

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 31

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte DOUGLAS W. ANDERSON,  
THOMAS D. FISHER, GREGORY A. HATCH,  
TOMMY D. WRIGHT and CHRISTINE R. SPIEGL

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Appeal No. 96-1445  
Application 08/371,684<sup>1</sup>

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ON BRIEF

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Before THOMAS, HAIRSTON and BARRETT, Administrative Patent Judges.

THOMAS, Administrative Patent Judge.

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<sup>1</sup> Application for patent filed January 12, 1995. According to the appellants, this application is a continuation of Application 08/082,312, filed June 24, 1993, now abandoned.

DECISION ON APPEAL

Appellants have appealed<sup>2</sup> to the Board from the examiner's final rejection of claims 1 to 32, which constitute all the claims in the application.

Independent claim 1 is reproduced below:

1. A three dimensional display system comprising:

(a) a light transmitter having a plurality of light transmitting elements for simultaneously generating a plurality of beams of light, each of said beams of light comprising a portion of a predetermined image, the totality of said beams of light comprising said predetermined image;

(b) a controller for controlling each of said light transmitting elements to periodically form said predetermined image from said beams of light comprising a portion of said predetermined image in a predetermined x-y plane;

(c) a light receiver/transmitter to receive and transmit said predetermined image along an axis passing through said x-y plane; and

(d) a rotating receiver having an axis of rotation along said axis for receiving and displaying said predetermined image, said light receiver being rotatable about said axis.

The following references are relied on by the examiner:

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<sup>2</sup> The notice of appeal filed on July 17, 1985 lists only claims 1 to 31 and not claim 32. We consider the failure to list claim 32 in the notice of appeal as an inadvertent error.

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Hirsch 19, 1963	3,077,816	Feb.
Ernstoff et al. (Ernstoff) 08, 1977	4,006,968	Feb.
Collender Sep. 15, 1981	4,290,083	
Hornbeck 29, 1991	5,061,049	Oct.

Claims 1 to 32 stand rejected under 35 U.S.C. § 103. As evidence of obviousness, the examiner relies upon the collective teachings of Hirsch, Collender, Hornbeck and Ernstoff.

Rather than repeat the positions of the appellants and the examiner, reference is made to the briefs and the answer for the respective details thereof.

#### OPINION

We sustain the above noted rejection of all claims on appeal under 35 U.S.C. § 103. Although the examiner appears to contend in portions of the answer that certain teachings of one reference could be used in another reference and that other features can be substituted in the teaching of another reference, the essential point of the examiner is correct, that being that the collective teachings of the references clearly would have indicated to the artisan that a planar

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image is transmitted substantially simultaneously to convey an entire field of information or a total image.

The three dimensional display system of the preamble of independent claim 1 on appeal is shown in essence in both Hirsch and Collender. A three dimensional display is essentially conveyed to a viewer in both references by means of rotating a two dimensional image by the action of stereoscopy. In reaching this conclusion of obviousness of the subject matter of the claims on appeal we are mindful that in the middle of page 2 of the specification appellants have defined the term "simultaneously" as "appearing to the viewer to be simultaneous-- even though the points of light are not initially generated simultaneously in time." Hirsch's flash lamp 110 conveys a beam of light to film 135, each frame 146 of which yields a x-y planar image of light beams convey through various mirrors and optics to a coaxial rear projection screen 56 in Fig. 1. This screen 56 rotates in unison with the rest of the optics and mirrors to display in a three dimensional form the planar image from each film frame 146.

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The bottom of col. 1 of Hirsch indicates that the prior art utilized cathode ray tubes as a rotatable image projection apparatus to a rotating screen. However, the top of col. 2 of this reference indicates that it was considered to have been an advantage in Hirsch that a moving film projector would have generated an entire sectional image at once, thus not requiring the use of scanning techniques as in the cathode ray tube approach of the prior art to Hirsch. The advantage was that whole sectional images of scenes were displayed for an entire period of the screen movement to add increased detail and image intensity to the viewer. Color film was also taught as well. This analysis is basically repeated at col. 6, beginning at line 22.

