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2,186,570

TELEVISION REPRODUCER

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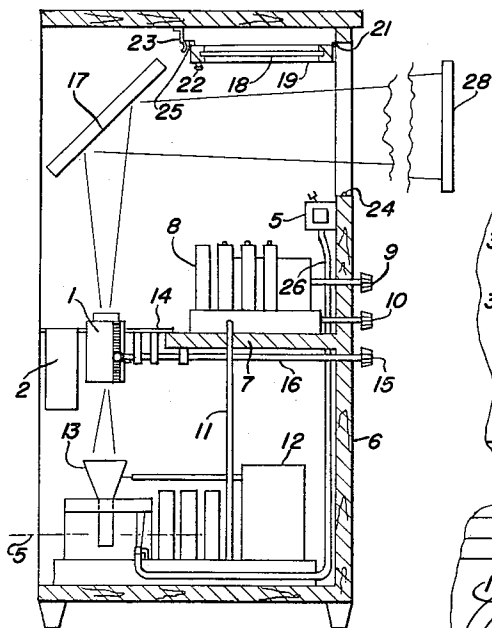


Fig. 1

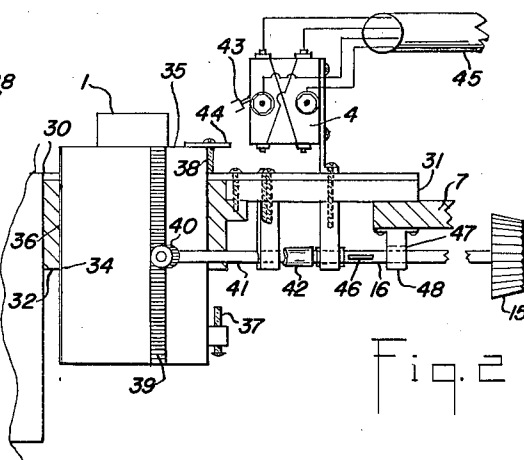


Fig. 2

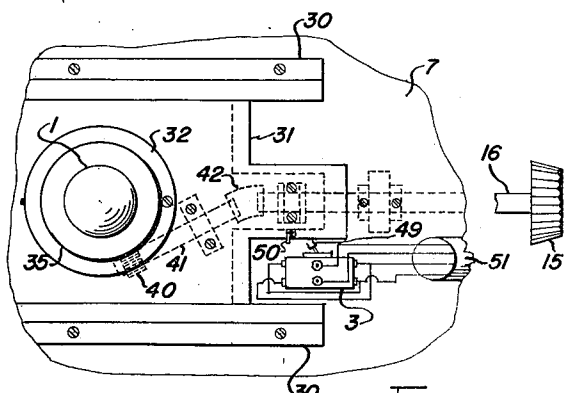


Fig. 3

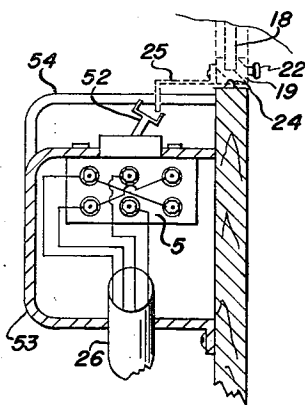


Fig. 4

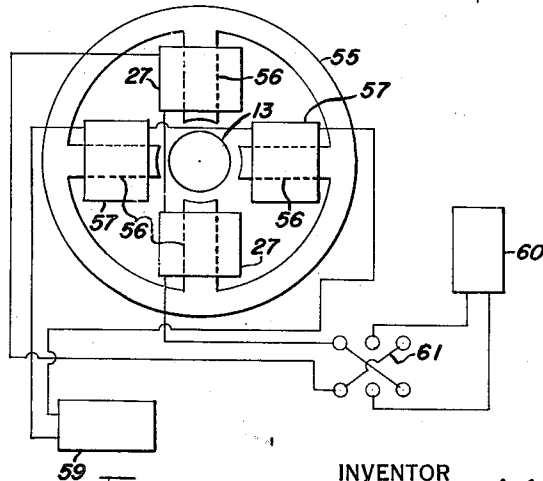


Fig. 5

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TELEVISION REPRODUCER

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9 Claims. (Cl. 178-7.5)

My invention relates to improvements in television apparatus, and, more particularly, to a television receiving apparatus wherein a cathode ray tube or like means is utilized for the production of a relatively small, brilliant image adapted to be projected to a larger, less brilliant image under various conditions of projection.

