July 30, 1946. R. V. BESHGETOOR 2,404,943

VIEWING DEVICE

Filed Oct. 18, 1944

Fig. 1.

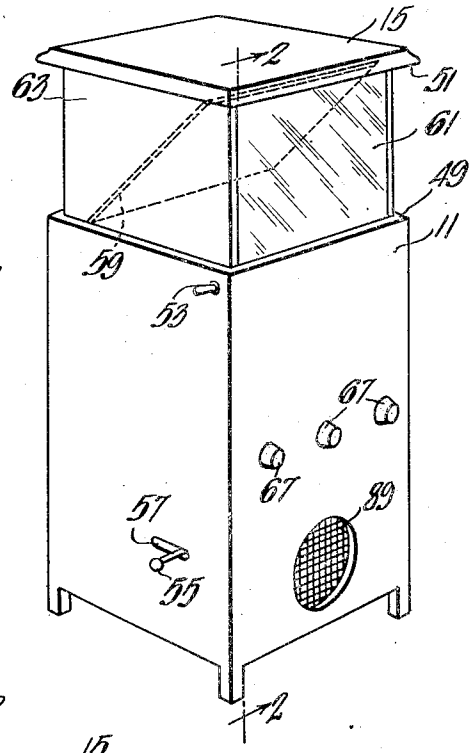


Fig. 2.

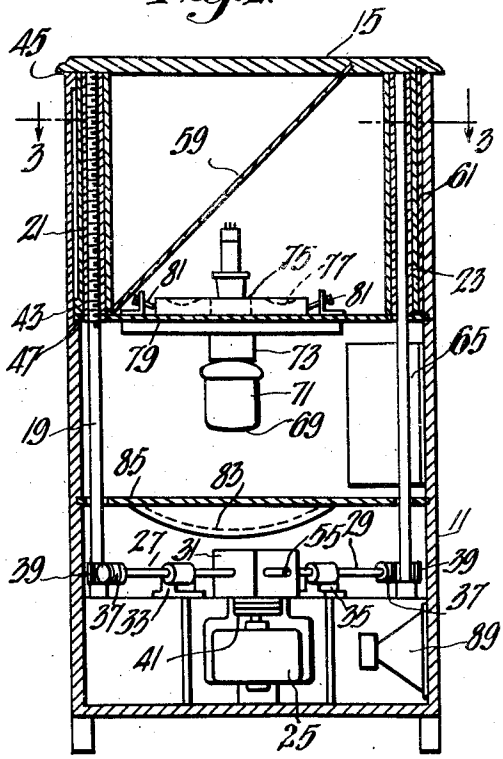
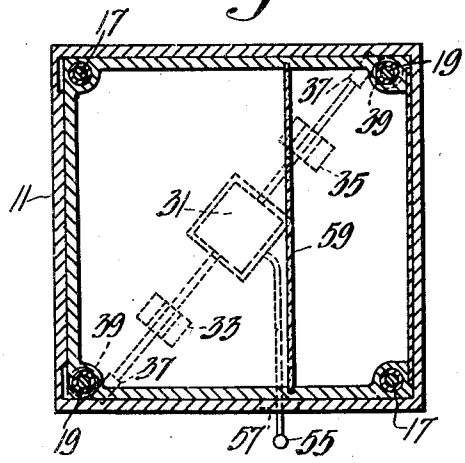


Fig. 3.



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Patented July 30, 1946 2,404,943

UNITED STATES PATENT OFFICE

2,404,943

VIEWING DEVICE

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Application October 18, 1944, Serial No. 559,201

2 Claims. (Cl. 88—24)

1

This invention is related to television receivers or the like and to the cabinets and viewing arrangements for use in connection therewith. Broadly speaking, the apparatus herein to be disclosed provides a cabinet construction for a television receiver system of the so-called projection type wherein a cathode ray tube is utilized to develop the television image and in which, in combination with this tube, suitable image enlarging optical systems are utilized in the development of the final enlarged image.

In accordance with a preferred form of the invention, a cabinet structure is provided wherein there is included an arrangement by which a reflector and viewing screen are positioned in fixed relationship one with regard to the other and the complete viewing unit is positioned within a movable section of the cabinet where the movable section is arranged for adjustment up and down relative to the receiver proper in order to provide for viewing. To this end, the receiver cabinet includes provisions for maintaining the upper portion of the cabinet horizontal at all times so that the receiver top may be appropriately covered and also may support flowers, vases, pictures, various objects or the like to make it more attractive in its appearance and at the same time, permit the objects to remain on the receiver during times when images are being viewed. This will then overcome many objections heretofore advanced that television cabinets of the movable top variety were unsightly, by making it possible to use the cabinet to support various items and thus improve the general appearance and still avoid the nuisance of removing and replacing the objects.

