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Application number GB

0808593.8

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2. Full name, address and postcode of the applicant or of each applicant *(underline all surnames)*:

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Patents ADP number *(if you know it)*: 9784604001

If the applicant is a corporate body, give the country/state of its incorporation: A British Company

3. Title of the invention:

DISPLAY APPARATUS

4. Name of your agent *(if you have one)*:

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Patents ADP number *(if you know it)*: 6692001

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Signature(s): P. Russell-Rayner Date: 9-5-2008

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant: Pat Russell-Rayner 01462 672538

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DISPLAY APPARATUS

This invention relates to display apparatus.

Many forms of display apparatus are known.

One such display apparatus involving the combined effects of light transmission and reflection is commonly known as 'Pepper's ghost'

One of the problems in relation to the known traditional Pepper's ghost apparatus is that it inherently involves apparatus occupying considerable space in relation to the observed viewable size of the images being presented/produced by the apparatus.

It is an object of the present invention to provide a Pepper's ghost type/form of apparatus that is less demanding on space as compared with known apparatus providing similarly sized images to the viewer.

Broadly according to a first aspect of the invention there is provided a Pepper's ghost form of display apparatus in which a primary image and a secondary image are required to interact, wherein in operation the primary image plane is effectively located along the viewing direction of the virtual image plane in advance of the virtual image plane..

In accordance with a second aspect displaying a primary image/object, means for displaying a secondary image/object , an inclined partially reflective screen interposed in the optical path of the secondary display in such manner that light reflected by the screen is superimposed along the optical path for the primary

display so as to produce a composite three dimensional virtual display optically located to the optical rear of the primary display.

Preferably the primary display is produced by a image display means arranged to produce a image in a plane transverse to a viewing axis of the apparatus, and the primary display plane .

For a better understanding of the invention and to show how to carry the same physical reference will now be made to the accompanying drawings in which

Figure 1 very schematically illustrates the principles of known arrangement for Pepper's ghost apparatus, and

Figure 2 schematically illustrates in a similar manner an arrangement for Pepper's ghost apparatus incorporating the concepts of the present invention.

Referring now to Figure 1 the apparatus shown therein includes a housing 1 that is schematically represented by a horizontal section 2 and a vertical section 3 that is beneath the horizontal section 2.

The horizontal section 2 has a rear end wall 4, a base 5, side walls 6 a top 7, and a front wall 8. This front wall 8 is formed by a transparent viewing window. The vertical section is connected to the base 5 as indicated in the Figure. The vertical section includes a base 9 and upstanding walls 10 whose upper edges connect with the base 6 of the horizontal section 2. As so far discussed the assembly of the two sections 2 and 3 effectively forms as hollow L shaped housing..

A partially reflective screen 11 that is inclined at an angle of approximately 45 degrees to the vertical is provided at the region of the intersection of the two sections 2 and 3..

The relative dimensions of the two sections 2 and 3 and the screen 11 are such that a horizontal central plane 12 extending lengthways of the horizontal section 2 is intersected by the vertical central plane 13 of the vertical section 3 and with the central region 14 of the screen.

With this arrangement the region 14 point of intersection of the aforesaid planes and that of the screen 11 defines the position of the viewing optical axis of the Pepper's ghost apparatus.

Conveniently, if considered appropriate for a particular embodiment of t he apparatus the interior of the two sections can be suitably coated/covered with a black non reflecting coating/covering.

At the base of the vertical section 3 there is located means (not shown) provided means for providing a primary display it is desired to display/exhibit by use of the apparatus. This primary display image can be a static image or object or a dynamic/moving image or object .

As seen in the Figure 1 a portion of he light of the primary image appearing at the screen 11 is reflected by the screen towards the left hand side of the Figure where it can be viewed by a person appropriately positioned with respect to the aforementioned optical axis. The remainder of such light passes through the screen 11.

As a result of the positioning and the inclination of the screen the display that a viewer sees when looking towards the screen will appear as a virtual display 15 at a distance behind the screen effectively equal to the distance between the centre of the screen 11 and that of the primary display source located at the base 9 of the vertical section.

