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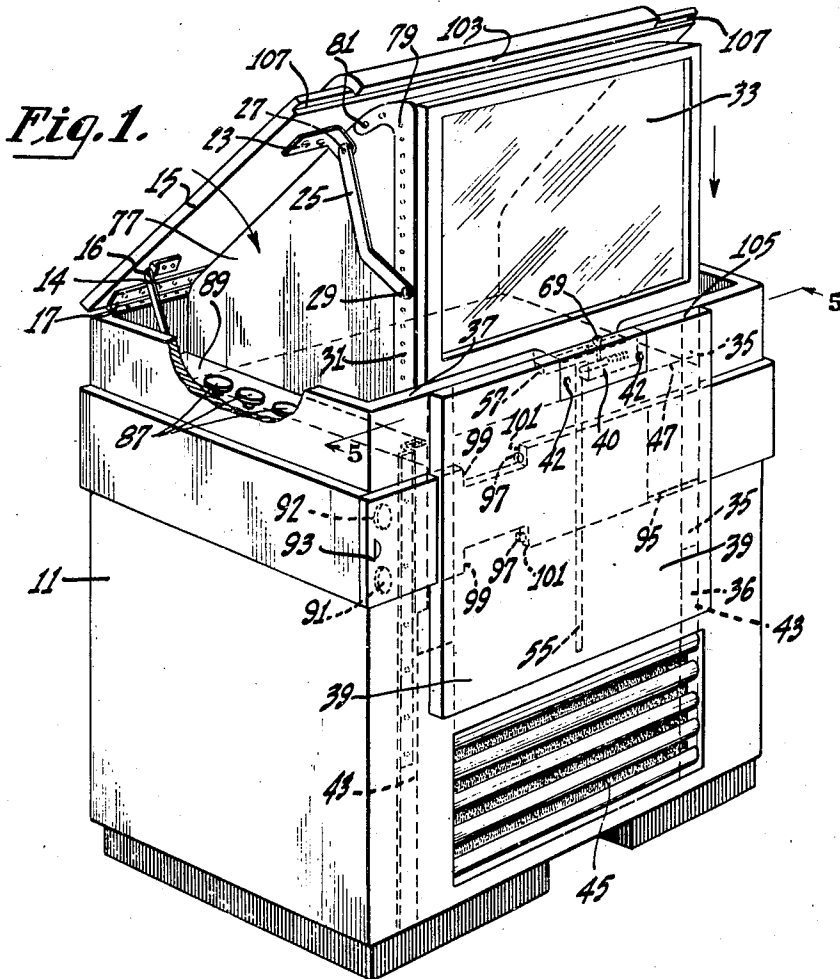
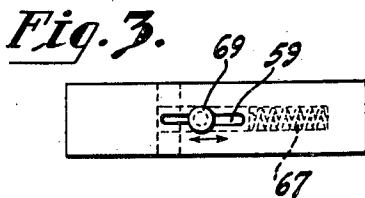
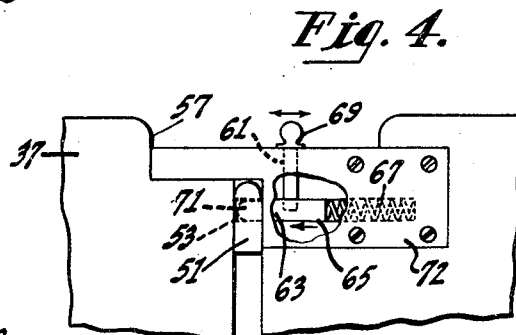
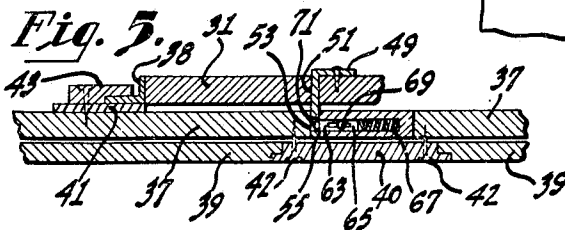
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2,476,494