In the past, receiver cabinets have been utilized wherein image enlarging apparatus has been incorporated as a part of the receiver, and provisions have been made for viewing the resultant television image on an opalescent viewing surface (formed from a plastic or otherwise) or upon a ground glass surface or the like placed in the front of the cabinet. However, due to the fact that arrangements of this general character must necessarily have considerable depth in order to permit the inclusion therein of the optical system, these arrangements generally have not gone into wide use.

Other arrangements which have been proposed in the prior art suggest a vertically-positioned image producing tube in an optical system arranged to direct a light image vertically and then, by virtue of the arrangement of the cabinet structure itself and the inclusion therein of a reflecting element positioned in the cabinet lid, the image is viewed upon opening the cabinet and so positioning the pivoted cabinet lid and its associated reflector, the produced image comes within the field of view of one or more observers. Provisions have also been made in prior art arrangements for providing a cabinet wherein the planar reflecting element for use in connection with the optical system is fixed in position but, generally speaking, cabinets of this variety have not gone into extensive usage because of the fact that a cabinet must, of necessity, and due to the inclusion of the optical elements involved, become unduly high and, therefore, not sufficiently pleasing in appearance.

2

Accordingly, to overcome these objections of the prior art, this invention provides a cabinet wherein the upper portion thereof in which there is positioned the planar reflecting element and the viewing screen is constructed in such a form that by means of elevator action, the upper section of the cabinet may be raised for viewing the produced television images and subsequently lowered to a position where the viewing screen and its associated light reflector are telescoped into the cabinet proper. Further, the present invention makes provisions for the combined reception of sight and sound signals and at the same time, provides a more suitable form of optical system and arrangement than is found in apparatus which has now gone into a general use. Further than this, the arrangement herein to be disclosed provides an extremely simple construction and arrangement and yet, one in which all of the necessary elements are housed within a minimum space. In addition, the structure provided by the present invention offers the advantage of a structure which is shallower from front to rear than that normally utilized for front viewing. This is because of the fact that a cabinet having a mirror or reflecting surface on the inner face of the lid which is hinged at its rear edge must be raised to view the image. This means that the lid when positioned at approximately a 45° angle for viewing must be the hypotenuse of an isoceles triangle and then about 40% longer than the sides, or, stated differently, such a lid would require a deeper cabinet in order to permit closure of the lid than when the mirror is fixed and the complete arrangement is lowered.

Accordingly, it becomes an object of this invention to provide a television receiver cabinet for a relatively small surface area so that it will be cheap to process or mold. At the same time, it becomes an object of this invention to provide

a television receiver cabinet in which reflected images may be viewed and which cabinet has its top section so supported that it will at all times remain horizontal so that flowers, decorations, pictures, attractive covering or the like may be positioned on top of the cabinet without the necessity of removal to view television images and later replacement for reasons of appearance. At the same time, it is an object of this invention to provide a television receiver cabinet in which the advantages of a fixed planar reflecting mirror and screen arrangements held rigidly in place with respect to each other may be had without resorting to unusually tall cabinet constructions.

Other objects and advantages of the invention will, of course, naturally suggest themselves to those skilled in the art to which the invention is related, it being understood that also included in these objects not heretofore numerated are those of providing a simple form of cabinet construction and a form which is efficient even though extremely cheap and easy to manufacture.

The invention, in one of its preferred forms, is conventionally represented by the accompanying drawing, wherein, Fig. 1 is a view of a television receiver cabinet employing novel features of the invention, with the cabinet viewing section being shown in elevated position; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, with the movable top section of the cabinet telescoped within the main body thereof; and Fig. 3 is a section taken on the line 3—3 of Fig. 2 looking in the direction of the arrows for the purpose of showing the control mechanism for raising and lowering the top section of the cabinet, with it being understood that for reasons of simplicity, portions of the apparatus included within the cabinet proper above the elevating control mechanism have been omitted.

Now, referring to the drawing, a main cabinet body 11 is arranged to house the complete television receiver apparatus, as well as the sound receiver. Such apparatus is not shown herein in detail since it is well known and has been exemplified in many prior art arrangements. Essentially, the receiver comprises apparatus for receiving amplifying and detecting signalling energy and converting the signalling energy into either or both sight video and sound audio signals, with the sight signals being converted into electro-optical image in well known manner, and which are produced for viewing upon a target element of a cathode ray image producing tube, and the sound signals become audible by the activation thereby of a suitable sound reproducing unit. These general instrumentalities have been represented, for example, in the prior art by U. S. Patent No. 1,870,702, granted to V. K. Zworykin on August 9, 1932, and by U. S. Patent No. 2,273,801, granted to D. O. Landis on February 17, 1942. In the Landis patent, there is also shown an optical system of the same general type as that included within the cabinet construction herein to be referred to in more detail.

