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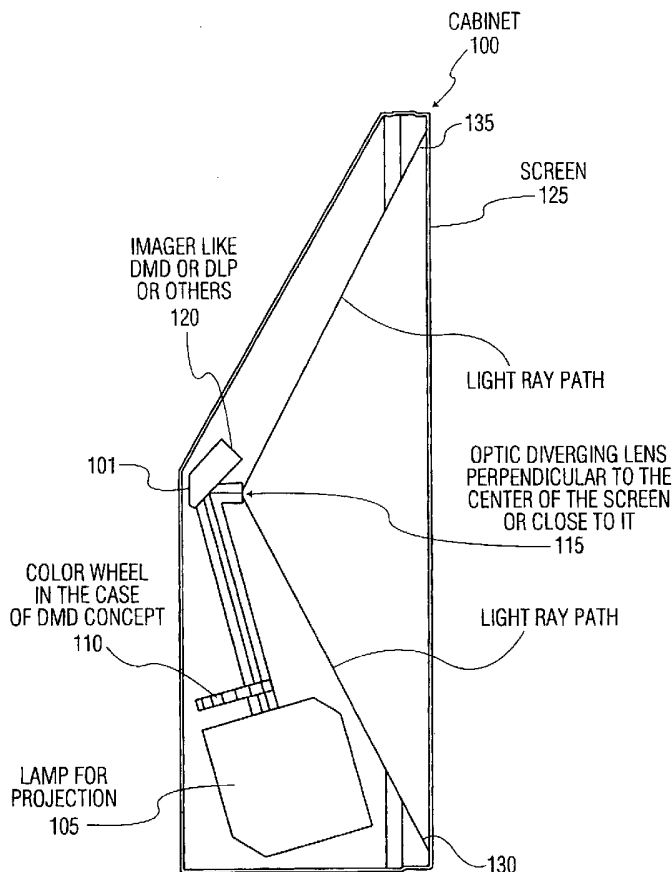
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(54) Title: CENTERED PROJECTION RAY PATH FOR DISPLAY INSTRUMENTS



(57) Abstract: A projection display having a centered projection path through a diverging lens positioned perpendicular and centered with the screen is disclosed. Such a centered projection path eliminates image distortion at the center of the screen.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

CENTERED PROJECTION RAY PATH FOR DISPLAY INSTRUMENTS

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application claims the benefit of U. S. Provisional Patent Application Serial No. 60/618,774 (Atty Docket PU040282), entitled "CENTERED PROJECTION RAY PATH FOR DISPLAY INSTRUMENTS " and filed October 14, 2004, which is incorporated by reference herein in its entirety.

10 **BACKGROUND OF THE INVENTION**

1. Field of the Invention

 The invention relates generally to a projection display and, in particular to the
15 lens position of a projection display.

2. Description of the Background Art

 Some new projection televisions include a light engine that is mounted in the
20 cabinet below the screen. Such projection televisions require very critical stability of the light engine in order to maintain image stability on the screen. This is primarily due to the steep "upangle" that the ray path follows. Small amounts of cabinet creep and/or movement due to thermal expansion mismatches can cause unacceptable image movement on the screen. This deformation may also be caused by sound
25 vibration or instrument vibration causing the instrument to flutter with the sound.

 Previous projection displays have little or no "upangle" in their raypaths. The mounting arrangement used in such projection displays for the light engines is not nearly so sensitive to position and rotational tolerances. These projection displays have used conventional sheet metal and molded plastic mounting systems without
30 regard to thermal expansion differences or creep.

SUMMARY OF THE INVENTION

The present invention relates to a projection display having a centered projection path through a lens positioned perpendicular and centered with the screen. Such a centered projection path eliminates image distortion at the center of the screen.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in greater detail, with relation to the accompanying drawings, in which

FIG. 1 shows a prior art projection display;

FIG. 2 illustrates image mismatch for the prior art projection display of FIG. 1;

FIG. 3 depicts a projection display of the present invention having a centered projection path through a lens positioned perpendicular and centered with a screen; and

FIGS. 4A-4B illustrate front and rear views of the projection display of the present invention.