IMAGE PROJECTION AND VIEWING APPARATUS

Filed Feb. 22, 1945

2 Sheets-Sheet 1



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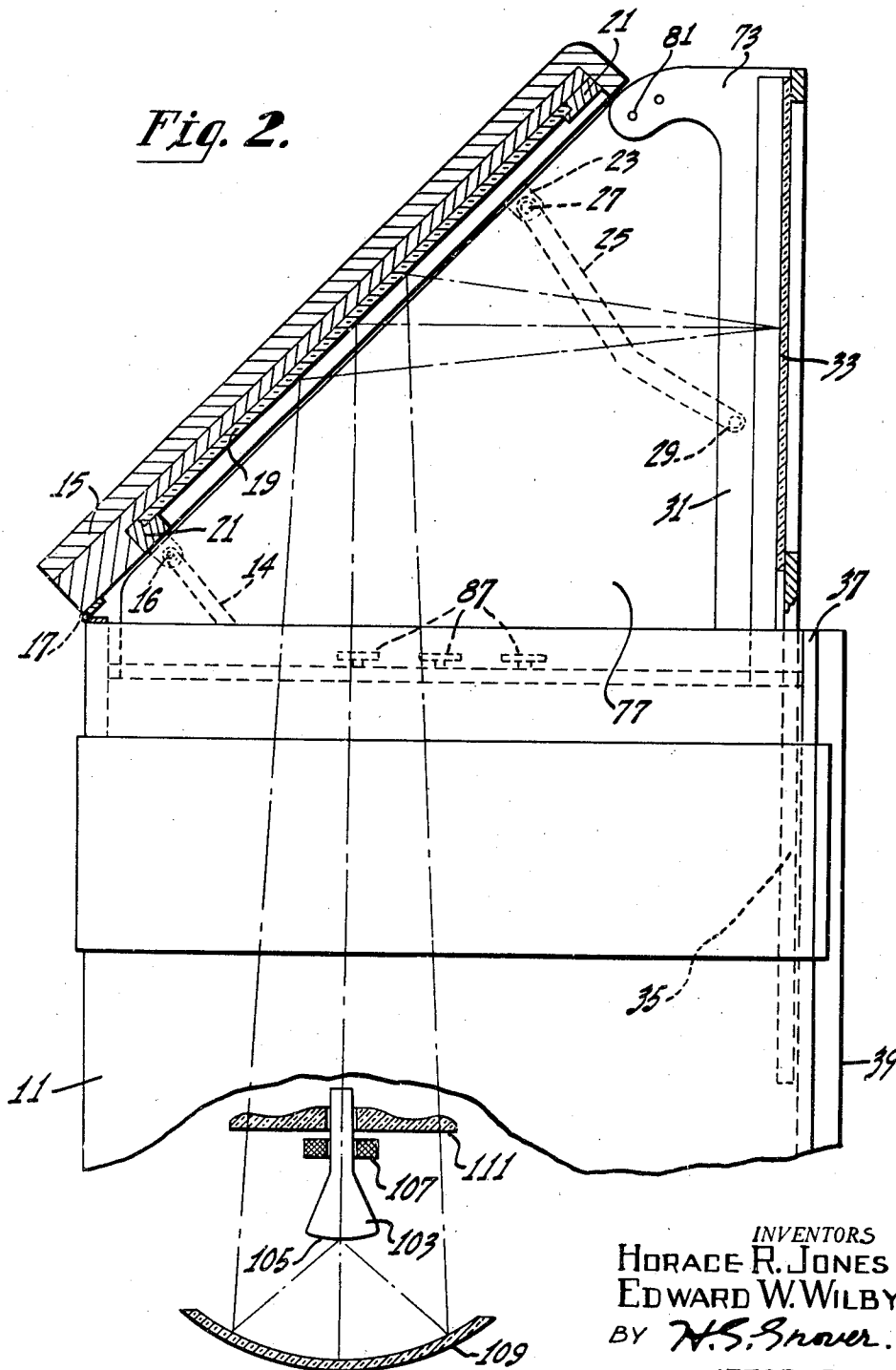
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IMAGE PROJECTION AND VIEWING APPARATUS

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Fig. 2.



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IMAGE PROJECTION AND VIEWING
APPARATUS

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4 Claims. (Cl. 88—24)

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This invention relates to improvements in image projection and viewing apparatus used particularly for observing television image productions. In its more detailed form, this invention relates to a cabinet construction particularly useful as a television image receiver of the variety wherein an optical enlargement of the original television image is adapted to be viewed on a relatively large image viewing screen.

