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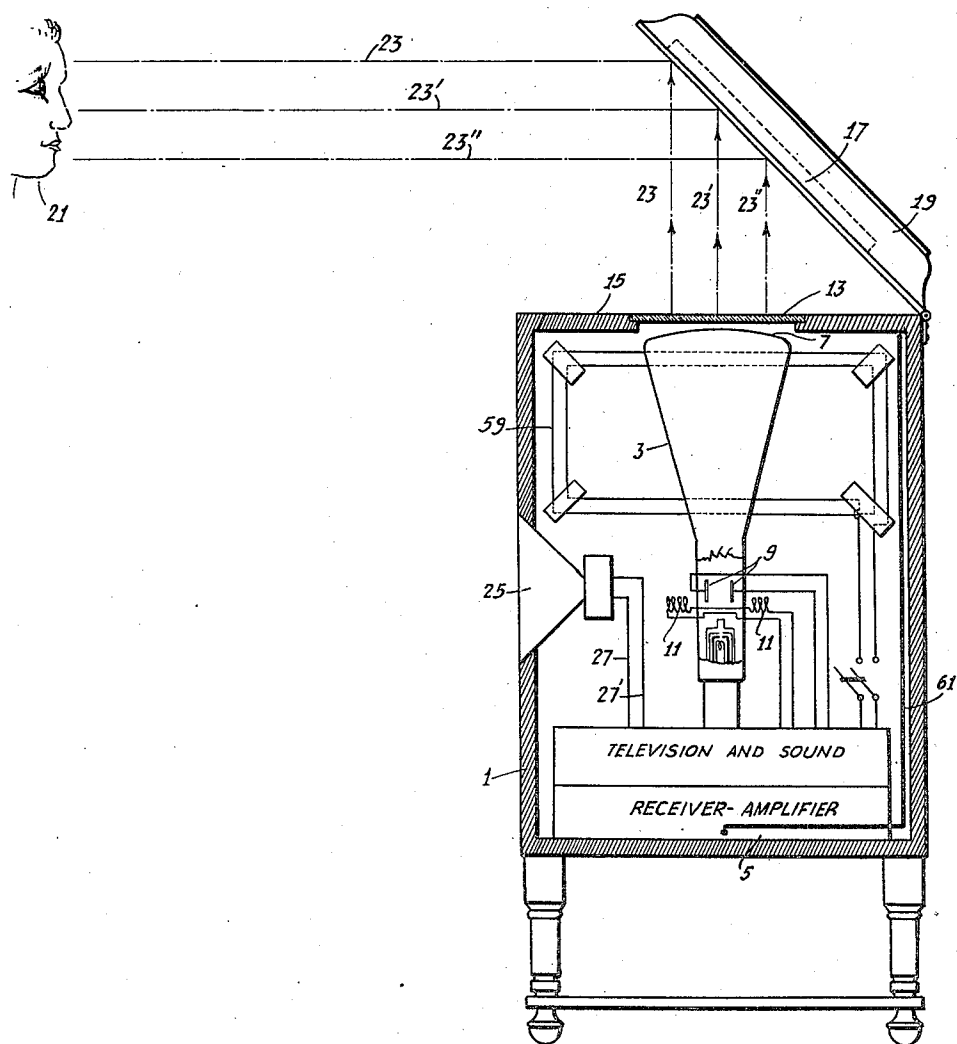
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TELEVISION APPARATUS

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Fig. 1



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TELEVISION APPARATUS

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The present invention relates to television devices and is directed particularly to a novel method and means by which television images may be viewed through a wide angle so that the observation of the received image is not limited to one or a few individuals but may be seen by all persons located within a reasonable distance of the receiving device.

According to the prior art, so far as applicant is aware, it has been customary in constructing viewing devices for television images to provide what has become known as a peep-hole device, that is, there is a small optical element, such as a lens, located immediately in front of the scanning device through which a single person may view the varying intensities of light as controlled in position by the scanning element or, where an enlarged image is to be viewed, arrangements have been provided whereby a large lens may be placed immediately in front of the scanning elements so that several people located immediately in front of the lens may view a somewhat enlarged image.

These systems, however, have many disadvantages. The peep-hole device is so small that only one or two people may view the electro-optical image produced by the scanning device at the same time. The second system is objectionable because of the fact that only those people who are located immediately in front of the large viewing lens may see the image since those people positioned within a relatively wide angle of the scanning device would see either no image at all or a distorted image.