DETAILED DESCRIPTION

As shown in FIG. 1, an existing projection display comprises a cabinet (not shown) that is formed from a molded plastic and surrounds a light box 20, a mirror 30 and a screen 25. An image from the light box is directed onto the mirror 30 and then reflected onto the screen 25. In FIG. 1 several ray paths 40, 50, 60 illustrate how the light is directed on different regions of the mirror 30 and reflected onto the screen 25. Light directed along ray paths 40, 50, in the middle and top of the screen have a steep angle compared to the screen 25.

FIG. 2 refers to the projection display of FIG. 1 and is directed to the screen 25 and light ray path 50. FIG. 2 illustrates height differences for the ray path 50 due to its steep angle of reflection from the mirror 30 so that image distortion may occur at the center of the screen 25 due to for example normal bowing of the screen or instrument vibration.

The present invention, shown in FIGS. 3-4B consists of a television cabinet 100 including a light engine 101, an optic diverging lens 115, an imager 120 and a screen 125. The light engine includes a projection lamp 105 and a color wheel 110. The image ray path from the light engine is directed through a diverging lens that is coupled to the output of the light engine 101 and is positioned on a line or close to a line that is perpendicular to the screen 125 and centered with it. The diverging lens is preferably positioned perpendicular to an area four square inches about the center point of the screen. In the case of a Digital Light Display (DLP) imager this method allows an arrangement having all the components hidden behind the screen. This arrangement also eliminates the issue of image distortion seen when the light comes at a small angle with respect to the center of the screen. The small angle for the light hitting the screen occurs only on the sides 130, 135, 140, 145 of the screen where the screen cannot move.

The arrangement shown in FIGS. 3-4B, advantageously reduces the height of the projection cabinet, since all the components can be hidden behind the screen.

Although an exemplary projection display which incorporates the teachings of the present invention has been shown and described in detail herein, those skilled in the art can readily devise many other varied embodiments that still incorporate these teachings.

Claims:

1. A projection display, comprising:

a light engine;

5 a diverging lens positioned at the output of the light engine; and

a screen, wherein the diverging lens is positioned perpendicular to the screen and positioned to minimize image distortion on the screen.

2. The projection display of claim 1 wherein the diverging lens is positioned

10 perpendicular to an area four square inches about the center point of the screen.

3. A projection system, comprising:

a light engine;

a diverging lens positioned at the output of the light engine; and

15 a screen, wherein the diverging lens is positioned perpendicular to the screen and positioned to minimize image distortion on the screen.

4. The projection system of claim 3 wherein the diverging lens is positioned

perpendicular to an area four square inches about the center point of the screen.

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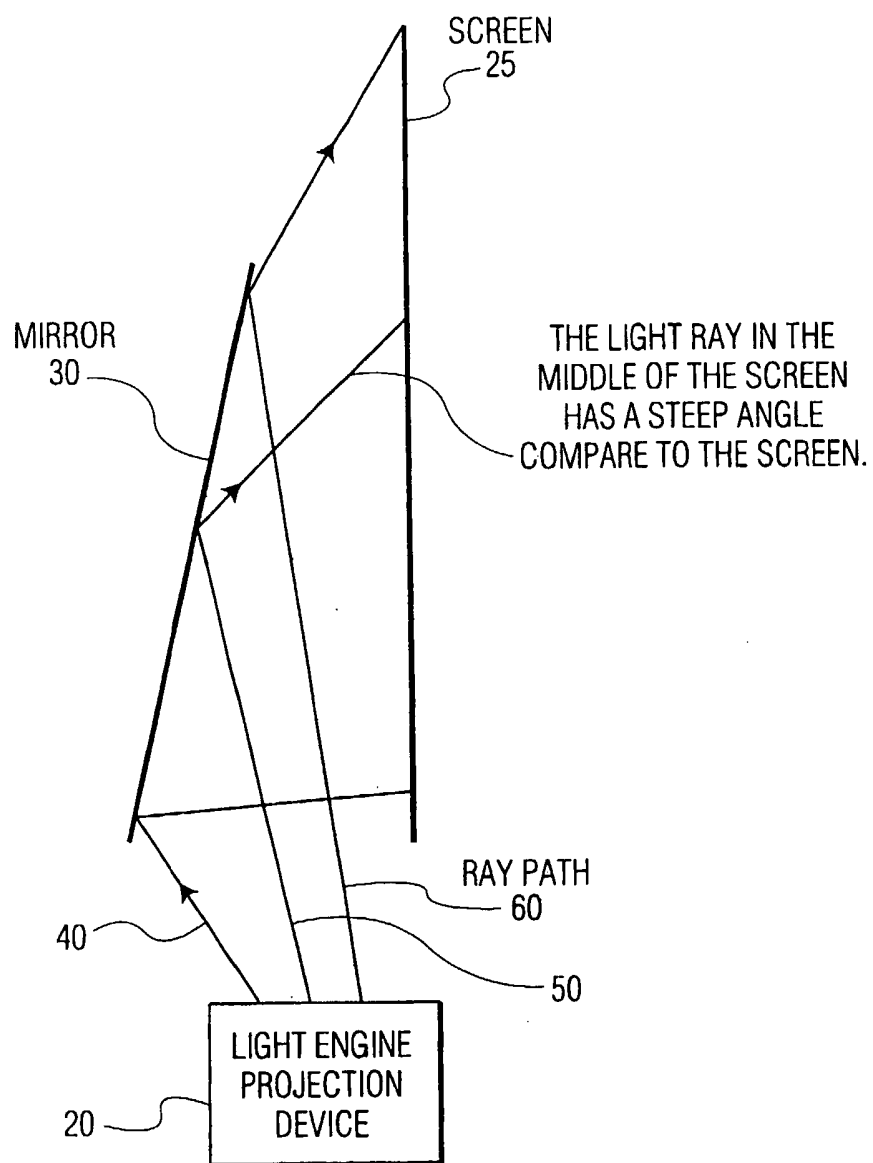