Various systems and arrangements for viewing television images in enlarged forms have heretofore been suggested and many of the prior art suggestions have proven useful in some degree. However, for the most part, the arrangements of the prior art have not satisfied the conditions of compactness, coupled with efficient and satisfactory operation, particularly from the standpoint of providing high detailed image viewing. Also, prior art systems have not been of the type which would permit the use of a rigid, planar viewing screen capable of being located, in the operating or useful position, in such manner that all portions thereof are maintained rigidly in the focal plane of the image projecting optical system and are yet capable of being moved wholly within a viewing region.

The present invention has, as one of its objectives, that of providing a television image projection and viewing construction and cabinet by which enlarged images of high definition may be observed.

A further object of the present invention is that of providing a television image projection and viewing arrangement and cabinet construction in which the viewing screen area is wholly contained within the cabinet structure during periods of non-usage and then for periods of image observations provisions are made whereby an opening of the cabinet simultaneously effects an accurate positioning and locating of the viewing screen area and brings it into a position of sharp focus with respect to the optical system by which the enlargement of a television image is brought about.

A further object of the invention is to provide a television image viewing cabinet in which a rigid image producing screen area is brought into viewing position in a highly efficient and fool-proof manner through the mere opening of the cabinet lid.

Other objects and advantages of the invention are those of providing a television image viewing cabinet which overcomes one or more difficulties found to exist in known forms of apparatus and which provides increased opera-

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tional efficiency, coupled with neatness of the appearance and a minimum cost of manufacturing.

Other objects and advantages of the invention will become apparent when the following specification and the appended claims are read in conjunction with the accompanying drawings in which:

Fig. 1 is a perspective view, partly in section, of one preferred form of cabinet construction;

Fig. 2 is a partial sectional side view of a portion of the cabinet to show the general relationship between the optical system, the image viewing screen, and the cabinet construction itself;

Fig. 3 is a top view of the locking arrangement for locating the viewing surface;

Fig. 4 is an elevational view of the arrangement shown by Fig. 3; and

Fig. 5 is a sectional view of a front portion of the cabinet taken on the line 5—5 of Fig. 1

Referring now to the drawings, the invention herein to be set forth comprises essentially a cabinet body or base member of substantially parallelepiped form having a hinged lid or closure element on the interior surface of which a reflecting mirror element is supported. A rigid and planar image viewing screen is carried in the front portion of the cabinet and arranged to slide in the plane of the screen up and down or out and in telescopically relative to the cabinet body along guides positioned interiorly of the cabinet. The positioning of the viewing screen in such a way as to elevate or suitably move it in the same plane externally of the cabinet body and to bring it into viewing position is effected by means of a linkage between the free edge of the cabinet closure element and a support frame structure for the viewing screen. The linkage thus provides a support and connecting element serving to elevate or suitably move the viewing screen to proper position with an opening of the cabinet closure element and for lowering and depressing or otherwise sliding or positioning the image viewing screen telescopically within the cabinet body itself with a closure of the cabinet lid. In addition, means are provided for locking the image viewing screen in its extended external position relative to the cabinet body to maintain the said screen in an optimum position for viewing. Also, masking plate elements or side shields are suitably carried from the viewing screen support frame to effect the dual purpose of masking the image projection system from extraneous light and also for preventing access

to the interior of the cabinet during operational periods of image viewing, so that users of the cabinet are protected against the effects of high voltages built up upon operational portions of the instrumentalities contained within the cabinet during periods of use.

Now referring more particularly to the drawings for a further understanding of the invention and first to Fig. 1 thereof, it will be observed that the invention is shown as adapted as an arrangement wherein the image viewing screen is elevated to viewing location. The system disclosed embodies the use of a parallelepiped shaped cabinet 11 provided with a lid, cover or closure element 15 which is suitably hinged along one of its edges by means of a hinge element 17 hinging it to the cabinet body. A link element 14 pivotally connects at one end 16 to the cabinet lid and at the other end (not shown) to any desired form of counter-balance arrangement supported within the main cabinet body, so as to permit easy opening and closing of the closure element.

A reflecting mirror 19 is suitably mounted and supported on the interior surface of the lid element 15 by means of a suitable mirror mount bracket element 21 (see Fig. 2) carried within the lid. At opposite sides of the lid element, and on the inner surface thereof, the brackets 23 are positioned (only one bracket is shown by the drawing). A link element 25 is pivotally supported at one end 27 by the bracket 23 and at its other end is pivotally connected at 29 to the support frame 31 in which a planar viewing screen surface 33 is supported. No details of the viewing screen will herein be included since it, per se, is not part of this invention. However, it will be understood that the screen 33 is a planar surface, usually of glass or plastic, which is of a translucent character. It may, where desired, be of lenticulated character to improve contrast and viewing and should be as non-directional as is consistent with good brilliance and sharp definition.

