

April 4, 1939.

O. C. GILMORE

2,152,959

PROJECTION DEVICE

Filed Jan. 27, 1936

3 Sheets-Sheet 1

Fig. 1.

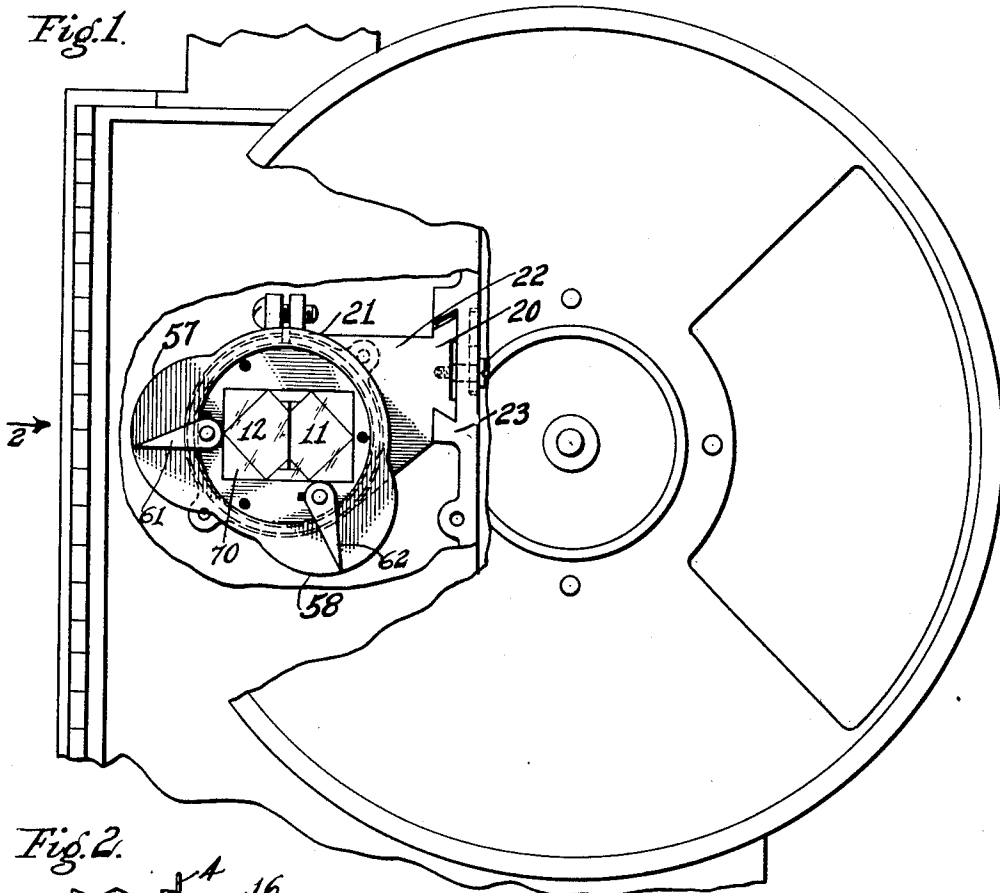
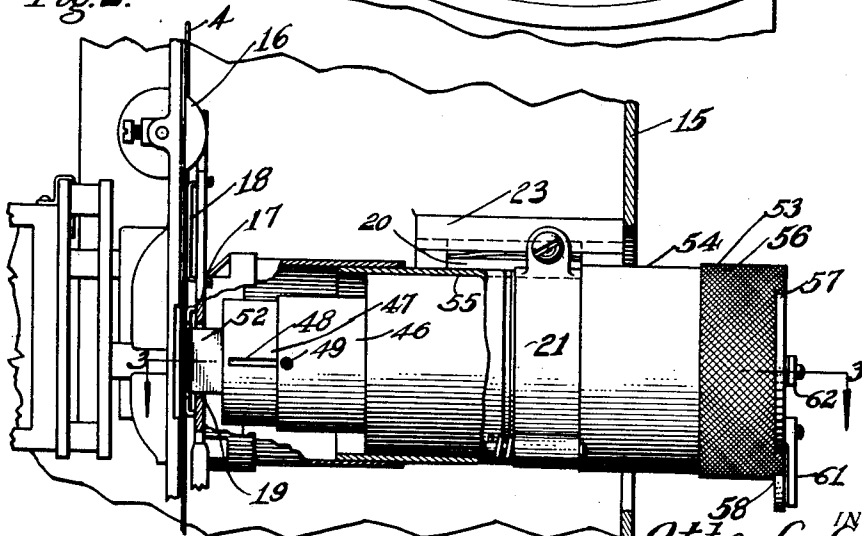