In the disclosed arrangement of the present invention, the cabinet 11 has included as a part thereof a top section 15 which is arranged to telescope within the cabinet body 11 proper. For this purpose, there is positioned to support the top section 15 a pair of vertically positioned guide rod elements 17 and a pair of threaded support spindle members 19. The guide rod elements 17 serve to guide and position the movable section of the cabinet as it is being raised and lowered by means of the threaded spindles 19 which are provided at the upper end with threads 21 arranged to fit within the threaded bushing members 23. The threaded spindles 19 thus serve as guiding and positioning elements and depending upon the direction in which the threaded spindles 19 are turned depends whether the movable cabinet section 15 is raised or lowered.

An elevator control mechanism for raising and lowering the movable cabinet section is provided by way of the drive motor 25 which is suitably positioned within the cabinet and in the base section thereof. The motor 25 serves to drive the shafts 27 and 29, and thus the threaded spindles 19, through the medium of a gear box 31. The details of the gear box have not been shown since these are generally well understood in the art. The shafts 27 and 29 are supported outwardly from the gear box by means of bearing members 33 and 35 and contain and support at their ends the worm elements 37 which are arranged to turn the pinions 39 which are secured in any desired manner to the drive spindles 19. The motor 25 which drives the spindles 27 and 29 through the gear box 39, is connected to the gear box by way of a suitable slip clutch unit 41 so that the elevated mechanism, when reaching an extreme position beyond which it cannot be moved, will cause slippage in the clutch and prevent thereby damaging the equipment. Further, this conveniently limits the motion of the movable upper section of the housing or cabinet. Any desired form of arrangement or stop elements may be utilized to determine the plane of maximum elevation and depression, although for convenience, the projecting lug 43 is adapted to have its upper edge contact the shoulder 45 to limit the upward motion of the elevated section 15 and the lower edge of the lug 43 contacts the shoulder portion 47 in its downward motion to prevent further movement thereof. In the alternative, the upper edge 49 of the main cabinet section may contact the overhanging edge 51 of the top movable section.

For controlling the operation of the motor, an on-off switch 53 of any desired character may provide the making and closing of the circuit to the motor proper and even though the motor is not immediately shut off when the movable section of the cabinet reaches an extreme up or down position, the slipping clutch 41 prevents any damage either to the motor or to the cabinet mechanism itself. So that the upward or downward direction of motion of the movable section 15 may be controlled, a gear shifting lever 55 is arranged to project outwardly from the gear box 31 and to be movable within the slot 57 in the cabinet proper. By moving the gear shifting lever 55 to one extreme position, the gears within the gear box 31 will be shifted so that the spindles 27 and 29 rotate in such a direction as to turn the pinions 39 in a direction to rotate the support spindles 19 in a direction to raise the upper section of the cabinet, for instance, whereas when the gear shifting lever 55 is in the other extreme position in the slot, the gears within the gear box 31 will be so changed as to reverse the direction of rotation of the spindles 27 and 29 and their associated worms 37 and pinions 39 that the movable section 15 of the cabinet moves in the opposite direction. Thus, in one position of the gear shifting lever 55, the movable cabinet section 15 is raised and in the other position of the gear shifting lever, the movable section of the cabinet is lowered.

The movable section of the cabinet includes as

a part thereof a reflecting mirror surface **59** which is positioned in the cabinet section at an angle of approximately 45° so that images directed upwardly along the optical path indicated by the arrow immediately below the mirror (see Fig. 2) shall be reflected upon the opalescent viewing sheet or even ground glass surface **61** so as to become observable to those intending to view the television images.

The reflector may be housed within the cabinet section **15** so that the complete cabinet section forms a so-called shadow box area by virtue of the solid side panels **63** or if desired, these side panels may be omitted.