The link element 25 is of substantially the bent shape indicated in order that it may clear the inner edge of the front panel member 37 with a closing of the lid and a resultant lowering of the viewing screen frame support element 31.

The viewing screen support frame 31 is arranged to move up and down in a general vertical plane (that is the plane of the viewing screen) and to be guided in this motion by means of support guides 35 carried from the lower portion thereof and slidable within grooves 36, formed behind the front surface 37 of the cabinet body. The main front panel 39 covers the greater portion of the cabinet front and serves both to cover all grooved and notched cabinet surfaces, as well as for cabinet trim and decorations.

The details of a preferred form of support and guide for the viewing screen support frame 31 is shown more particularly in Fig. 5 where, as will be seen, a bracket element or runner 38 is attached to one edge of the viewing screen support frame 31 and arranged to be guided in the space provided between a suitable spacer unit 41 and the runner mount strip 43. This guiding arrangement permits the viewing screen and its associated frame to move up and down within the guides with a raising and lowering of the cabinet lid, as will later be described in more detail. The connections shown to permit

lowering of the viewing screen frame support element 31 so that it telescopes within the cabinet body are such that the frame is lowered relatively slowly with the initial closing of the lid, but then as the lid closes further and more nearly approaches a closed state the frame is lowered very rapidly.

The lower portion of the cabinet is provided with a grille area conventionally represented at 45, behind which it may be assumed that suitable sound reproduction elements are located. The guide slots provided between the runner 43 and the spacer element 41 extend substantially for the height of the cabinet, while the guide strips or runner elements 39 for the frame 31 extend approximately half the length of the guide path when the viewing screen is in the position indicated by Fig. 1. With a closure of the cabinet lid a lowering of the viewing screen 33, in the direction shown by the arrow, is effected to telescope it within the cabinet body. In this motion the viewing screen support frame runners 39 move in the guides substantially to the bottom of the cabinet. The viewing screen support frame 31 has its lowermost edge 47 terminate substantially as indicated in order that no interference with the sound reproducing units shall be occasioned when the screen is lowered in that in the lowered position the support frame and its guides are arranged to straddle the unit contained within the cabinet behind the grille 45.

A locking plate 49 is attached to the rear of the lower portion of the frame member 31 and protrudes through the said frame member, as indicated particularly by Fig. 5. The protruding L-shaped projection 51 of the locking plate has an aperture or slot 53 cut therein. This slot or aperture is substantially centered at the midpoint of the front panel strip 37 of the cabinet and it is arranged to slide up and down in a slot 55 which is cut in the panel member 37, as indicated by Fig. 1. In this way, the L-shaped projection 51 is at the bottom of the slot 55 with the cabinet lid closed and is in a locking position, indicated by Fig. 1, with the cabinet lid fully opened.

The slot 55 which is cut into the panel 37 is masked from the front by the main front panel 39.

A locking means for maintaining the viewing screen frame support member 31 (and thus the viewing screen 33) in its uppermost position is located within a recess 57 cut into the panel member 37 (as shown by Fig. 4, in particular). A guide slot 59 is cut in lock element (later to be described) which fits in the recess portion 57 of the panel 37. Through this guide slot a pin 61 protrudes and is attached to or anchored in a catch element 63 which forms the locking unit. The catch element 63 is supported within a drilled hole or slot 65 within which there is also located a compression spring 67. One end of the spring 67 is fitted in the base of the slot or hole 65 and its other end attaches to, or at least bears against, the catch element 63 so as normally to force the catch in the direction shown by the arrow in Fig. 4.

The pin element 61 which is attached to the catch 63 has a release button 69 attached to it. The button 69 is readily accessible when the top of the cabinet is open, and motion of the button 69 to the right, for instance, permits a lowering of the viewing screen 33 and its support frame 31 by releasing the catch 63 from the locking plate

aperture 53. The catch element 63 is so shaped to its outer edge 71 that the locking plate extension 51 will pass by it upon raising until the catch comes opposite the aperture 53, whereupon it will lock the screen support assembly in position so that the screen support frame cannot be lowered, due to the shape of the catch by reason of the catch fitting within the opening or aperture 53 in the L-shaped extension 51, unless the release button 69 is moved to the right, as shown, so that the spring pressed detent or catch 63 will also be moved against the pressure of the spring 67 to withdraw it from the aperture in the locking plate.