Fig. 2.



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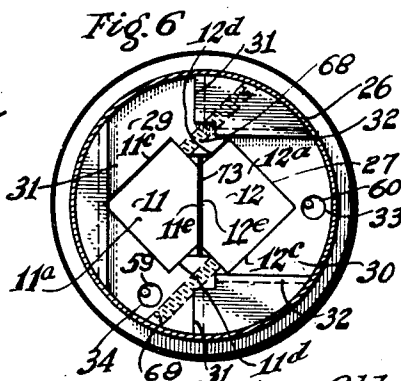
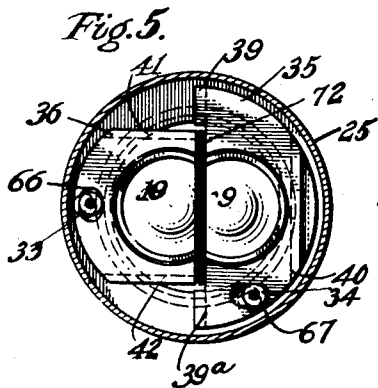
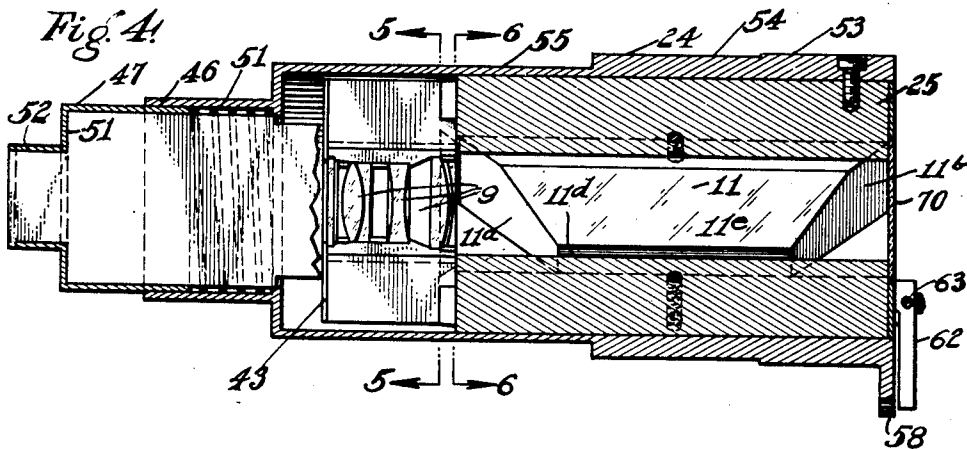
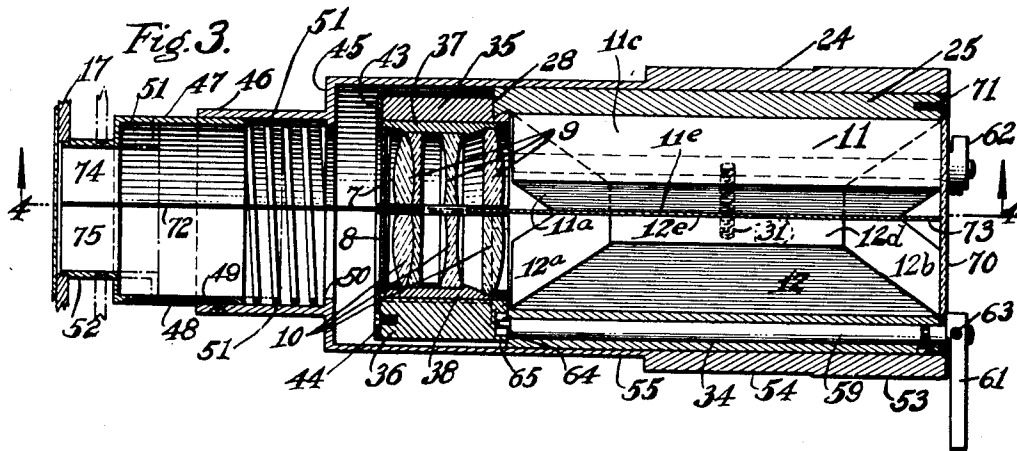
O. C. GILMORE