By the present invention these difficulties have been overcome and it is possible for a number of people to view and appreciate the television image at the same time. Therefore, as a preliminary object of my invention I have sought to overcome the difficulties of the prior art and to provide a television receiving device which while being of compact size and suitable for home installation may nevertheless be such as to permit a great many people to view the received image and thus increase the commercial importance of television.

It is a great disadvantage from a commercial

viewpoint to attempt to market a television receiver which can be viewed by only a few people.

As a further object and advantage of my invention I have sought to modify further the receiving device above outlined so as to permit it to be used in a two-way television system, that is, to so modify the device that it may transmit as well as receive the images. By such an arrangement it is possible for a number of persons located at remotely separated points to see each other at the same time that they are carrying on a voice conversation. This two-way conversation may be accomplished by either wire or radio transmission of both the voice and television signals.

According to a preferred form of my invention I have provided a cabinet somewhat similar to the well known phonograph cabinet, known in the art as the "Victrola", and in combination with this I have mounted television transmitting and receiving equipment. In the lid of the cabinet I have made provision for what I have termed a viewing screen. This screen may function in the case of a two-way television system also as a transmitting screen in that as will hereinafter become apparent different sections of the screen serve as image reconstructing devices for the receiver and as image producing devices for the transmitter.

A further object and advantage of my invention is to so construct and arrange the system that the two-way television equipment may, where desired, be converted into a monitoring system in order that a person viewing the screen may at his option view his own image at the same time that he is viewing the image of a person or object remotely spaced from him. In this manner it is possible to reach a fair conclusion as to whether or not the transmission will be satisfactory and when transmitting conditions are adjusted by observation of the monitor image the equipment may be switched from a monitoring position to a transmitting position after which two-way sight and voice conversation will be established.

Other objects and advantages of the inven-

tion are to construct and provide a system for transmitting and receiving television images which presents a good appearance in the home, which will be compact, pleasing to look upon and efficient in its use.

Still other objects and further advantages will become apparent and at once suggest themselves to persons skilled in the art to which the invention relates by a consideration of the following specification and claims in connection with the accompanying drawings, illustrating conventionally several embodiments which my invention may assume.

By the drawings,

Fig. 1 illustrates a sectional view through a receiving device constructed in accordance with the principles of my invention;

Fig. 2 illustrates a modification of the showing of Fig. 1 wherein the system is adapted to both transmitting and receiving voice and television signals; and,

Fig. 3 illustrates a front view of the receiving and transmitting device with a viewing screen raised to the position at which it will be observed by the person viewing the television transmission and so positioned that his image may be electro-optically transmitted to a remote point.

To refer now specifically to the drawings forming a part of my present disclosure, I have provided a cabinet 1 within which is positioned an image reconstructing tube 3 of the general type shown and described for example in my copending application Serial #483,309, filed September 25, 1930. In accordance with the disclosure set forth in the aforesaid copending application, signals received in the receiver amplifying device 5 are transmitted to the image reconstructing tube 3 and produce upon the fluorescent end wall 7 thereof varying intensities of light which are controlled in accordance with received signalling impulses. These controlled light intensities are suitably positioned upon the fluorescent end wall 7 of the tube 3 by means of electro-static deflecting plates 9 or electromagnetic coils (not shown) for controlling the position of the cathode ray stream in a position from left to right of the tube as viewed in Fig. 1 and by means of electromagnetic deflecting coils 11 or electrostatic plates (not shown) controlling the position of the produced light spot in a direction at right angles to the path of deflection produced by the static deflecting plates.

Detailed description of the means by which the intensity of the cathode ray stream striking the end wall 7 of the tube 3 is not here given since it is set forth fully in the aforesaid copending application.

As the fluorescent end wall 7 of the tube 3 glows, becomes luminous or emits light of an intensity varying in accordance with the variation in intensity of received signalling impulses, light of proportionately variable in-

tensity is transmitted through the transparent plate 13 carried in the upper wall 15 of the cabinet 1 to a reflecting surface 17. The reflector 17 is preferably mounted in the lid 19 of the cabinet.

In order to permit an observer 21 to view the electro-optically reconstructed image on the reflecting screen 17, the lid 19 of the cabinet should be raised to a position approximately 45 degrees to horizontal as has been illustrated by Fig. 1. Thus, the light spots produced upon the end wall 7 of the tube 3 are projected along a series of paths, 23, 23', 23'', etc., so that they may be viewed by the observer 21.

Since a sound accompaniment for the television picture is usually desirable because it permits a more pleasing entertainment, the accompanying system is so arranged that sound reception may accompany the optical reproduction. To view an electro-optically reconstructed television image in synchronism with related sound provision has also been made for the reception of accompanying and related sound impressions. In order to accomplish this objective, I have mounted within the front wall of the cabinet 1 a sound reproducing element 25 which is suitably connected by a pair of conductors 27, 27' to the television and sound receiver amplifier 5.