FIG. 1

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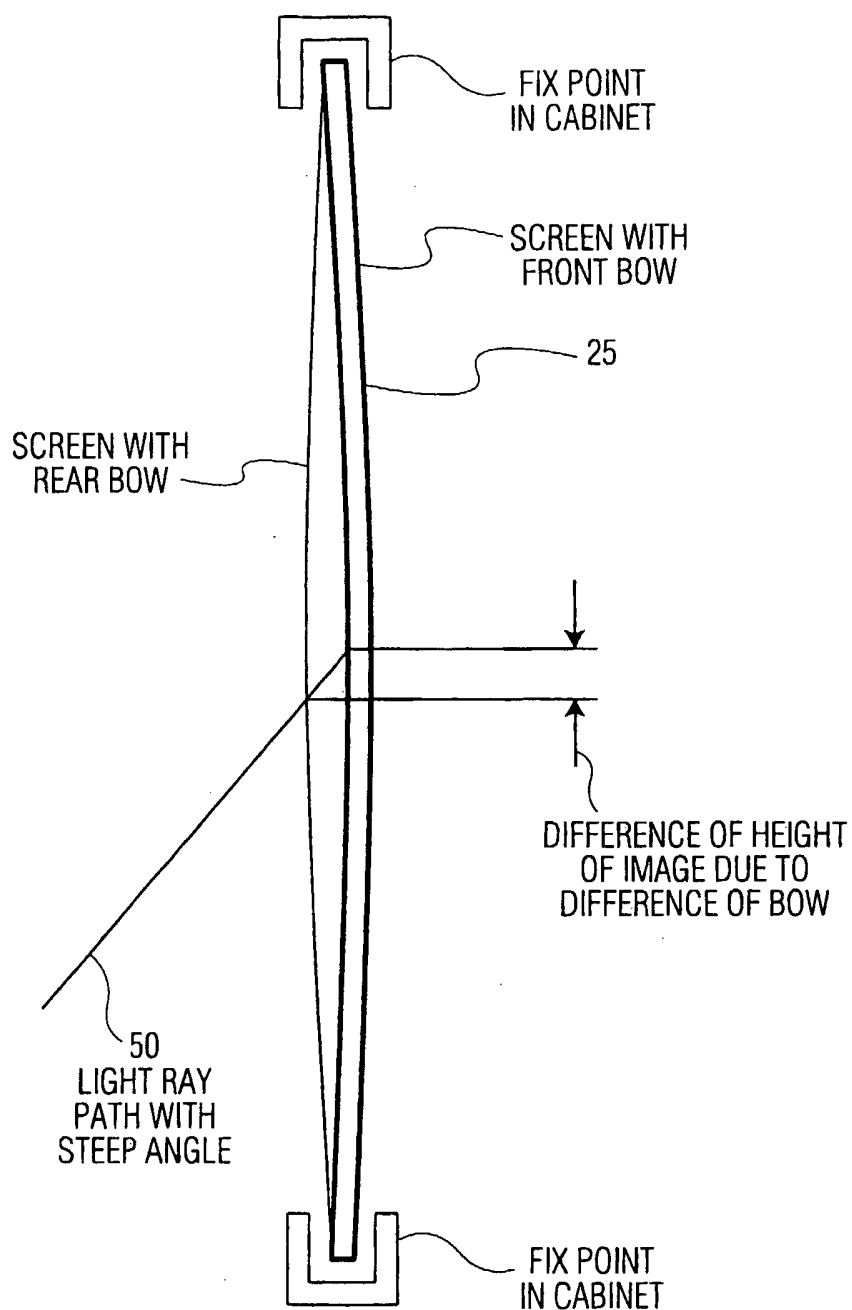