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PROJECTION DEVICE

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3 Sheets-Sheet 2



BY

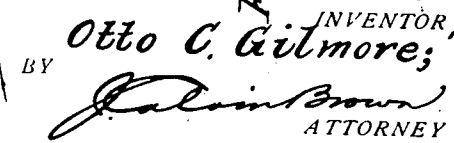
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2,152,959

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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,152,959

PROJECTION DEVICE

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Application January 27, 1936, Serial No. 60,923

10 Claims. (Cl. 88—16.4)

This invention relates to attachments for projection machines of the type used for moving picture film, slides, or still photography.

More particularly, the invention has to do with a device which may be utilized in conjunction with standard types of motion picture projection machines, and which requires no change in the projection machine construction, but readily adapts the projection machine for use in color photography.

By way of example, it may be stated that in the motion picture art at the present time, several methods are used for the production of color pictures. These methods are readily divided into two classes, to-wit: the subtractive and the additive. This invention has to do with the additive method or system of color photography, in that with the said invention, filters are supplied which color the light rays in such a manner that a picture appears upon the screen in substantially natural color rendition. It is apparent that in the use of a device of the character contemplated by this invention that the pictures initially should be photographed by a suitable camera having an attachment which adapts the camera for either the additive or subtractive process of forming a color negative. I have described such a device in an application filed January 25, 1936, for Camera attachments, Serial No. 60,776.

In the present invention, I have assumed that the positive film has two images identical in characteristics and arranged in side-by-side parallelism. If we assume but two of such images, the device of the present invention would, when used in a suitable projection machine, project said pictures in such a manner that the two pictures merge to produce an image on a screen having natural color rendition. Hence, in the case of motion pictures which constitute a succession of stills, the pictures on the projection screen would all be in color.

Heretofore, so far as the inventor is aware, complicated prismatic systems have been used in the projection of pictures in color. Ordinary prisms or mirrors are employed and it is a known fact that glass has a certain percentage of light absorptivity, and that the number of reflecting surfaces directly affects the brilliance of the projected picture.

As an object of the present invention, I so arrange certain elements that there is a minimum of light absorptivity with a reduction of reflecting surfaces, to the end that a brilliant picture may be projected upon a viewing screen.

The present invention is so arranged that two pictures having defined color values may be projected and merged through the use of two prisms.

It has been found in actual practice of the invention that distortion, fuzziness, ghosting, and flicker are reduced to a minimum in the projected picture.

Other objects and uses of the invention will readily suggest themselves to those skilled in the art, and with the above objects and others in view, the invention consists in the novel and useful provision, formation, construction, association, and relative arrangement of parts, members and features, all as disclosed in certain embodiments in the accompanying drawings, described generally, and more particularly pointed out in the claims.