It can be appreciated readily that it is desirable to provide an external means to remove completely the above described locking equipment and mechanism. For this purpose the upper section of the front panel 39 is provided with a removable panel section 40 of suitable size and shape to cover fully the recess 57 which is cut into the front panel 37, as well as to permit access to the frame locking apparatus. The removable front panel section 40 is held in place against the front panel 37 by suitable positioning and adjusting screws 42, for instance, (see Fig. 5) which can readily be covered from the front by decorations or ornamentations sunk into recesses in which the screws are mounted. The cover plate element 72 for the lock unit is arranged to cover and hold the complete locking equipment in position. This cover plate 72 is then suitably attached to the removable panel section 40 so that a removal of the panel section will also remove the locking mechanism. When the locking mechanism is once removed it will be apparent that the front edge of the frame member 31 is released and the frame and screen assembly may be removed completely from within the cabinet housing.

As is shown more particularly by Fig. 2, the linkage mechanism 25 connecting the lid 15 with a viewing screen support frame 31 is adequate to effect both a raising and a lowering of the frame element 31 and consequently the viewing screen 33. However, in order that the frame element 31 shall not interfere with the closing of the cabinet lid, the top portion 73 of the support frame 31 is suitably shaped, as indicated, so as to move clear of the inner surface of the cabinet lid upon its closure.

In the statement of invention, it was indicated that masking areas or side shields were utilized to prevent extraneous light from affecting the projected optical image, as well as for providing a means whereby access to the interior of the cabinet becomes impossible. Such masking shields have been represented by Fig. 1 in the form of substantially triangular shaped covering plates or side shields 77 which are secured along the edge portion at such points as 79 to the support frame 31 and also at 81 to the overhanging edge portion of support frame. Generally speaking, the near edge of the triangular shaped masking plates 77 which are nearest the hinged lid of the cabinet 15 is unsupported in that the edge support from the frame 31 is generally adequate where light weight material is utilized.

It will be noted from an observation of Fig. 1 that the side shields 77 are mounted inwardly from the sides of the cabinet proper to some considerable extent. It has been found that such positioning of the side shields permits the location of radio receiving apparatus for either sound or television along the side walls of the cabinet

and yet the arrangement permits adequate clearance for the side shields between the side mounted radio apparatus and the centrally located optical system.

For reasons of simplicity this radio apparatus has not been shown in detail in the accompanying drawings but for the purpose of ready control suitable control knobs 87 for effecting an operation, adjustment and control may be installed upon an instrument panel shown at 89, for instance, within the cabinet. A panel of this type may be at either side of the cabinet, with one control being for sound and the other for television, for instance. Further controls may be provided in the form of additional control knobs 91, 92 positioned behind a sliding panel 93 carried in the front of the cabinet, which panel is arranged to slide behind the main front frame panel 39 and the front frame member 37. The slidably positioned panel 93 is thus located so as to be movable within a slot area shown conventionally at 95 with the limit of motion determined by the pins 97 bearing against the shoulder portions 99 and 101 of the slidable member.

When the receiver instrumentally is not in use for the purpose of receiving television images to be projected upon the screen 33, the cabinet lid 15 is usually closed. Under these circumstances the edge portion 103 of the lid is arranged to bear and rest upon the upper edge 105 of the front panel member 39 and to fit closely thereagainst which makes it apparent that the lid 15 cannot readily be raised by grasping any central portion. This arrangement is desirable in order that the screen structure 33 and its support frame 31 may readily be protected from bending and damage as might be done with opening the lid from its central position. However, to effect an easy opening of the lid, the protruding lip 107 has been provided at each edge of the lid element. This protruding lip is arranged to overhang very slightly the front panel 37 in the space between the main front panel 39 and the cabinet corners. By grasping the protruding lip at each edge of the lid, the lid may be raised with relatively little effort due to the already mentioned counter-balance attached to the lid at the end of the link 14.

The radio apparatus contained within the cabinet is so connected as to apply demodulated video signals to modulate the cathode ray beam developed within a cathode ray tube 103, for instance. The tube 103 has a target area in the form of a fluorescent or luminescent screen 105 on which the electro-optical images are caused to appear when the developed cathode ray beam is suitably signal modulated and deflected in bi-directional paths by means of any conventional beam deflecting yoke, such as 107, to cause the beam to trace a desired image raster on the target area 105.