It is customary in the television art to provide radio receiving means for intercepting broadcast television signals, including a cathode ray tube with associated control circuits whereby, under the influence of rhythmical deflection and intensity control, images can be reproduced in accordance with the intercepted signals.

In certain of such receiving apparatus, relatively large cathode ray tubes have been used whereby an image can be reproduced of sufficient size and brilliancy to have entertainment value when viewed directly in a normally illuminated room.

More recently, cathode ray tubes of a relatively small size, and capable of producing images of relatively high intrinsic brilliancy, have been produced wherefrom images can be projected to sizes larger than those produced upon the earlier "direct-vision" tubes. Any of the newer, "projection-type" cathode ray tubes for example, are applicable in apparatus embodying my invention.

It has been customary in the past to provide television sets containing such "projection-type" cathode ray tubes, these being disposed horizontally within a cabinet provided with a projection lens at or near the front face of the cabinet, whereby images from the tube can be projected to a point external to the cabinet upon a reflection-type screen to produce enlarged images. Alternately, sets have been provided in the past comprising such a cathode ray tube disposed at or near the back of a receiving cabinet, and in cooperation with a ground glass screen on the front face of the cabinet, images have been projected by a projection lens interposed between the tube and the ground-glass transmission-type screen which can be viewed from a point external to the cabinet.

It may be seen, however, that, in the event that it is desired to use a common set for the projection of images at will to either a reflection-type or transmission-type screen, with the set properly adjusted for one condition of projection, the images produced on the other screen will be optically inverted in a horizontal direction so that, for example, printed matter will appear readable from right to left instead of in the con-

ventional direction. Thus, the proper lateral aspect of the image is not maintained in the two conditions of projection. Under existing methods, it would be necessary to resort to expensive and cumbersome optical apparatus to accomplish a reinversion of the image in a lateral direction, and this condition, therefore, becomes a serious difficulty in providing a satisfactory combination receiver.

In view of the desirability of effecting such a combination without the shortcoming here outlined, it is an object of my invention to provide an improved television receiving apparatus adapted to produce television images alternately upon a transmission-type screen mounted in the front surface of the receiving cabinet, or upon a reflection-type screen disposed external to and at a substantial distance from the cabinet of the receiver.

This and other objects will be apparent from the following description of an embodiment of my invention.

In accordance with my invention, I have provided a cabinet containing television image-reproducing means including a cathode ray tube of the projection type, a transmission-type screen upon the face of the cabinet, a reflection-type screen external to the cabinet, means for projecting an image from the cathode ray tube selectively upon either of the screens, and means cooperating with certain components of the apparatus to invert the image on the cathode ray tube in a horizontal direction when one of the screens is removed from service and the other is employed.

For the purpose of illustrating my invention, an embodiment thereof is shown in the drawing, wherein

Figure 1 is a simplified, elevational view, partly in section, of a television receiver constructed and operating in accordance with my invention;

Figure 2 is an enlarged, detail, sectional view taken from Figure 1, showing a modification;

Figure 3 is a plan view of Figure 2 showing another modification;

Figure 4 is an enlarged, detail, fragmentary view taken from Figure 1; and

Figure 5 is an enlarged, detail view looking upwardly on line 5-5 in Figure 1, and showing diagrammatically part of the electrical control circuit.

Referring now to Figure 1, the reference numeral 6 designates a cabinet of any suitable type containing a shelf 7 on which is mounted radio receiving apparatus 8 provided with con-

trois 9 and 10 on the front of the cabinet for adjusting the apparatus to receive selectively any desired transmitted signal.

The output of the receiving apparatus 8 is conducted by a cable 11 to control apparatus 12 including suitable amplifiers, synchronizing devices, power-supply units and the like of any of the various types well-known in the art and adapted to produce on the associated cathode ray tube 13 an image in accordance with the signals received by the receiving apparatus 8.

Preferably in association with the shelf 7, is an optical system 14 comprising a long-focus lens 1 and a short-focus lens 2. A control knob 15 is provided on the front of the cabinet 6 which communicates by means of a shaft 16 with the optical system 14. The lens 1 is focused by rotation of the knob 15. The lenses 1 and 2 operate independently of each other and are movable bodily together, to selectively associate them with the cathode ray tube 13, by moving the control knob 15 in a direction along the axis of the shaft 16.

A mirror 17, preferably of the front-surface type, is supported within the cabinet in the region which is both directly over the cathode ray tube 13 and the operating lens unit, and directly behind a screen 18 provided on the front of the cabinet 6.