Since it is normally required to view such an image in conjunction with a secondary image the source of the second image is provided at a location optically to the rear of the primary virtual image position,

As shown t this secondary image source 16 is located at the right hand end of the horizontal 2 of the housing 1 and since this second image is located it is to further to the rear of the screen 11 it significantly increases the overall length of the housing and the complexity of its construction

It has been found for many applications of apparatus such as discussed in relation to Figure 1 that the length of the apparatus can introduce inherent disadvantages in some such applications particularly where space for locating apparatus for use and/or transportation of the apparatus, and storage of the apparatus etc..

With a view to significantly reducing the overall size of the apparatus it has been found that by significantly varying the optical arrangements of the apparatus the overall length of the apparatus can be reduced as is indicated in the apparatus schematically shown in relation to Figure 2 which illustrates a Pepper's ghost apparatus incorporating the concepts of the present invention and can be considered as comprising a housing 20 in the form of a single hollow closed container separated into upper and lower sections 21 and 22 by means of an inclined partially reflective screen 23 that is inclined to the horizontal at an angle of 45 degrees.

As shown the housing upper section 21 includes a rear wall 24 (as represented in the Figure), a top 25, side walls 26, and a front wall 27, whilst the lower section 21 includes a base 28, side walls which are actually continuations of the side walls 26 of the upper section, a rear wall that is a continuation of the upper section rear wall 24, and a front wall that is a continuation of the front wall 27,

The portion of the front wall 27 associated with the upper section 21 is formed by a transparent viewing screen.

With this arrangement the primary display source 29 is located at the rear wall 24 of the upper section 2

It will be appreciated that the front to rear dimensions of the housing 20 are such that the wall 24 is at the appropriate optical distance from the screen 23 that enables a viewer located at the intended viewing position 30 to observe the primary display 29 by looking directly though the transparent front wall 27 into the interior of the housing.

The second display which is to be associated with the primary display is produced by means of a display means source, for example, a laptop or note book, or a dynamic image/object located in the vicinity of the base 28 of the housing that is the base of the lower section 22 and in such position that its display may be seen reflected by the inclined screen 23. and this in the interacts with the field of view of the primary display seen by the viewer.

This second display by reason of it being reflected by the screen 23 takes the form of a virtual display is located in a plane that is displaced along the optical axis of the viewing direction relative to the plane of the prime image. As a consequence the viewer observes a three dimensional representation of the combined images to the rear of the plane of the virtual display .

However second image by reason of its association with the screen 23 will appear to the viewer at the viewing position 30 as though it is located at the back of the apparatus and will in practice be optically positioned behind the primary image. at the wall 24 That is to say the virtual image of the apparatus is in the plane this plane being parallel to the plane of the rear wall of the apparatus.

In practice it has been found that since the partial reflectivity of partially reflective materials typically have a reflectance value of some 12% and a transmission value of 84% the brightness of of what is in the Figure 1 arrangement considered to be the virtual image is increased by a factor of 7 since the images directly associated with the inclination of the screen are in practical terms reversed so that the brightness of the secondary image is correspondingly reduced by a factor of 7.

s may be noted from the Figure 2 the virtual display is located to the rear and effectively behind the physical rear of the actual apparatus.

Thus as a result of the proposals of the present invention the physical depth of the housing for the apparatus can be more than halved as compared with known apparatus thereby resulting in a compact installation presenting a relatively bright primary display without undesirable compromising of the perceived 'Pepper's ghost 3 dimensional effect.