The receiver amplifier 5 may be so designed that there are two receiving portions therein, one portion receiving energy from a radio receiver tuned to the frequency of the television transmitter and feeding the receiving tube 3; the other portion receiving energy from a receiver tuned to the frequency of the transmitter of the sound channel used in connection with the above referred to sight channel and feeding the loud speaker 25. To provide synchronized sight and sound transmission separate carrier waves may be utilized or what is commonly termed "multiple modulation" may be employed. In the latter case a single carrier wave may be modulated by the television signal and also by a second carrier frequency, said second carrier frequency being modulated by the voice. When this type of transmission is used only one receiving antenna is necessary. Also, it is within the scope of my invention to receive combined sound, television and synchronizing signals in accordance with the disclosure of U. S. Patent #1,770,205, or copending application of Julius Weinberger, Theodore A. Smith and George Rodwin, Serial No. 349,834, filed March 25, 1929.

Referring now to the possibility of modifying the arrangements shown and described in connection with Fig. 1 so as to provide a two-way television system, I have shown one form which my invention may assume for carrying out these aims and objects by the arrangements of Figs. 2 and 3. As this mod-

ification is illustrated by Fig. 2, the receiving tube 3 provided with a fluorescent screen 7, which was shown and described in connection with Fig. 1, has been moved to the rear of the upper support surface 15 so that the varying intensity light spots produced upon the screen 7 and directed through the glass plate 13 toward the mirror surface 17 upon which the observer views the screen will permit sufficient space in which to mount a transmitting device within the same cabinet. In order to transmit images I have provided a transmitting tube 27 of the cathode ray type, which, for example, may be of the general type disclosed and claimed in my copending application Serial #683,337, filed December 27, 1923 or which for example may be of the general type disclosed and claimed in my copending application Serial #468,610, filed July 17, 1930.

According to the disclosures in the aforesaid applications the transmission is accomplished by a cathode ray transmitting tube wherein there is a photoelectric plate formed of a series of globules of photoelectric material which are carried upon an insulating plate, for example aluminum oxide, and immediately behind this insulating plate is a conductor plate covering the entire area of the insulating plate. In front of the photoelectric globules is a grid-like structure serving as an electron collecting or anode element. Upon traversing from the rear, the photoelectric plate with a cathode ray stream controlled as to position by suitable deflecting plates or coils influenced by synchronizing signals of appropriate frequency, the insulating layer of aluminum oxide is broken down and the various globules of photoelectric material are caused to discharge their stored electric charges so as to influence sequentially the associated amplifying circuit.

Thus, an observer, indicated as 21, may view upon the mirror surface 17 an image of a person or object located at a remote point as reconstructed by the receiving tube 3 and simultaneously the image of the person viewing the screen 17 is directed from a second portion of the mirror surface 17 through the objective 29 to the photo-active layer 31 of the transmitting tube 27. In order to focus the image projected upon the photo-active layer 31 the objective lens 29 is shown as being adjustable in and out of the cabinet. This, for example, may be accomplished by means of a small hand-wheel 33 carried upon a spindle or shaft 35 arranged to turn the small pinion 37 which meshes with the rack 39 to control the focus point of the objective lens 29 and thus the image upon the light sensitive surface 31. In order to screen the objective lens 29 from light other than that representative of the subject whose image is to be transmitted I have provided a

collapsible and bellows-like screening element 41 which surrounds the objective 29 and which upon closure of the lid 19 of the cabinet 1 will be folded immediately below the lid by reason of the bellows-like construction. To transmit any voice currents originating from the subject, an image of which is to be transmitted, I have provided a microphone 43 arranged immediately in front of the cabinet 1. The microphone is connected with an amplifying device 45 in any well known manner. The transmitting tube 27 also is suitably connected with the transmitter amplifying device by means of conductors generally designated as 47. The output of the transmitter amplifier device may be connected through conductors 49 with any appropriate form of transmitting equipment.

So that it may be possible to utilize the system herein above disclosed for either monitoring purposes or for two-way television, I have provided a switching device 51 arranged to connect when thrown in one position the transmitter tube with external transmitting circuits and when thrown in the other position to connect with the receiver tube through suitable amplifiers so as to monitor the image signals representing the subject positioned in front of the viewing screens 17. Thus, when the switch 51 is located upon the upper set of contacts 53 the system functions as a two-way transmitter and when the switch 51 is thrown upon the lower set of contacts 55 the system functions as a monitoring device. The various connections from the receiving and transmitting amplifiers to tubes 3 and 27 and to sound translating elements 25 and 43 are not shown in Fig. 2 because of the desire to simplify the drawing.