The screen 18 consists preferably of a relatively thin sheet of Celluloid of the slow-burning type and roughened on the interior surface by sand-blasting, or by grinding with an abrasive powder or other suitable means. The screen 18 is mounted in a suitable frame 19 which is pivotally supported in the front surface of the cabinet 6 by hinges 21. A knob 22 is provided whereby the frame 19 can be swung from a position coplanar with the front surface of the cabinet 6 to the position shown within the cabinet, in which latter position it is held by a spring catch 23. A ball-and-socket latch 24 is provided to retain the frame 19 in the vertical position co-planar with the front surface of the cabinet when desired.

A double-pole double-throw switch 5 is provided on the front of the cabinet at a point adjacent the frame 19 and is so disposed as to be actuated by an arm 25 upon movement of the frame 19. The switch 5 is connected by means of a four-wire, shielded cable 26 to operate as a polarity-reversing switch between the horizontal-deflecting wave generator in the control apparatus 12 and the electro-magnetic deflecting coils 27 associated with the cathode ray tube 13.

The operation of my invention is as follows. A radiant energy signal is intercepted, amplified and detected by the radio receiving apparatus 8 and the resultant signal is communicated by the cable 11 to the control apparatus 12 where it is further amplified if desired and all or part of the signal is then utilized to control the input to the deflecting coils 27. The signal is, moreover, applied to the control element in the cathode ray tube 13 and, by the cooperation of the intensity and position control applied to the tube 13, an image is reproduced on the tube 13 in accordance with the signals intercepted by the receiving apparatus 8.

In the condition of operation of the apparatus of Figure 1 when the screen 18 is co-planar with the front surface of the cabinet 6 and the lens 1 is associated with the cathode ray tube 13, an image will be projected from the tube 13 by way of the mirror 17 to the screen 18 on the front of

the cabinet 6. Thus, a relatively small image appears upon the screen 18 clearly visible from a point directly before this screen and looking in the direction toward the receiving apparatus, and may have sufficient brilliancy to be clearly visible in a fully illuminated room.

In another condition of operation, with the screen adjusted as described above and the lens 2 associated with the cathode ray tube 13, because of the shorter focus of the lens 2, an image of the image on the cathode ray tube 13 is projected by way of the mirror 17 to the screen 18 which image is appreciably larger than the image created by the lens 1. Thus, there is provided means for producing, on a transmission-type screen on the front of a television cabinet, a plurality of sizes of enlarged images from a cathode ray tube image-reproducer.

For a third condition of operation of my receiver, the screen 18 is moved by means of the knob 22 from the above described position to the non-operating position in the upper part of the cabinet 6. As shown in Figures 1 and 4, upon this movement of the screen 18, the arm 25 operates the switch 5 to reverse the polarity of the deflecting voltage applied to the deflecting coils 27, so that the image reproduced upon the cathode ray tube 13 will be laterally inverted. A reflection-type screen 28 lies substantially upon the horizontal portion of the optical axis of the system comprising the cathode ray tube 13, the lens 1 and the mirror 17, so that in this third condition of operation, an image will be projected by that optical system upon the screen 28. The image produced upon the screen 28 will appear in proper lateral aspect when viewed by an observer from a position between the cabinet 6 and the screen 28, in a direction away from the receiving apparatus. Thus, there is provided automatic means whereby, for example, printing may be maintained easily readable regardless of whether a transmission-type or reflection-type screen is used in my receiving apparatus.

In Figure 2 is shown in somewhat greater detail the optical system with a modified form of control apparatus whereby proper lateral aspect is maintained under various conditions of projection in my invention. Carried on the shelf 7 and guided by rails 30 is a carrying plate 31 on which are mounted the lenses 1 and 2 by means of an adapter 32. The lens 2 is fixedly mounted in the adapter 32 whereby a suitable condition of focus is maintained.

The lens 1 is carried in an opening in the adapter 32 and is held from radial motion by a key 34 on the tube 35 of this lens and in axially slideable relation to a key-way 36 in the adapter 32. An adjustable screw-stop 37 is provided to limit the possible upward travel of the lens 1 in the adapter 32, and a second adjustable screw-stop 38 is provided to limit the possible downward extent of travel. A gear rack 39 provided upon the surface of the lens tube 35 and an associated pinion 40 on a shaft 41 provide for vertical positioning of the lens 1. A universal joint 42 connects the shaft 41 to the shaft 16 for rotation by the latter. Suitable friction may be introduced in any appropriate bearing or by other means to overcome the downward effect of gravity upon the lens 1, but in a preferred embodiment of my invention there is a sufficiently close fit between the lens tube 35 and the adapter 32 to prevent downward motion of the lens 1 except upon the application of a force of rotation to the knob 15.