From the above it will be noted that a Pepper's ghost apparatus incorporating a single in-line housing construction greatly facilitates the construction of such apparatus in so fare as the sizes and the visual shape of the housing are concerned

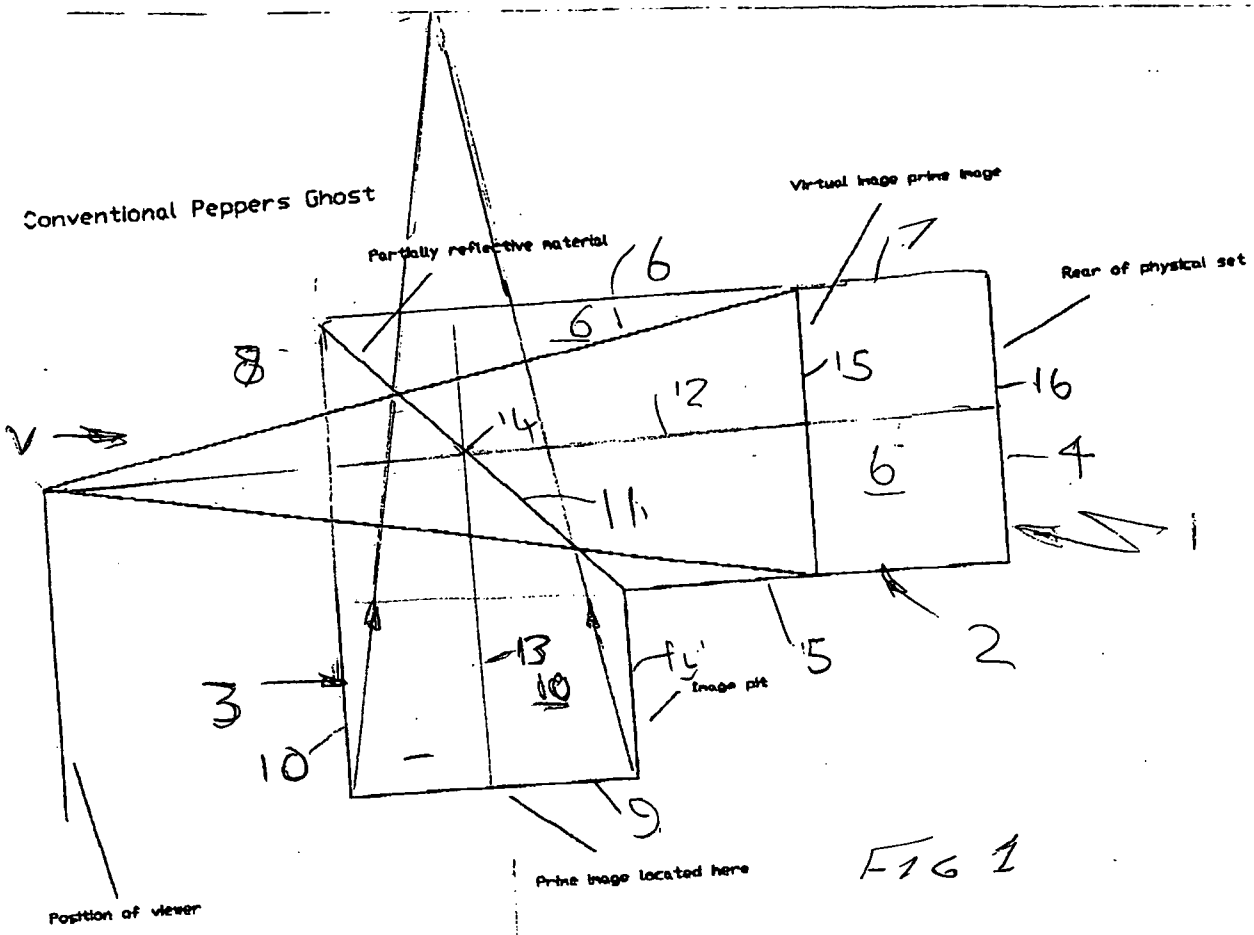
Conventional Peppers Ghost
Partially reflective material
Virtual image prime image
Rear of physical set
Image pit
Prime image located here
Position of viewer