In the drawings:

Figure 1 is a fragmentary front elevation of a portion of a projection machine incorporating the invention,

Figure 2 is a fragmentary view, partly in section, and constituting a side elevation looking in the direction of the arrow 2 in Figure 1,

Figure 3 is a longitudinal sectional view on the line 3—3 of Figure 2,

Figure 4 is a sectional view on the line 4—4 of Figure 3,

Figure 5 is a sectional view on the line 5—5 of Figure 4,

Figure 6 is a sectional view on the line 6—6 of Figure 4,

Figure 7 is a perspective view of the several parts of the invention shown separated, and,

Figure 8 is a perspective view of one of the prisms used in practicing the invention.

Referring now to the drawings, attention is specifically directed to Figures 7 and 8, wherein in Figure 7 I have shown the several elements of the present invention arranged in separated position, to the end that the principle of the invention may be readily understood. At 1, I have shown an arc with a reflector 2 for directing rays of light from the said arc through an aperture 3, forwardly of which is film 4, panels or frames of which are successively positioned within said aperture. It is to be observed that the film 4 for each frame is provided with two image-bearing areas 5 and 6, the image areas being substantially identical as to size and in parallel edge-to-edge relationship. Forwardly of the film are one or more filters 7 and 8. These filters may be of any desired color, by way of example one of said filters may be blue-green and the other orange-red. 9 and 10 are lenses,

and 11 and 12 are Dove erecting prisms. As is customary, with prisms of this character, the prism 11 has two refracting faces 11^a and 11^b and a reflecting face 11^c. The prism 12 has two refracting faces 12^a and 12^b and a reflecting face 12^c. In order to render the device of this invention containing the elements thereof as compact as possible, I have cut each prism so that surfaces 11^d and 12^d are substantially parallel to their respective reflecting surfaces. I have provided a surface 11^e for prism 11 and 12^e for prism 12, which is inclined substantially at a 45° angle to the surfaces 11^d and 12^d respectively. The surfaces 11^e and 12^e are arranged in juxtaposition. The refractive faces 11^a, 12^a and 11^b, 12^b are substantially maintained in right angular relationship.

If a light pencil is passed through the aperture, photographic images on the film will be projected through the filters 7 and 8, the two lenses 9 and 10, and thence through the prisms, the light image 13 striking a projection screen 14. The images on the film are brought into registry on the screen 14 through means which permits adjustment of the two lenses, the adjustment of one lens being at right angles to the adjustment of the other lens. Both images are in color, the combining of which reproduces the projected image in substantially the original or natural color of the object. The arrangement is such that the pencils of light through each lens strike the refracting faces 11^a and 12^a and are reflected to the faces 11^c and 12^c, respectively, and through the emergent refracting faces 11^b and 12^b. As the images are arranged in side-by-side parallel relationship, as shown at 5 and 6, it becomes essential to erect the images. It will be observed that vertical planes passed through the light pencils will cut the refracting faces and the reflecting face of each prism obliquely. By arranging the reflecting surfaces of each prism at a 45° angle, to each of the vertical planes passed through the light pencils, the image bearing light pencils are not only inverted, but rotated 90° transversely to the axis of each light pencil.

Referring to Figures 1 and 2, I have shown fragmentarily a portion of a projection machine which may be utilized in practicing my invention. The portions of the projection machine are for illustration only, might be any type of projection machine, magic lantern, or the like, and for motion pictures or stills. As is customary with projection machines, a lens is provided through which the image bearing light pencil is passed. In the present instance, I have so arranged my invention that it may be substituted in the place and stead of the ordinary projector lens, thus converting what might otherwise be a machine for projecting pictures in black and white into a color picture projector. I utilize all the elements of the projection machine, save and except the projector lenses. Thus, it is possible to change very quickly from a black and white picture to a color picture, even in those theatres where a single projection machine is used.

In Figure 2, 15 is the projector housing, within which is the various mechanism constituting the projector but forming no part of this invention. However, 16 is a guide roller for film, such as already illustrated in Figure 7 at 4. The gate is shown at 17, the usual shoe or shoes at 18, and the aperture at 19.

