed to receive color transmitted impulses and impart a color picture to said picture glass, said means comprising a plurality of color filters disposed at intervals in timed relation with the transmission of color impulses between said electron gun and said picture glass, said color filters having a phosphores-

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cent coating capable of picture retention, said color filters arranged and constructed as a part of a sphere having its center coincident with said electron gun, each of said color filters comprising a portion of said sphere part corresponding in size to said picture glass.

2. A cathode-ray tube as set forth in claim 1 in which means is provided for rotating said sphere part about an axis spaced from said picture glass to successively present each of the plurality of color filter sphere portions to the scope of said electron gun.

3. A cathode-ray tube comprising an envelope, a picture glass at one end of said envelope, an electron gun at the opposite end of said envelope, means arranged and constructed to receive color transmitted impulses and impart a color picture to said picture glass, said means comprising a plurality of color filters disposed at intervals in timed relation with the transmission of color impulses between said electron gun and said picture glass, said color filters having a phosphorescent coating capable of picture retention, said color filters arranged and constructed as a part of a sphere having its center coincident with said electron gun, each of said color filters comprising a portion of said sphere part corresponding in size to said picture glass, means for rotating said sphere part about an axis spaced from said picture glass to successively present each of the plurality of color filter sphere portions to the scope of said electron gun, said means for rotating said sphere part including a synchronous motor, said synchronous motor positioned outside said cathode-ray tube, magnetic means rotatably driven by said synchronous motor arranged and constructed for imparting drive to said sphere part, said magnetic means comprising a support, a plurality of solenoids equal in number to the plurality of color filters and spaced at regular intervals about a circle on said support, means for individually actuating any one of said plurality of solenoids, and a magnetic button on said sphere part spaced from said rotating axis, whereby the individually actuated solenoids act as clutches between the synchronous motor and said sphere part.

4. A cathode-ray tube comprising a substantially semi-spherically shaped envelope of non-magnetic material, a projection lens at one end of said envelope, an electron gun disposed at substantially the center of said semi-spherically shaped envelope and at the opposite end of said envelope, and a color filter means rotatable within said envelope between said electron gun and said projection lens.

5. A cathode-ray tube as set forth in claim 4 in which the color filter means includes a part of a sphere and is journally carried on an axis spaced from and to one side of said projection lens whereby the color filter means sphere part extends across said projection lens.

6. A cathode-ray tube as set forth in claim 5 in which picture retentive phosphors are affixed to said color filter means sphere part.

7. A cathode-ray tube comprising an envelope, a picture glass at one end of said envelope, an electron gun at the opposite end of said envelope, a wheel journaled for rotation within said tube and having a portion thereof disposed between the electron gun and the picture glass, a plurality of color filters carried by said wheel, means for rotating said wheel comprising a synchronous motor positioned outside said tube, magnetic means rotatably driven by said synchronous

motor arranged and constructed for imparting drive to said wheel, said magnetic means comprising a support, a plurality of solenoids equal in number to the plurality of color filters and spaced at regular intervals about a circle on said support, means for individually actuating any one of said plurality of solenoids, and a magnetic button on said wheel, whereby the individually actuated solenoids act as clutches between the synchronous motor and said wheel.

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