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[54] **ELECTRO-OPTICAL IMAGE COMPOSITE DISPLAY**

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[52] **U.S. Cl.** .....**250/213 VT,** 178/6.8, 250/83.3 HP, 350/174

[51] **Int. Cl.**.....**H01j 31/50,** G02b 27/14

[58] **Field of Search**.....350/174, 171; 250/213 VT, 83.3 HP; 178/6.8

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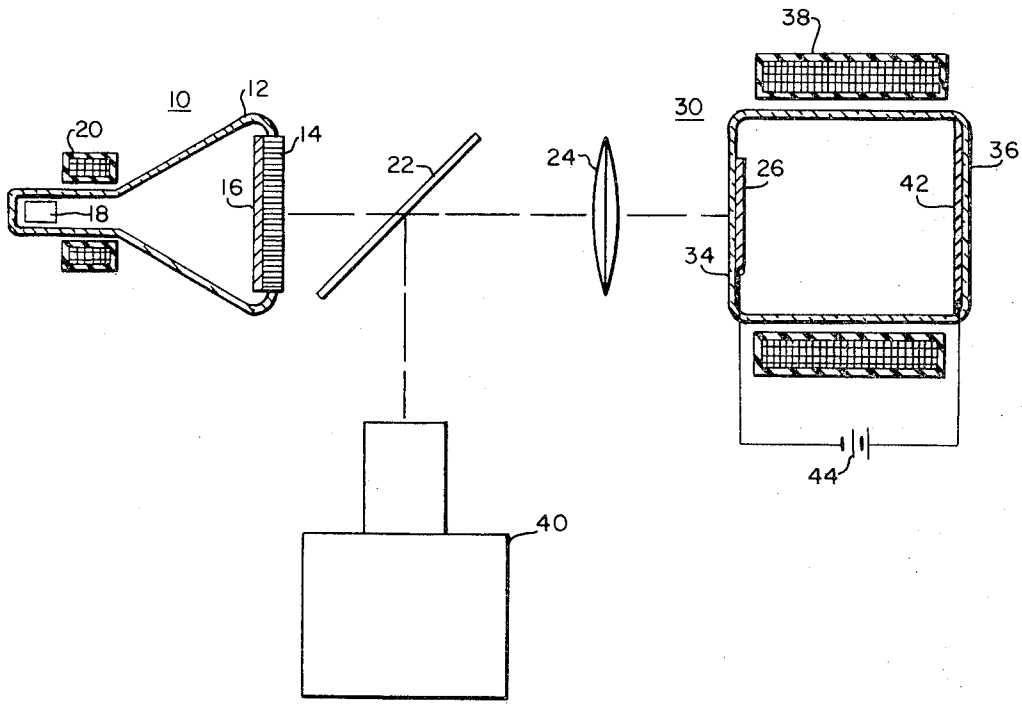
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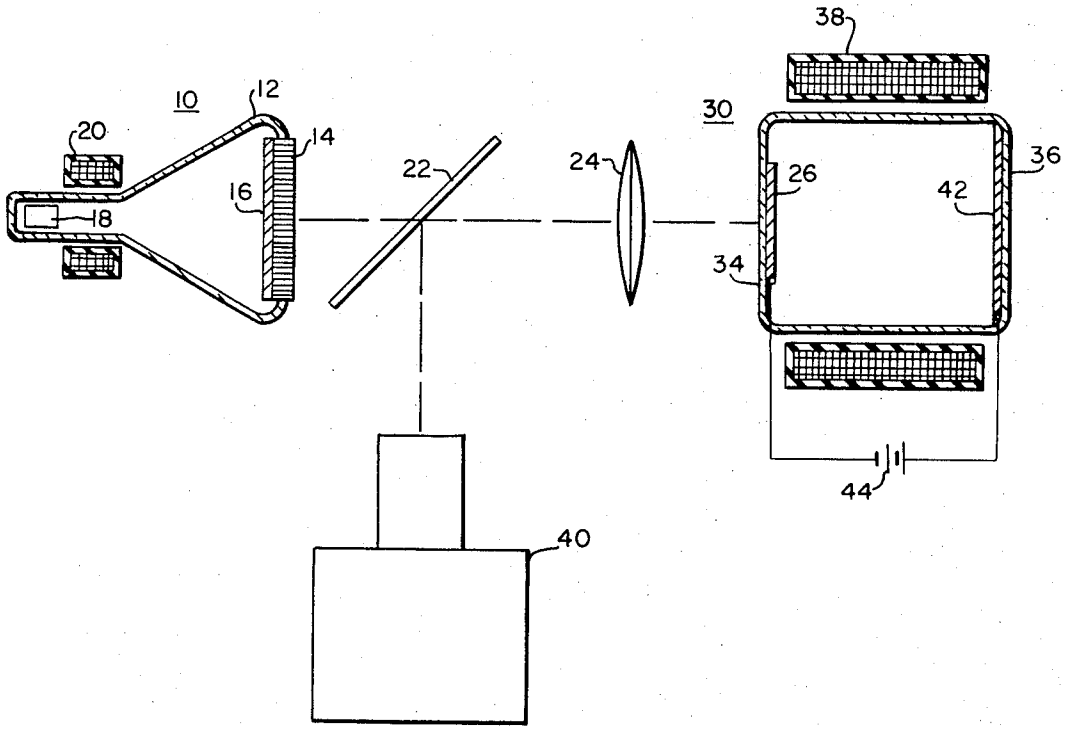
Attorney—F. H. Henson and C. F. Renz

[57] **ABSTRACT**

Electro-optical display system for providing a composite display of an optical image wherein a first image provided by means of a cathode ray display device is superpositioned onto a second image derived from hard copy information such as slides, maps or other character information. The system is comprised of a cathode ray tube with suitable means for directing a first light image generated by the cathode ray tube onto the photocathode of an image intensifier. The second image which may be projected by means of a slide projector is also focused onto the photocathode of the image intensifier. These two images directed onto the photocathode generate an electron image corresponding to the composite image of the first and second image. This electron image is then accelerated and amplified through the image intensifier to provide a visible light display by means of a suitable phosphor positioned at the opposite end of the image intensifier with respect to the photocathode. This output visible image is a composite image of the first two images.