A suitable form of image enlarging and projecting system for use in connection with a cabinet structure of the type herein disclosed has been set forth in detail by the U. S. Patent No. 2,273,801, granted to D. O. Landis on February 17, 1942. Accordingly, detailed reference for the illustrative form of cathode ray tube and associated optical system will not be made other than to state that the electro-optical image developed upon the target or screen area 105 is produced when the tube 103 is substantially centered upon the optical axis of the system and arranged to direct its light image toward a light reflecting surface such as the spherical mirror

109. The mirror 109, in turn, reflects the optical image toward and through an aspheric correcting or zone plate 111 which is arranged external to the path of light from the light source 105 to the reflector 109 but is axially aligned with each. The aspheric plate 111 is arranged to correct for spherical aberrations introduced into the reflected light rays from the spherical mirror 109. The correcting plate also serves to focus the reflected image sharply upon the viewing screen area 33 after the image has been reflected thereto from the surface of the mirror 109 supported upon the inner face or surface of the cabinet lid.

It will be seen, accordingly, that the correcting plate 111 must be so lined up and arranged that it will bring the complete reflected image into a sharply focused position on the viewing screen 33 when the latter element is located in its elevated and extended position and locked thereat by means of the spring pressed catch element 63 sliding within the slot 53. At such times the viewing screen surface 33 may be assumed to be in a vertical position and the cabinet lid and its reflecting mirror may be assumed to be in a position 45 degrees to the vertical, that is the axis of the optical system including the tube, the spherical reflector and the correcting plate.

Various ways and means to align the optical system to bring about the result are known in the art and certain forms thereof have been exemplified by the mentioned Landis patent so that further details thereof need not herein be given.

While it has been suggested herein that the arrangement disclosed is intended primarily for use in an optical image enlarging system of the type broadly disclosed by the above-mentioned Landis patent, it will nevertheless be appreciated that other modified forms of optical image enlarging systems may readily be utilized. Such optical systems may incorporate an optical system of the general character shown and described in the Goldsmith U. S. Patent No. 2,307,211, granted on January 5, 1943, which is referred to by way of example as a modification of the optical system suggested. Further, it will be appreciated that where desired, the source of optical images may be a motion picture projector included within the cabinet and having a suitable projecting objective which will focus the image of the film frames upon the viewing screen 33. Such an optical system might, for instance, be of the general type disclosed and claimed in U. S. Patent No. 1,988,522, granted to K. H. V. Stanley on January 22, 1935.

Various other modifications of the disclosed may readily be resorted to and relied upon where desired so that, for instance, the closure member may open from the side of the cabinet and the screen and support structure slide in and out laterally, with other components appropriately modified. Accordingly, the exemplification of the invention as herein given shall be considered in its broadest rather than limiting forms.

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

1. Image viewing apparatus of the type wherein image producing means are included within a cabinet body which comprises the combination of a hinged cabinet closure element positioned to open and close on the cabinet body and to completely cover when closed that portion of said cabinet body to which it is hinged, a planar reflecting element supported upon the inner sur-

face of the closure element, and a planar image viewing screen and an associated screen support frame, guide means positioned parallel to the front wall of the cabinet for guiding the screen support frame and the viewing screen so as to slide and telescope the said elements wholly within the cabinet body and beneath the said closure element in one position and also to slidably move the said elements at least partially externally to said cabinet body in a plane of motion coinciding with the plane of the said viewing screen element, and a mechanical linkage connection between the closure element and the viewing screen support frame contained wholly within the cabinet body in a closed position of the viewing screen for moving the said support frame and the viewing screen in the said plane of motion to the external position relative to the said cabinet body upon manual opening of the closure element about the hinge connection thereof to the cabinet body and for retracting the viewing screen support frame and the viewing screen in the same plane and telescoping the said elements within the cabinet body upon manual closure of the said closure element upon the cabinet body so that the said viewing screen support frame and the said viewing screen are completely enclosed within the cabinet body and lie beneath the said closure element, whereby when the closure element is in a predetermined opened position and the viewing screen is withdrawn from the cabinet, images developed by the image producing means within the cabinet are directed upon the said reflecting element and then reflected from the reflecting element to focus sharply upon the viewing screen in its extended position.