A lens tube housing, designated generally as 20, is provided in all projectors and the same includes a collar 21 which normally surrounds and

holds the objective. This collar is so constructed as to allow the objective, including its mount, to be readily removed from the projection machine. The collar has the usual collar mount 22 adjustably secured to member 23, whereby the objective may be focused, in the well understood manner.

To best house the elements of the invention which are shown in separated relationship in Figure 7, I provide a casing or tube 24 adapted to confine a prism holder 25. This prism holder secures the prisms 11 and 12 in proper position, to-wit: the position illustrated in Figure 7. To this end, the prism holder is provided with a substantially circular periphery 26 and longitudinally bored or cut in a manner conforming to the configuration of the prisms when held in juxtaposition (see Figure 6 at 27). One end 28 of the holder is recessed in the manner shown in Figure 6 at 29 and 30, and the marginal walls bounding both recesses are formed with dove-tail slots, as shown at 31 and 32, respectively. The dove-tail slots 31 are substantially at right angles to the dove-tail slots 32. The prism holder is provided with two longitudinally extending eccentric bores 33 and 34, the bores communicating with the recessed areas and with the opposite end of said holder.

Within the lens tube and adjacent the prism holder at its innermost end are lens holders 35 and 36 secured to and surrounding lens barrels 37 and 38. The lens barrel and lens holder, in each instance, are in the form of annular segments (see Figure 5), and the segments of said lens holder and said lens barrel are separated slightly, as shown in the same figure. Each lens barrel is adapted to secure and carry a segmental lens set, to-wit, the sets 9 and 10. The lens holder 35 is provided with three spaced-apart parallel dove-tailed tongues 39, 39^a and 40, and the lens holder 36 is provided with two spaced-apart parallel dove-tailed tongues 41 and 42. It will be noted that the dove-tailed tongues 39 and 39^a lie in the same plane but are separated. The tongues 39, 39^a and 40 are received within the confines of the dove-tailed grooves 31 while the tongues 41 and 42 are received within the grooves 32. It will thus be seen that any movement of a lens holder is lateral with respect to the opposite lens holder. The filters 7 and 8 may be conveniently secured to the lens holder or barrel through the medium of two split annular members 43 and 44.

The tube 24 is provided with an inwardly directed annular flange 45 which in turn carries a tube 46 of reduced diameter, both tubes being in axial alignment.

An aperture tube 47 is telescopically received within the tube 46, and the tubes 46 and 47 are keyed against relative rotation by providing the tube 47 with a longitudinal peripheral groove 48, within which is received the end of a screw 49 passed through the tube 46. Adapted to be interposed between the inner end of the tube 47 and an annular ledge 50 is a coil spring 51. This spring normally urges the tube 47 outwardly of the tube 46.

The tube 47 is provided with an inwardly directed flange 51' and secured to the flange is a housing 52 substantially rectangular or square in outline. This housing 52 is adapted to engage the gate 17 and be in part received within the apertured opening of said gate.

It will be observed that the periphery of the tube 24 varies as to external diameter at the zones

53, 54 and 55. The collar 21 is carried on the portion 55 and bears against the ledge or shoulder that is formed between the zones 54 and 55, and the part 53 has its periphery knurled, as shown in Figure 2 at 56. The part 53 is provided with wings 57 and 58, and said wings are adapted to have imprinted thereon graduations or other indicia, not shown in the drawings.

Shafts 59 and 60 extend through the bores 34 and 33, respectively, the outermost ends of both shafts provided with pointer members 61 and 62 adapted for play over any graduations on the said wings 57 and 58. These pointers are conveniently fixed to the shaft in any approved manner, such as by the medium of set screws 63. Both shafts are provided at opposite ends with eccentric pins 64 and carried on said pins are rollers 65. Each roller is positioned within an elongated slot 66 and 67 formed in the lens holders 35 and 36. It will be noted that the elongated slots are so disposed as to have their longest axes in right angular relationship. Turning movement of the shaft 59 will move the lens holder transversely relative to the lens holder 35 and turning of the shaft 60 will move the lens holder 35 transversely with relation to the lens holder 36.