FIG. 2

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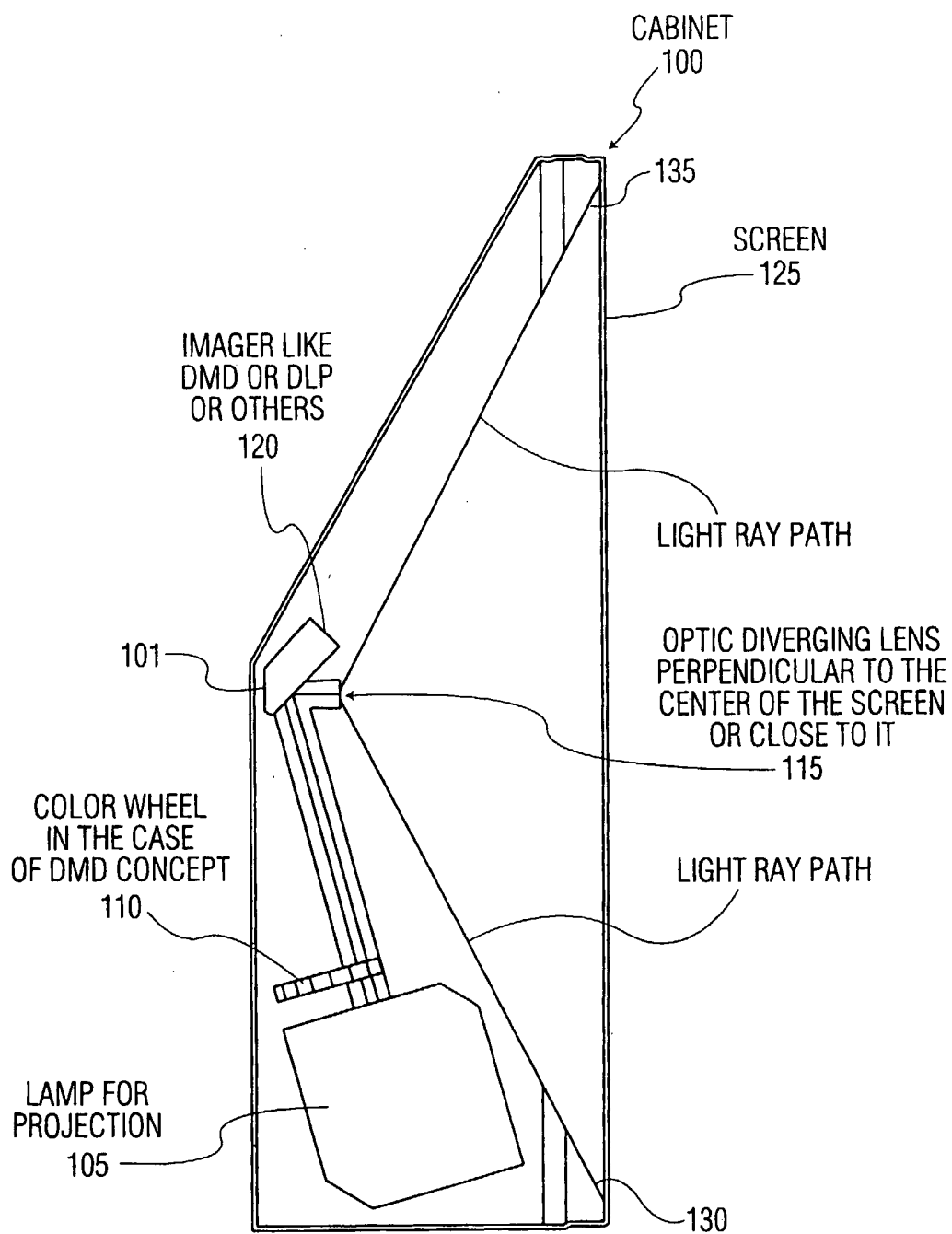