Although Hirsch would have indicated to the artisan that the use of television images, which must inherently be scanned in a raster-scan approach, would have been a disadvantage for such a three dimensional display system, Collender's approach allows TV signals to be conveyed in a three dimensional manner to the viewer. Collender's approach allows successive whole frames of television information to be scanned individually and successively for a viewer to enjoy in a three dimensional

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depiction. Note the abstract at lines 10 to 19; col. 1, lines 25 through 37; col. 5, lines 13 through 15; col. 5, line 64 through col. 6, line 19 and col. 6, lines 32 through 48 as they relate to teachings associated with Fig. 6 of Collender.

The essential means to achieve this approach is by means of 24 CCDLCLV x-y planar elements over arrayed in an arc corresponding to the showing of element 2 in Figs. 1 and 2B. In contradistinction to appellants' arguments, each of these elements is not merely a CCD but is also a liquid crystal light valve LCLV. Appellants' own positions in the brief relative to Collender indicate that the charged couple array provides a data storage capability which feeds the liquid crystal light valves in parallel with data collected in the CCD's. Thus, the planar type image of a television frame in Collender is permitted to be depicted substantially simultaneously to the extent claimed. From an artisan's perspective then, the teachings in Collender would have been an obvious enhancement to the overall approach taken by Hirsch since entire television frames of information may be depicted in the same manner that a motion picture frame 146 in Hirsch may be depicted in its entirety in a successive manner and,

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whereas Hirsch's approach disfavored the use of television type signals through a CRT device, Collender's device permits such a signal and type of information to be conveyed in a three dimensional environment.

The details of the CCDLCLV element discussed have been known in the prior art beginning at col. 7, line 26 of Collender. Indeed, this portion, at lines 60 through 63, makes a specific cross reference to Ernstoff, another reference relied upon by the examiner in this rejection, by patent number to provide a color capability to the liquid crystal matrix array described in that reference. Col. 8, lines 8 through 12 also indicate that other solid state imaging surfaces may be used to produce image arrays either by reflective or transmissive means indicating that the liquid crystal approach was merely cited as one of those means. To the artisan, this logically leads to Hornbeck's teachings.

As to Ernstoff, it appears that each picture element forming an entire planar color image is formed by three primary color components using band reflective mirrors such as dichroic mirrors in the back of the liquid crystal materials forming the planar matrix array. Each color "cell" in this

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reference is formed of the triads represented in Fig. 4 where element 57 in Fig. 6A shows the dichroic reflector mirrors. The discussion at col. 3 of this reference conveys to the reader the recognition that such a full color flat panel liquid crystal display apparatus in Ernstoff may replace an ordinary cathode ray tube device, discussed in Hirsch and normally used to convey television information as in Collender. At least these portions of Ernstoff are pertinent as relating to the dichroic mirrors: Col. 6, lines 27 through 32 and col. 7, line 53 through col. 8, line 4. As recognized by Collender, noted earlier, the color image capability of Ernstoff would have conveyed to the viewer plural beams of light from a single planar matrix, each beam conveying a separate color for convergence as a common beam for the viewer.

The teachings in Hornbeck, utilized by the examiner as the fourth reference of the combination utilized to reject all the claims on appeal, is a specifically cross referenced prior art document utilized by appellants as the basis for their matrix of digital micromirror devices (DMDs) noted in the paragraph bridging pages 12 and 13 of the specification as

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filed. It is therefore recognized that such teachings in Hornbeck provide a two dimensional image. Array Fig. 31 of this reference shows two rows of pixels, which in itself is a two dimensional array. Such an array was utilized in the printing apparatus shown in Figs. 32a and 32b. A larger planar array is shown in Figs. 42a and 42b.

The obvious substitutability of the spatial light modulators (SLM) of Hornbeck, as reasoned by the examiner, for the CCDLDV devices of Collender/Ernstoff is derived by a careful study of Hornbeck's teachings. The examiner has made a general reference to both cols. 1 and 2 of Hornbeck. Col. 1, lines 32 through 34 indicate that such SLMs has found numerous applications in the art for projection displays. Certain SLM devices employed various effects such as liquid crystal as indicated at col. 2, lines 11 through 18. A combination of a CCD and LC array is noted at the bottom of col. 2, again which portion was specifically cross referenced in the statement of the rejection. This is precisely the same type of device specifically taught as usable in the three dimensional projection device of Collender. The discussion beginning at col. 3 indicates that another SLM type of device