While it has already been explained in the prior art, such as the above-mentioned Landis patent, as to the arrangement by which television images are produced, the conventionally represented portions of this disclosure include the receiving amplifier unit **65** suitably positioned within the fixed section of the cabinet and arranged to be controlled, for instance, by suitable control knobs **67** or the like. The video or image signals are appropriately separated from the sound signals and caused to influence in known manner the production of images on the end wall target **69** of an image producing tube **71** of the cathode ray type. As was also explained in the Landis patent, a suitable deflecting yoke **73** may surround the neck of the cathode ray tube and the complete tube assembly may then be positioned within a central aperture or opening **75** in a correcting plate **77**, which is also frequently termed an aspheric zone plate. The correcting plate **77** is supported within the cabinet by means of a support bracket **79** which also serves to support the complete tube assembly and this plate is adjustably mounted and positioned in desired relationship by means of the set screws **81** also conventionally represented. Light produced on the target area **69** of tube **71** is projected downwardly toward a spherical reflecting element **83** which is suitably supported within the cabinet and positioned relative to the tube **71** by means of a support bracket **85**. The light of the image produced in the cathode ray tube is then directed toward the reflector and thence back through the correcting plate **77** to the mirror **59** and arranged to focus at a finite distance, for instance, upon the opalescent viewing surface **61**, and the image thus becomes observable when the top section of the cabinet is raised to the position indicated in Fig. 1, for instance. It is desirable that the upper circuit of motion shall preferably be such that the length of the light path from the image producing tube target **69** through the optical system and from the reflector **59** to the viewing screen or surface **61** shall be of optimum length for the chosen system.

Sound accompaniments for the television program or sound produced separately from the television program is heard in the usual manner by way of the sound reproducing unit **89** which, for instance, may be positioned in the lower area of the cabinet.

It is, of course, to be appreciated that various modifications readily may be made in the arrangement herein disclosed without in any way departing from the spirit or scope of these specifications. For instance, the movable section **15** may be raised by the use of similar or suitable tracks or guides of the general nature disclosed with the operation of elevation or lowering thereof, controlled mechanically by means of a crank somewhat similar to the manner in which the windows of automobile doors are opened and closed. Alternatively, various modifications in the gearing arrangement may be provided, as well as arrangements whereby the inclusion of the slip clutch **41** may be avoided through the use of suitably controlled contact members or a limit switch serving to break the motor circuit at both the extreme upward and extreme downward positions of travel of the movable upper cabinet section.

Still further alternative elevator control systems which may be used would embody a variety of leverage schemes patterned according to previously used mechanisms to open camera lens and shutter devices out into focusing positions from the body of the camera. In such systems the essential feature of the mechanical linkage was the fact that the movable front is always maintained in a position which is parallel to the format (the plate or film surface) of the camera. Systems of this general type are known and require no further detailed explanation. For convenience, these various arrangements have not been shown in detail, although it is to be understood that they may readily be utilized through the inclusion of well-known mechanical systems for this purpose. It also may be appreciated that various other combinations may be added to the disclosed arrangement and still maintain cabinet dimensions of approximately those customarily used in connection with radio console and phonograph combinations, while still providing a cabinet which will not in any way give the appearance of being unusually deep, unusually tall or unusually squatty.

Having now described the invention, what is claimed and desired to be secured by Letters Patent is the following:

1. A cabinet structure for viewing electro-optical images on an image producing tube positioned internally of the cabinet comprising a main cabinet body section adapted to have the image producing tube unit included therein, an optical system to direct the produced light image along a predetermined path within the cabinet, a movable cabinet top section for the cabinet, said top section being adapted in its depressed position to telescope within the main cabinet body section, an image viewing screen element and an inclined reflecting surface each fixedly supported relative to the other and carried within the said movable section and movable integrally therewith, said reflecting element being arranged to reflect the light image directed through the cabinet upon the viewing screen surface, and means for raising and lowering the top cabinet section relative to the main body of the cabinet, means for limiting the upward motion of the movable section so that when said movable section is brought to its maximum elevated position the said viewing screen surface is exposed relative to the main cabinet body section and the optical path length of the optical system is such as to focus sharply the produced image upon the screen for viewing.

2. A viewing device comprising a main cabinet section adapted to have included therein in substantially fixed position an image producing element and an optical image enlarging system for directing the light of the image within the cabinet along a predetermined optical path, a movable top section for the said cabinet supported on the main cabinet body member so as to telescope therein and form a top cover thereof in one

extreme position and to protrude therefrom in a second position, means for elevating the movable top section relative to the main cabinet section by moving the movable section along a vertical path, a viewing screen element for permitting viewing the images produced within the main cabinet section supported by the said movable top member and adapted to move upwardly with the top and to telescope inwardly of the main cabinet section with the top, a reflector unit supported within the movable top member for directing the light image projected within the cabinet by the optical system toward the viewing screen element, guide and elevating means for controlling the position of the top section with respect to the main cabinet body member during periods of raising and lowering thereof, a drive means for moving said elevating means to raise and lower the top, means for causing a reversal of the direction of the drive of the movable top member for opening and closing, and means to limit the upward motion of the top to a position whereat the optical path length from the image producing element to the viewing plane through the optical system and from the reflector is such that the produced image is sharply focused in enlarged form on the viewing screen.

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