FIG. 3

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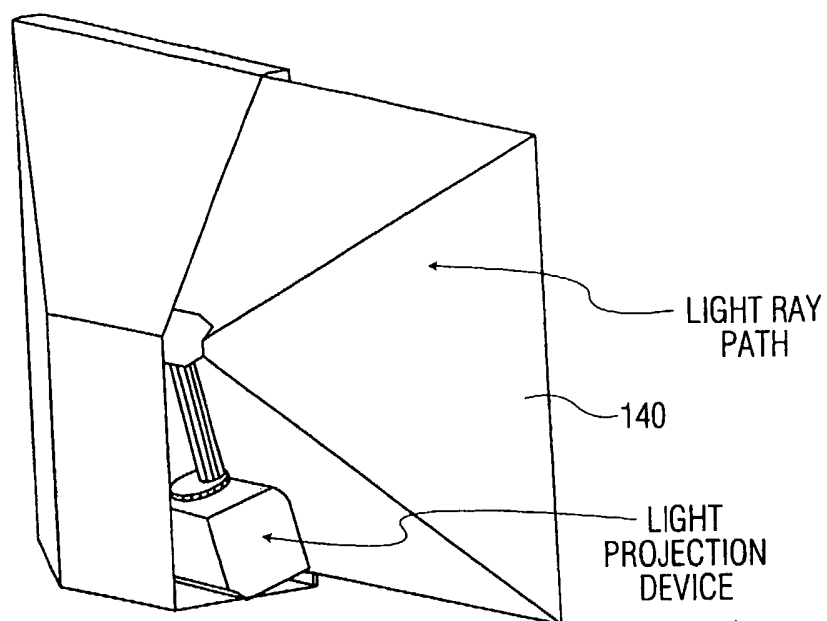


FIG. 4A

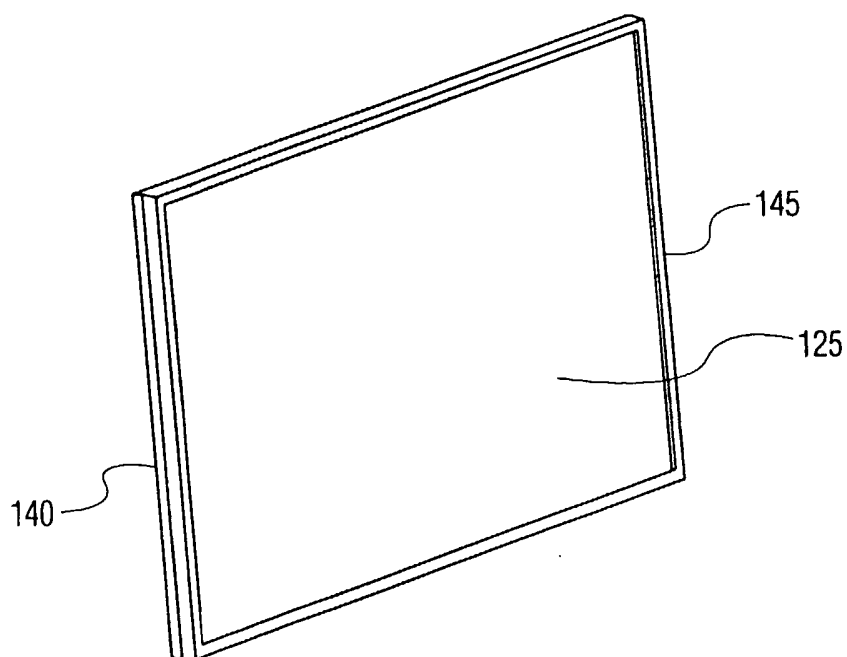


FIG. 4B

INTERNATIONAL SEARCH REPORT

International application No

PC 1, JS2005/036324

A. CLASSIFICATION OF SUBJECT MATTER
H04N5/74 H04N9/31

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 706 062 A (STOLOV ET AL) 6 January 1998 (1998-01-06) abstract column 9, line 46 - line 58 figure 19 -----	1-4



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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PLI, JS2005/036324

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5706062	A	06-01-1998	NONE