2 Claims, 1 Drawing Figure




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ELECTRO-OPTICAL IMAGE COMPOSITE DISPLAY

BACKGROUND OF THE INVENTION

This invention relates to a method and apparatus for mixing auxiliary hard copy data such as maps, vectors, format, characters, etc. from an optical slide projector with an electrically generated dynamic display data for presentation on a display screen. The electrical generated dynamic display data may be in the form of a conventional cathode ray tube display screen. There are many applications wherein it is desirable to have an effective means of projecting hard copy slide information directly onto the phosphor of a cathode ray tube simultaneously with electrically generated dynamic information. Examples of where such techniques may be found useful are air traffic control centers, satellite control centers, inventory control centers, area surveillance and weather tracking systems where area maps, information bearing alphanumerics, lines, vectors or other nonmoving data can be usefully displayed along with the dynamic electrical data available from devices such as radar or a computer. One present system now utilized in the industry is to project the hard copy data onto a cathode ray tube phosphor screen through one or more optical ports at the rear of the cathode ray tube. This method requires a relatively high power projection lamp or lamps and produces a background brightness resulting in reduced contrast and overall effectiveness of the electrically generated display. The cathode ray tube also must have a relatively thin phosphor which may cause poor quality in the projected data since the image has to penetrate the cathode ray tube phosphor.

SUMMARY OF THE INVENTION

This invention is directed to an optical system which utilizes a cathode ray tube of conventional design for providing a first image representative of the dynamic information. A second image provided by means of hard copy data is projected by means of a slide projector and both the first and second images generated by these two devices are imaged via a beam splitter onto the photocathode of an image converter tube. As a result, a photoelectron image is generated from the photocathode of the image converter tube which is a composite image of the two optical images projected onto the photocathode. The photoelectron image is accelerated and focused onto a phosphor display screen which thereby provides a composite of the hard copy data from the slide projector and the dynamic information from the cathode ray tube in a visible display.

BRIEF DESCRIPTION OF THE DRAWING

For a better understanding of the invention, reference may be had to the preferred embodiment, exemplary of the invention illustrating a schematic diagram embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring in detail to the drawing, a cathode ray tube **10** is illustrated which may be of any suitable type which includes an envelope **12**, and a faceplate portion **14**. The faceplate portion **14** may be of a fiber optic type structure and a phosphor screen **16** is provided on the inner surface of the faceplate **14**. An electron gun **18** is provided at the opposite end of the envelope **12** and generates an electron beam which is scanned by any suitable electrostatic or electromatic deflection means such as the coil **20** for deflecting the electron beam in a suitable scanning pattern over the phosphor screen **16** to provide a dynamic image representative of information applied to the electron gun **18**. This electrical information applied to the electron gun **18** may be in the form of radar or computer information which is of a dynamic nature in information. The light image generated by the phosphor layer **16** is directed through a half silvered mirror **22** and focused by means of a lens **24** onto the photocathode **26** of an image converter tube **30**.

The hard copy information which may be in the form of a map, for example, is projected by means of a slide or film projector **40** onto the half silvered layer **22**. The light image from the slide projector **40** will be reflected by the mirror **22** through the focusing lens **24** onto the photocathode **26** of the image converter **30**.

The result is that the two light images generated by the cathode ray tube **10** and the slide projector **40** are projected onto the photocathode **26** and generate an electron image corresponding to the composite images. The image converter or amplifier **30** may also be of any suitable design and consists of an envelope **32** having an input window **34** and an output window **36**. The image converter tube **30** may be of any suitable type and may be of an electrostatic focus or electromagnetic focus and in the specific embodiment shown a focus coil **38** is illustrated for focusing the electron image from the photocathode **26** onto a phosphor output screen **42**. A suitable accelerating voltage is provided between the photocathode **26** and the output screen **42** by means of any suitable potential source such as the battery **44**. In this manner, the photoelectron image emitted by the photocathode **26** in response to the projection of the two images from the cathode ray tube **10** and the projector **40** are imaged on the output phosphor **42** to provide a visible image corresponding to the information within the photoelectron image.

By this combination one is able to maintain control of the brightnesses of the two sources **10** and **40** so as to obtain a desired contrast on the output image provided on the phosphor screen **42**. In addition, the image converter provides means of amplification of the image directed onto the photocathode **26** to provide a high brightness output image.

I claim as my invention:

1. An electro-optical system comprising a cathode ray display means for providing a first image representative of dynamic information of a scene, a second means for providing a second image representative of stationary information of the scene and different than said first image, an image converter tube comprising a photocathode and an output phosphor display screen, a half silvered mirror positioned in the optical path between said display means, said second means and said image converter tube so as to combine said first and second images and direct the composite image display to said image converter tube, and an optical system for focusing said first and second images onto the photocathode of said image converter tube to

generate an electron image from said photocathode representative of the composite display of said first and second images, and means for accelerating and focusing said photoelectron image onto said phosphor output screen to provide a visible display representative of the composite display of said first and second images.

2. A system as set forth in claim 1 wherein said first information is of a moving nature and wherein said second information is of a relatively stationary information with respect to said first information.

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