By suitable adjustment of the control knobs 57 and 59 the subject located in front of the viewing screen 17 may control at will the character of transmission and also the character of reception, that is, the degree of amplification in the transmitting amplifier may be controlled, for example, by means of the knob 57 and the intensity of the reproduced image may be controlled in the receiving tube 3 by means of the knob 59.

Monitoring of the television signals prior to the time of transmission, during transmission, or during portion of the transmission is important because of the desirability of ascertaining whether or not all the conditions of pick-up are perfectly accomplished. This means that there will be a certainty that there is sufficient illumination; that there will be perfect framing of the object of which an image is being transmitted; and that the optical focusing is properly accomplished.

A common power supply unit is provided for all units of the assembly. This arrangement has been found to be very satisfactory and serves to cheapen the cost of manufacturing to a considerable extent.

In the event that it is desired to reduce the size of the received image while increasing the definition on the viewing reflecting surface 17, for example as in Fig. 1, it may be found convenient to alter the contour of the surface 17 from the planar surface shown by Fig. 1 and make it convexly curved or where an enlarged image of less definition is desired it may be found appropriate to construct the screen as a convexly curved long focus reflecting element. However, for general usage it is more suitable to construct the screen or reflecting mirror-like surface 17 as a flat surface in the manner illustrated.

The above description has made reference to a glass plate 13 contained within the upper section 15 of the cabinet 1 but it should be understood that this is not essential. The arrangement is however herein illustrated and described, since it has been found convenient to utilize such a glass or equivalent plate as a means by which the end wall 7 of the tube 3 may be protected.

For the purpose of making this home television receiver self-contained and convenient to install, I provide an antenna structure within the cabinet. The antenna can be of the well-known coil type shown in Figure 1 at 59. For installations where a sound channel is used with the sight channel two such coil antennae are supplied, each connected in the usual manner to its respective radio receiver mentioned above.

When ultra-high frequencies of the order of 60,000 kilocycles are used for television broadcast purposes the two antennae required (one for sight and one for sound) may then be of the so-called "doublet" type, the simplest form of which is a conducting rod, the total length of which is equal to one-half wave length. This conductor has connected to it a short transmission line which terminates at the radio receiver. Such an antenna can be bent so that it can be placed in the cabinet in any suitable location. This is shown in Figure 1 at 61.

While it will become apparent that many and varied modifications of the invention not here specifically illustrated or described may be made, I nevertheless believe myself to be entitled to make and use any and all of these obvious modifications provided they fall fairly within the spirit and scope of the invention as set forth and defined by the hereinafter appended claims.

Having now described my invention, what I claim and desire to secure by Letters Patent is the following:

1. In a radio receiving device for reconstructing electrooptical images, a cabinet, a cover for said cabinet, an image reconstructing device contained within said cabinet, and an image reflecting member supported upon the inner surface of said cabinet cover and movable by opening said cover to a position

from which the image produced on said image reconstructing device as reflected from said member may be viewed.

2. In a radio receiving device for reconstructing electrooptical images, a cabinet having housed within one portion thereof an image reconstructing device, a hinged cover for said cabinet, a member supported within said cover for changing the path of the light rays emanating from said image reconstructing device, signal receiving means contained within said cabinet, and an amplifying system contained within said cabinet and responsive to signals received on said receiving means for amplifying said signals for the control of said image reconstructing device, whereby the reconstructed electro-optical images are observable upon said screen.

3. In a television receiving device, an electron tube for reconstructing in accordance with received signalling oscillations an electrooptical image of a subject, a cabinet within which said electron device is supported, a cover for said cabinet, a reflecting surface mounted in said cover and adapted to be positioned at a suitable angle with respect to the plane of said electron device whereby images produced by said electron device may be observed on said reflecting device, a sound reproducing device carried within said cabinet, and receiving means adapted to receive signals corresponding to both electrooptical image points and related sounds so as to control both the electrooptical image production and sound production.

4. In a television receiving device, an electron tube for reconstructing, in accordance with received signalling oscillations, an electrooptical image of a subject, a cabinet within which said electron device is supported, a cover for said cabinet, a reflecting surface mounted in said cover and adapted to be positioned at a suitable angle with respect to the plane of said electron device whereby images produced by said electron device may be observed on said reflecting device, means carried upon said cabinet for controlling the quality and intensity of said received image, a sound reproducing device carried within said cabinet, and receiving means adapted to receive signals corresponding to both electrooptical image points and related sounds.