2. Image viewing apparatus of the type wherein image producing and optical projecting and enlarging means are included within a cabinet body which comprises a hinged cabinet closure element positioned to open and close on the cabinet body, a planar reflecting element supported upon the inner surface of the closure element, and a planar image viewing screen and an associated screen support frame, guide means for guiding the screen support frame and the viewing screen so as to slide the said elements and cause them to telescope within the cabinet body in one position and also to move the said elements at least partially externally to said cabinet body in a plane of motion coinciding with the plane of the said viewing screen element, a linkage connection between the closure element and the viewing screen support frame for providing the motion of the said support frame and the viewing screen to the external position relative to the said cabinet body with an opening of the closure element about the hinge connection thereof to the cabinet body and for retracting the viewing screen support frame and the viewing screen and telescoping the said elements wholly within the cabinet body with a closure of the said closure element upon the cabinet body, and locking means for locating and fixedly positioning the image viewing screen and its support frame in a predetermined optimum extended position outwardly from the cabinet so that the plane of the viewing screen surface coincides with the focal plane whereat an optical image projected along an optical path from the image producing means and the optical means to the reflector and thence to the image viewing screen is brought into sharp focus.

3. Viewing apparatus for observing television images projected by an optical system for enlarg-

ing television images developed upon cathode ray image producing means included within the cabinet body which comprises a hinged cabinet closure element positioned to open and close on the cabinet body, a mirror element supported upon the inner surface of the closure element, a planar image viewing screen, a viewing screen support frame carried within the cabinet, guide means for guiding the screen support frame and the supported viewing screen so as to slide the said elements and cause them to move within the cabinet body to an inoperative position in one extreme of motion and to move the said elements to an operative position with the plane of motion coinciding with the plane of the said viewing screen element so that the supported viewing screen is external to said cabinet body, a link connection between the closure element and the viewing screen support frame for moving the said support frame and the viewing screen in the said plane of motion to the external operative and viewing position relative to the said cabinet body upon a manual actuation to open position of the closure element about the hinge connection thereof to the cabinet body to substantially a 45° angle relative to the axis of the optical system and for moving the viewing screen support frame and the viewing screen in the same plane to an inoperative position wholly within the cabinet body upon a manual actuation to closed position of the said closure element upon the cabinet body, and locking means for locating and fixedly positioning the image viewing screen and its support frame in its extended and operative position outwardly from the cabinet so that the plane of the viewing screen surface is at a 45° angle relative to the mirror and the plane of the viewing screen coincides with the focal plane whereat an optical image projected along an optical path from the image producing means and the optical system to the mirror and thence to the image viewing screen is brought into sharp focus.

4. Image viewing apparatus for television receivers having a cathode ray tube image producing means and an associated image projecting optical system included within a cabinet body which comprises a hinged cabinet closure element positioned to open and close on the cabinet body, a mirror reflecting unit supported upon the inner surface of the closure element to receive images from the optical system and to reflect said images, a substantially rigid planar image viewing screen and an associated screen support frame carried by said cabinet, guide means for guiding the screen

support frame and the viewing screen so as to permit motion of the said elements wholly within the cabinet body in the plane of the viewing screen to an inoperative position in one direction of movement and also to permit the said elements to be slidably moved in the same plane to a position of operation whereat the viewing screen is located external to said cabinet body, said guide means being so arranged that the path of motion of the screen support frame and the viewing screen maintains the plane of the said screen at all times substantially unchanged, a linkage connection between the closure element and the viewing screen support frame for providing the motion of the said support frame and the viewing screen in the said plane of motion to the external operative viewing position relative to the said cabinet body with an opening of the closure element about the hinge connection thereof to the cabinet body and for retracting the viewing screen support frame and the viewing screen in the same plane and telescoping the said elements wholly within the cabinet body to an inoperative position with a closure of the said closure element upon the cabinet body, and a spring pressed releasable locking means for locating and fixedly positioning the image viewing screen in the said guide means in its extended position outwardly from the cabinet so that the plane of the viewing screen is at the focus of the optical image projecting system with the optical path being from the image producing means through the optical system to the said reflector and along a reflected path therefrom to the said image viewing screen, said focal position being obtained when the reflecting mirror unit is at substantially a 45° angle to the axis of the optical system and at the same angle to the plane of the image viewing screen surface.

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EDWARD W. WILBY.

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