FIG 1

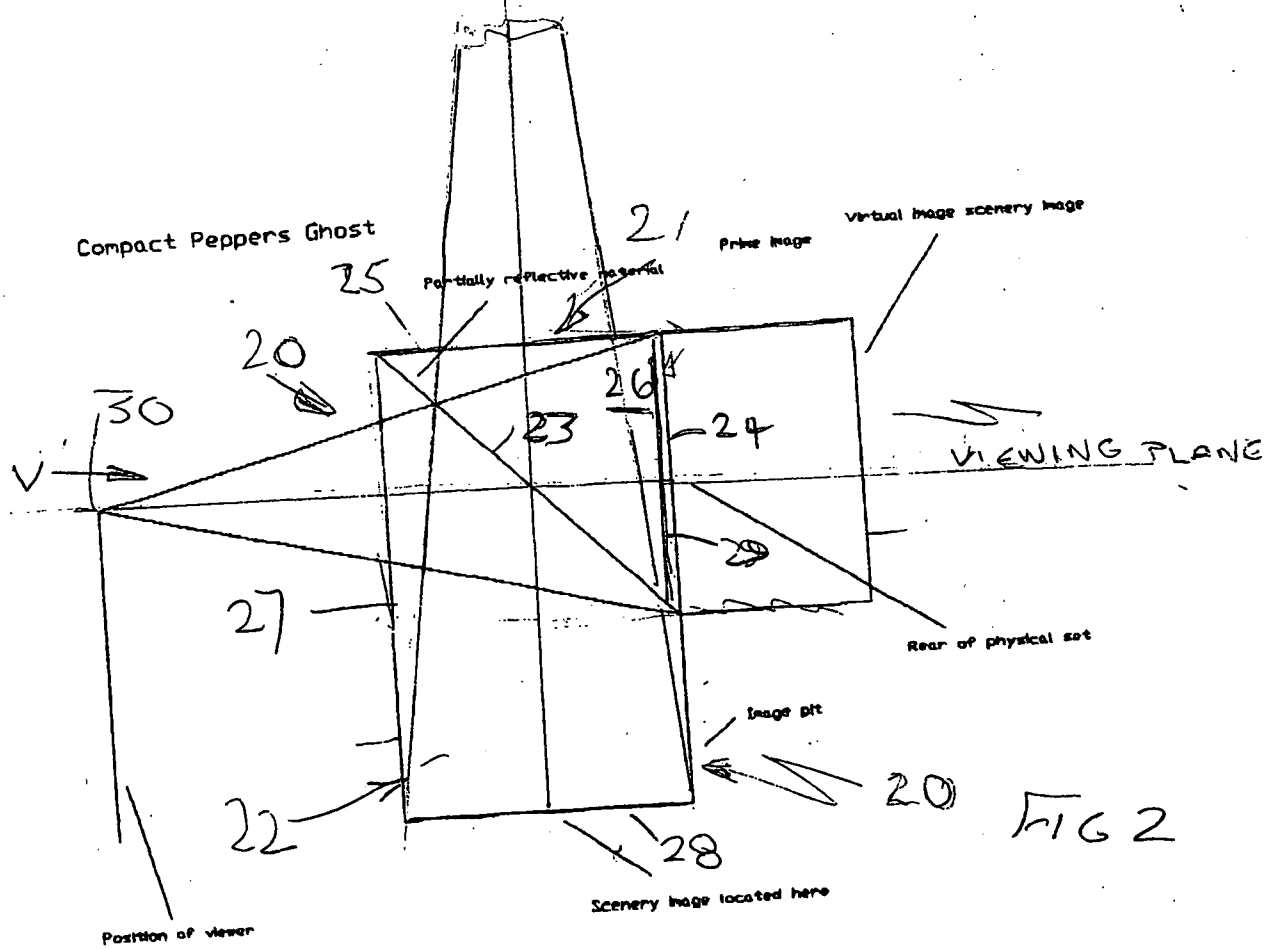
Compact Peppers Ghost
Prime image
Virtual image scenery image
Partially reflective material
VIEWING PLANE
Rear of physical set
Image pit
Scenery image located here
Position of viewer

FIG 2