In the embodiment of my invention as shown in Figure 2, I substitute for the switch 5 in Figures 1 and 4 a double-pole double-throw polarity-reversing switch 4 mounted on the plate 31 and having a toggle 43 adapted to cooperate with an extension 44 attached to the lens tube 35, whereby the switch 4 is operated when the lens 1 is moved a very small distance downward from its uppermost position as determined by the stop 37. A cable 45 is provided to connect the switch 4 between the deflecting-voltage generator in the control apparatus 12 and the deflecting coils 27 in a manner such that deflection is accomplished in one direction with the lens 1 in its uppermost position, whereas in all other positions of this lens deflection is accomplished in the opposite direction with respect to the lateral aspect of the image reproduced.

A key 46 is provided on the shaft 16 and is adapted to cooperate with a key-way 47 in a bearing 48 in a manner adapted to prevent rotational motion of the shaft 16 when it is pulled outward to render the lens 2 coaxial with the cathode ray tube 13.

Thus, in operation, when it is desired to use the transmission-type screen 18 and either of the lenses 1 and 2, it is necessary first to rotate the knob 15 to a position wherein the lens 1 is in focus for this condition, which will be its uppermost position as determined by the stop 37, and the key 46 will then lie in a position wherein it may engage the key-way 47 when an outwardly axial force is applied to the knob 15 if it is desired to use the lens 2. In this manner the correct lateral aspect is ensured when the lens 1 or the lens 2 is to be associated with the projection system because the switch 4 is, under this condition, in the correct position for producing a normal image on the transmission-type screen 18.

Thus, in this embodiment of my invention, there is provided switching means in association with the optical system of my apparatus whereby the proper lateral aspect is maintained in a projected image under the various conditions of operation encountered in my apparatus.

Figure 3 represents a plan view of a portion of an optical system similar to that shown in Figure 2, except that the switching control means have been somewhat modified. The carrying plate 31 is shown, carried on the shelf 7 and guided by the rails 30, and by axial motion applied through the knob 15 and the shaft 16, the lenses 1 and 2 can be positioned with their axes selectively coincident with the axis of the cathode ray tube 13. In this embodiment it is contemplated that the lens 2 will be used only in connection with the transmission-type screen, and the lens 1 be used only in connection with the reflection-type screen, and, consequently, the reversing switch 3, corresponding to and serving the same purpose as the switches 5 and 4 in Figures 1 and 2, may be operated by the influence of the motion which selectively associates those lenses with the cathode ray tube 13. Thus, the switch 3 is mounted on the shelf 7 in a manner such that the toggle 43 will be operated by an extension 50 carried on the plate 31, and the position of that switch will be determined according to which of the lenses 1 and 2 is associated with the cathode ray tube 13. A four-wire cable 51 is provided for the connections between the switch 3 and is connected to the deflection apparatus as in previous embodiments of my invention to effect the ap-

propriate reversal or inversion of the lateral aspect of the image.

A preferred form of the screen-actuated embodiment of my invention is more clearly shown in Figure 4 wherein the arm 25 carried on the frame 19 is adapted to cooperate with the toggle 52 of the switch 5 to operate that switch when the frame 19 is moved to a position within the cabinet. In this embodiment the switch 5 is mounted within a switch box 53. A slotted guard plate 54 is provided whereby only a relatively small portion of the top of the arm 25 is allowed for access to the toggle 52, thereby preventing manual operation of the switch 5.

In Figure 5 is shown in more detail the deflecting system associated with my apparatus, and the circuit connections of the deflecting-energy generators, switching means and deflecting coils are shown. In Figure 5 a magnetic core 55 is provided with four inwardly extending pole pieces 56, two of which carry the vertical deflecting coils 57 and the other two of which carry the horizontal deflecting coils 27. The vertical deflecting coils 57 are permanently connected to the vertical-deflection generator 59, whereas the horizontal deflecting coils 27 are connected to the horizontal-deflection generator 60 through a polarity-reversing switch 61 which corresponds to the switches 3, 4 or 5, and is adapted to selectively reverse the polarity with which the output of the generator 60 is applied to the coils 27 in series. Thus, the vertical image aspect is permanently fixed by the permanent connection between the generator 59 and the coils 57, but the lateral aspect of the reproduced image is selectively changeable by means of the switch 61 interposed between the generator 60 and the coils 27 in series.