may be fabricated in both one and two dimensional arrays, the deformable mirror, the discussion of which begins at col. 4, lines 5 to 11 and indicates that they may be utilized in linear or areal patterns for display purposes. Thus, it would have been apparent to the artisan that these teachings of Hornbeck clearly cross correlate and indicate the substitutability of the DMD devices of Hornbeck for the prior art approach depicted by the Collender/Ernstoff approach. Indeed, the linear and areal arrays of pixels, each of which may be individually addressable and containing at least one deflectable reflecting beam of light, form the essence of the teachings in Hornbeck beginning at col. 9, line 15. His spatial light modulators were also therefore called deformable mirror devices DMDs. From a study of Ernstoff's structure providing the color image capability of Collender's device, each pixel or cell in Ernstoff would apparently be substantially colorless until the dichroic mirrors were placed in such a position as to reflect a certain color to the viewer for each pixel or cell. In a similar manner, the deflectability of the reflecting beam of the spatial light modulators in Hornbeck would have achieved the same effect by

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the use of deformable mirror devices. The use of the dichroic mirrors in Ernstoff would have thus been an obvious enhancement to the SLM/DMDs of Hornbeck to achieve the conveyance of individual color beams to the viewer.

We are therefore convinced that despite the earlier noted inadequacy with respect to the examiner's reasoning of the statement of the rejection, the art relied upon itself conveys an analytical or substitutional linkage among the references themselves in such a manner to arrive at the subject matter of each of the claims on appeal. Stated differently, the teachings of each reference relied upon by the examiner obviously would have been combinable to the artisan to arrive at the subject matter of the claimed invention of each claim on appeal in the manner basically reasoned by the examiner which has been embellished here. For example, as to claim 1, the collective teachings of Collender, Ernstoff and Hornbeck would have indicated the simultaneous generation of plural beams of light, that is, plural color beams of light, to form a planar image to the extent that Hirsch's teachings may be construed as presenting only a single beam of light for a planar image. Both Hirsch and Collender teach the specific

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electronic and mechanical controls which are necessary for controlling the rotatability of the receiving screen for the viewer to essentially "see" a 3-D depiction. Various light receiving and transmitting means in the form of mirrors and lenses including the dichroic mirrors of Ernstoff obviously would have been employed to convey a single planar image from plural image sources/beams. Taken in this light, therefore, we do not agree with the positions advocated by appellants in the initial portions of the argument section of the principal Brief on appeal as to independent claim 1 on appeal.

As to the features in dependent claims we note the following. As to claim 2 various circuits clearly control the rotatability of the image projection apparatus in both Hirsch and Collender. The beam intensity control features in dependent claims 3 and 4 are met by the collective teachings of Collender, Ernstoff and Hornbeck. As to the features in dependent claims 5 to 8, they are obviously met by the teachings in Hornbeck, which appellants' own invention relies upon as a basis for their invention disclosure. The simultaneity feature of dependent claims 9 through 16 is taught by Collender and Ernstoff with similar teachings

transferred to Hornbeck's approach utilizing a different structural device. The same may be said of the subject matter of dependent claims 17 through 24, which in turn reflect in part the subject matter of previous claims just discussed. Finally, the dichroic filters in dependent claims 25 through 32 are met by the teachings of Ernstoff and Hornbeck as discussed earlier.

As thus amplified in this opinion, the examiner's position does not appear to us to be based on hindsight or contrived from the reading of the subject matter of the disclosed and claimed invention. It appears also that the DMDs of Hornbeck are a structural analogue to the dichroic mirrors of Ernstoff since each pixel 20 of Fig. 1A of Hornbeck may deflect the beam 30 along hinges 34 and 36 as shown in Fig. 2 of Hornbeck for a particular color representation to the viewer. Appellants repeated reference to the book by Sze relating to CCD devices is misplaced since it represents an incomplete consideration of the teaching value of Collender which does not merely teach CCD devices alone but CCDLCLV devices combined from CCD devices and LCLV devices.

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In view of the foregoing, the decision of the examiner rejecting claims 1 through 32 under 35 U.S.C. § 103 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

	)	
JAMES D. THOMAS	)	
Administrative Patent Judge	)	
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	)	BOARD OF PATENT
KENNETH W. HAIRSTON	)	)
Administrative Patent Judge	)	APPEALS AND
	)	
	)	INTERFERENCES
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