5. In a two-way television system, a cabinet, an electronic image reproducing device supported in one portion of said cabinet, an electronic image transmitting device located in a second portion of said cabinet and along an axial path substantially parallel to said image reproducing device, a plurality of sound translating elements for converting sound signals into electrical impulses and for converting electrical impulses into sound impulses, transmitting and receiving amplifiers supported within said cabinet and coordinated respectively with said transmitting and

sound and image reconstructing devices, and a reflecting screen forming a portion of said cabinet for reflecting and projecting the image produced on said image reproducing device away from said cabinet and directing the image of a subject positioned in the viewing plane of said reflecting device inwardly of said cabinet toward said transmitting device whereby two-way communication of voice signals and two-way communication of electrooptical signals may be maintained.

6. In a two-way television system, a cabinet, an electronic image reproducing device supported in one portion of said cabinet, an electronic image transmitting device located in a second portion of said cabinet and along an axial path substantially parallel to said image reproducing device, a plurality of sound translating elements for converting sound signals into electrical impulses and for converting electrical impulses into sound impulses, transmitting and receiving amplifiers supported within said cabinet and coordinated respectively with said sound and image transmitting devices and said image reconstructing and sound reproducing devices, a reflecting screen forming a portion of said cabinet for reflecting and projecting the image produced on said image reproducing device away from said cabinet and directing the image of a subject positioned in the viewing plane of said reflecting device inwardly of said cabinet toward said transmitting device, and an adjustable optical system for focusing the image to be transmitted as reflected from said reflecting device upon the said transmitting element.

7. In a two-way television system, a cabinet, an electronic image reproducing device supported in one portion of said cabinet, an electronic image transmitting device located in a second portion of said cabinet and along an axial path substantially parallel to said image reproducing device, a plurality of sound translating elements for converting sound signals into electrical impulses and for converting electrical impulses into sound impulses, transmitting and receiving amplifiers supported within said cabinet and coordinated respectively with said transmitting and reproducing devices, a hinged cover for said cabinet, a reflecting screen forming the inner portion of said cabinet cover for reflecting and projecting the image produced on said image reproducing device away from said cabinet and directing the image of a subject positioned in the viewing plane of said reflecting device inwardly of said cabinet toward said transmitting device, and means cooperating with said transmitting and receiving amplifier system for switching the control of the transmitter amplifier and receiver amplifier system so as to convert the two-way system of transmitting

and receiving electrooptical images into a monitoring system whereby the reconstructed image is a likeness of the subject, an image of which is to be transmitted.

8. In a two-way television system, a cabinet, an electronic image reproducing device supported in one portion of said cabinet, an electronic image transmitting device located in a second portion of said cabinet and along an axial path substantially parallel to said image reproducing device, a plurality of sound translating elements for converting sound signals into electrical impulses and for converting electrical impulses into sound impulses, transmitting and receiving amplifiers supported within said cabinet and coordinated respectively with said transmitting and image reconstructing devices, a self-contained antenna system within said cabinet for connection with said amplifiers, a hinged cover portion for said cabinet, a reflecting screen forming the inner portion of said cabinet cover for reflecting and projecting the image produced on said image reproducing device away from said cabinet and directing the image of a subject positioned in the viewing plane of said reflecting device inwardly of said cabinet toward said transmitting device, switching means cooperating with said transmitting and receiving amplifier system for switching the control of the transmitter amplifier and receiver amplifier system so as to convert the two-way system of transmitting and receiving electrooptical images into a monitoring system, and means for adjusting the quality of transmission while monitoring the transmitted image so that the reconstructed image is a true likeness of the subject, an image of which is to be transmitted.

9. A radio receiving device comprising a cabinet, a hinged cover for said cabinet, a cathode ray tube contained within said cabinet, means contained within said cabinet for controlling said cathode ray tube to cause the production of electrooptical images upon the end wall thereof, a transparent plate supported within said cabinet adjacent the end wall of said tube for protecting the tube, and a reflecting surface supported upon the inner surface of said cover for providing, when said lid is raised, a wide angle viewing surface for the electro-optical image produced in said tube.

10. A television receiver comprising a cabinet, a receiving system including a self-contained antenna system and an amplifier supported within said cabinet, a cover for said cabinet, an image reconstructing device contained within said cabinet, said image reconstructing device being responsive to image signals received upon said antenna system and amplified by said amplifier, and an image reflecting member supported upon

the inner surface of said cabinet cover and movable by opening said cover to a position from which the image produced by the amplified signals upon said image reconstructing
5 device as reflected from said member may be viewed.

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