To assure that the prisms will at all times be maintained in position within the tube 24, I provide threaded screws received within tapped openings of the prism holder and which bear against a certain surface of each prism. This construction is illustrated at 68 and 69. Further, to protect the beam emergent faces 11^b and 12^b I may provide a cover glass 70 diametrically spanning and secured to the forward end of the tube 25 by any suitable means, such as shown at 71.

I have provided septums at 72 and 73. The septum 72 is carried by the housing 52 and divides the housing into two compartments 74 and 75. The septum likewise extends through the tubes 46 and 47 and between the filters 7 and 8, and part-way between the lens sets 9 and 10. A further septum, lying in the same plane as the septum 72 and designated as 73, extends between the prisms 11 and 12 to a zone adjacent the cover glass 70 at one end and part-way between the lens sets 9 and 10. This is best illustrated in Figure 3.

The operation, uses and advantages of the invention are as follows:

When it is desired to use the projection machine for color purposes, which is to say for recreating on a screen pictures in natural color, the regular lens is removed from the projection machine and my invention substituted. The part 52 is received within the aperture of the gate, as illustrated, the spring 51 urging said member 52 into gate engagement. If we assume that a film, such as has been previously described is utilized, light will pass through the film, the lens sets, and prisms for projection upon the screen 14. The septums act to separate the light passing through the device, which is essential when the light is of different colors. By adjusting the pointers 61 and 62, the lenses are moved so that the two images projected upon the screen 14 are in registry. Any horizontal displacement of the image which would cause a fringing is compensated by adjustment of the lens 10 and any vertical displacement of the image is compensated by movement of the lens 9.

It will be seen that the device is saving in light, to the end that the projected picture is brilliant and detailed. It is important to note that I accomplish the ends of my invention through the

use of two prisms, and that only one reflecting surface is used for each light pencil.

Certain features of the invention consist in the provision of a single tube for holding the various elements having substantially, in the commercial article, the same diameter as a standard lens tube, and likewise, a tube having the same optical length. The projection is in a straight line and on the same optical axis as a standard projection lens; the result is that there is no mechanical change in the projection, gate, shutter, focusing, and the like. Furthermore, there are only two moving parts to the device, all parts enclosed, of simple design, require no oiling, and the lenses are directly calibrated to correct for any parallax. Standard lenses can be used. Furthermore, no adjustment of a prism is required for the rotation of the image. Hence, it is possible to use a single lens, prism, and color filter, thus completing one optical unit for one picture, and two optical units for two pictures.

I claim:

1. A device for use in the projection of pictures in color that comprises a supporting frame, a plurality of optical systems supported thereby, each optical system comprising an erecting rhomboid prism arranged to turn an image bearing light beam through 90° and an objective in axial alignment, the axes of the systems being substantially parallel and quite close together, the adjacent edges of the prisms being bevelled to allow them to lie close together, and a septum between said prisms to prevent diffusion of light from one prism into the other.

2. A device for use in the projection of pictures in color that comprises a supporting frame, two adjustably mounted optical systems mounted thereon, each optical system comprising a Dove erecting prism arranged to turn an image bearing light beam through 90° and an objective in axial alignment, the axes of the systems being substantially parallel and quite close together, the adjacent edges of the prisms being bevelled to allow them to lie close together, a septum between said prisms to prevent diffusion of light from one prism into the other, means to shift one of the objectives in a vertical direction and means to shift the other objective in a horizontal plane.

3. A device for use in the projection of pictures in color that comprises a tubular supporting frame, a plurality of adjustably mounted optical systems supported thereby, each optical system comprising a Dove erecting prism arranged to turn an image bearing light beam through 90° and an objective in axial alignment, the axes of the systems being substantially parallel and quite close together, the adjacent edges of the prisms being cut away to allow them to lie close together, and a tubular hood telescopically mounted in said frame at one end and serving to enclose the light beams between the optical systems and the film in the projector with which the device is used.