It should be clearly understood that various modifications are possible within the scope of my invention. For example, in the embodiment of Figure 1, the switch 5 may be mounted at or about the hinges 21 of the frame 19 and operated by the upper member of the frame 19. Similarly, in the embodiments shown in Figures 2 and 3, various mechanical configurations may be employed to accomplish the appropriate reversal or inversion in accordance with my invention.

Moreover, although I have shown three distinct modes of operation of my invention, namely, a small image projected on a transmission screen, a large image projected on a transmission screen, a large image projected on a transmission screen, it should be understood that more or fewer conditions of operation are possible within the scope of my invention and that suitable lens turrets may be employed to make possible more conditions of operation just as one lens may be eliminated in those embodiments shown when fewer conditions of operation are desired.

I claim as my invention:

1. In television receiving apparatus, an image-reproducer of the projection type and being in the form of a cathode ray tube, means for deflecting the cathode ray, means for reversing the lateral aspect of the image on said image-reproducer, and a single control means for controlling said reversing means and simultaneously adapting said apparatus selectively for projection of the image such that it may be viewed in proper lateral aspect in a direction either toward or away from said apparatus.

2. In television receiving apparatus, an image- 75

reproducer of the projection type and being in the form of a cathode ray tube, means for deflecting the cathode ray, switch means for reversing the lateral aspect of the image on said image-reproducer, and movable means for adapting said apparatus selectively for projection of the image such that it may be viewed in a direction either toward or away from said apparatus, said switch means being disposed for actuation by said movable means upon movement of the latter for the purpose set forth.

3. In television receiving apparatus, an image-reproducer of the projection type, means for adapting said apparatus selectively for projection of the image such that it may be viewed in a direction either toward or away from said apparatus, and means for inverting the lateral aspect of the projected image and actuated by said first-named means upon operation of the latter for the purpose set forth.

4. In television receiving apparatus, an image-reproducer of the projection type and being in the form of a cathode ray tube, means for deflecting the cathode ray, switch means for reversing the polarity of said ray-deflecting means to reverse the lateral aspect of the image on said image-reproducer, and means in the form of a movable screen for adapting said apparatus selectively for projection of the image such that it may be viewed in a direction either toward or away from said apparatus, said switch means being disposed for actuation by said screen upon movement of the latter for the purpose set forth.

5. In television receiving apparatus, an image-reproducer of the projection type, means in the form of a movable screen for adapting said apparatus selectively for projection of the image such that it may be viewed in a direction either toward or away from said apparatus, and means for inverting the lateral aspect of the projected image and actuated by said screen upon movement of the latter for the purpose set forth.

6. In television receiving apparatus, an image-reproducer of the projection type and being in the form of a cathode ray tube, means for de-

flecting the cathode ray, switch means for reversing the polarity of said ray-deflecting means to reverse the lateral aspect of the image on said image-reproducer, and means including an adjustable lens for adapting said apparatus selectively for projection of the image such that it may be viewed in a direction either toward or away from said apparatus, said switch means being disposed for actuation by said lens upon adjustment of the latter for the purpose set forth.

7. In television receiving apparatus, an image-reproducer of the projection type, means including an adjustable lens for adapting said apparatus selectively for projection of the image such that it may be viewed in a direction either toward or away from said apparatus, and means for inverting the lateral aspect of the projected image and actuated by said lens upon adjustment of the latter for the purpose set forth.

8. In television receiving apparatus, an image-reproducer of the projection type and being in the form of a cathode ray tube, means for deflecting the cathode ray, switch means for reversing the polarity of said ray-deflecting means to reverse the lateral aspect of the image on said image-reproducer, and means including lens units operating independently of each other and movable bodily together to adapt said apparatus selectively for projection of the image such that it may be viewed in a direction either toward or away from said apparatus, said switch means being disposed for actuation upon movement of said lens units for the purpose set forth.

9. In television receiving apparatus, an image-reproducer of the projection type, means including lens units operating independently of each other and movable bodily together to adapt said apparatus selectively for projection of the image such that it may be viewed in a direction either toward or away from said apparatus, and means for inverting the lateral aspect of the projected image and actuated upon movement of said lens units for the purpose set forth.

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