4. A device for use in the projection of pictures in color, that comprises a tubular supporting frame, a pair of objectives mounted in side by side relationship in said frame, each for focusing a separate light beam, Dove erecting prism means aligned with said objectives for turning the images carried by said light beams through 90°, a hood telescopically mounted in said frame at the end that will normally be closest to the film from which the pictures are to be projected, spring means to press said hood towards said film, and a septum mounted within said hood and extending in a direction parallel to said light

beams for preventing the diffusion of one into the other.

5. A device for use in the projection of pictures in color, that comprises a tubular supporting frame, a pair of objectives mounted in side by side relationship in said frame, each for focusing a separate light beam, Dove erecting prism means aligned with said objectives for turning the images carried by said light beams through 90°, a hood telescopically mounted in said frame at the end that will normally be closest to the film from which the pictures are to be projected, spring means to press said hood towards said film, a septum mounted within said hood and extending in a direction parallel to said light beams for preventing the diffusion of one into the other, means for shifting the axis of each of the objectives comprising a mounting member through the medium of which the objective is mounted in the frame, said member being slidably attached to the frame, a manually rotatable rod also mounted in the frame, and an eccentric on one end of said rod adapted to position the said mounting member.

6. A device of the type described that comprises a cylindrical frame, a cylindrical hood telescopically connected to said frame and adapted to extend substantially to the film gate of the projector with which the device is to be used, a plurality of separate objective lens systems mounted in side by side relationship in said frame, each adapted to receive and focus light from a different image, a separate erecting prism means also within said frame for the light projected from each image for rotating the light beam that comes from the image so as to make the projection of the image on the screen appear in an upright position, and septum means substantially separating the lens system and prism means for one of the image beams from the other lens systems and prism means.

7. In a device of the type described for projecting a plurality of images onto a screen in registration, a support, a completely separate objective lens system for focusing each image upon the screen and bringing it into registry with each of the other images, said objective lens systems being mounted within movable housings carried by said support, means to adjust the position of said objective housings with respect to each other, and erecting prism means carried by a housing mounted within said support, said objective adjusting means being supported by said prism housing.

8. In a device of the type described for projecting a plurality of images onto a screen in registration, a frame, a completely separate objective lens system for focusing each image upon the screen and bringing it into registry with each of the other images, said objective lens systems being mounted within movable housings carried by said frame, means to adjust the position of said objective housings with respect to each other, and erecting prism means carried by a housing mounted within said frame, said objective adjusting means comprising rods extending through said prism housing from the front of the device and having an eccentric connection with an objective housing.

9. A device of the type described that comprises a cylindrical frame, a plurality of separate objective lens systems mounted in housings and supported in side by side relationship within said frame, each adapted to receive and focus light from a different image, and erecting prism means mounted in a housing which is also supported within said frame for rotating the light beams that come from the images so as to make the projection of the images on the screen appear in an upright position, said prism housing having guideways in one end thereof for movably supporting an objective housing.

10. A device of the type described that comprises a cylindrical frame, a cylindrical hood telescopically connected to said frame and adapted to extend substantially to the film gate of the projector with which the device is to be used, a plurality of separate objective lens systems mounted in housings and supported in side by side relationship within said frame, each adapted to receive and focus light from a different image, a septum carried by said hood and extending between said lens systems for maintaining complete separation between the light from different images, erecting prism means mounted within a housing which is also supported within said frame for rotating the light beams that come from the images so as to make the projection of the images on the screen appear in an upright position, said prism housing having guideways in one end thereof for movably supporting an objective housing, and means for adjusting said objective housing with respect to the other comprising rods extending through said prism housing from the front of the device and having an eccentric connection with said objective housing.

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