



[54] LENS ARRAY SHEET SURFACE LIGHT SOURCE, AND TRANSMISSION TYPE DISPLAY DEVICE

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[21] Appl. No.: 523,609

[22] Filed: Sep. 5, 1995

[30] Foreign Application Priority Data

Sep. 6, 1994	[JP]	Japan	6-236017
May 18, 1995	[JP]	Japan	7-142386
Jun. 12, 1995	[JP]	Japan	7-167861

[51] Int. Cl.⁶ G02B 27/10

[52] U.S. Cl. 359/443; 359/452; 359/400

[58] Field of Search 359/443, 452, 359/453, 454, 459, 460, 591, 592, 594, 596

[56] References Cited

U.S. PATENT DOCUMENTS

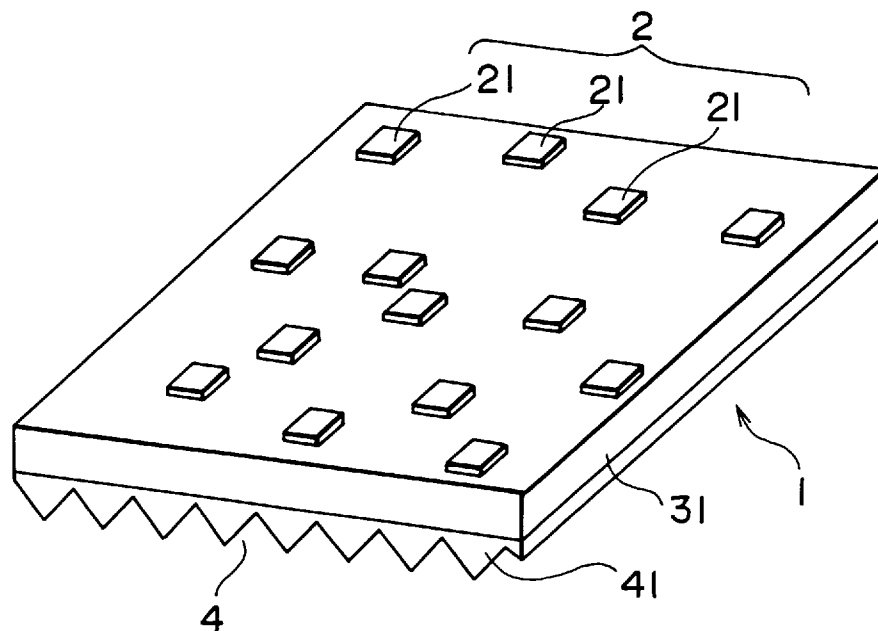
5,592,332 1/1997 Nishio et al. 359/619

Primary Examiner—Daniel P. Malley
Attorney, Agent, or Firm—Parkhurst & Wendel, L.L.P.

[57] ABSTRACT

A lens array sheet according to the present invention, comprising a transparent substrate, a lens array having lens elements that are one-dimensionally or two-dimensionally formed on the front surface of the transparent substrate, and a cluster having a large number of cluster members randomly formed in a prism shape on the rear surface of the transparent substrate, each of the length, the width, and the height of each of the cluster members being in the range from the wave length of source light to 500 μm. Thus, a lens array sheet that effectively uses light energy of the light source, maintains the light condensing effect, prevents the luminance from deteriorating, homogeneously distributes the luminance on the light emitting surface, prevents equal-thickness interference fringes and wasteful light dispersion to out of the angular range of visual angle can be provided. In addition, a surface light source having the lens array sheet is provided. Moreover, a bright transmission type display device having the surface light source is provided.

14 Claims, 18 Drawing Sheets



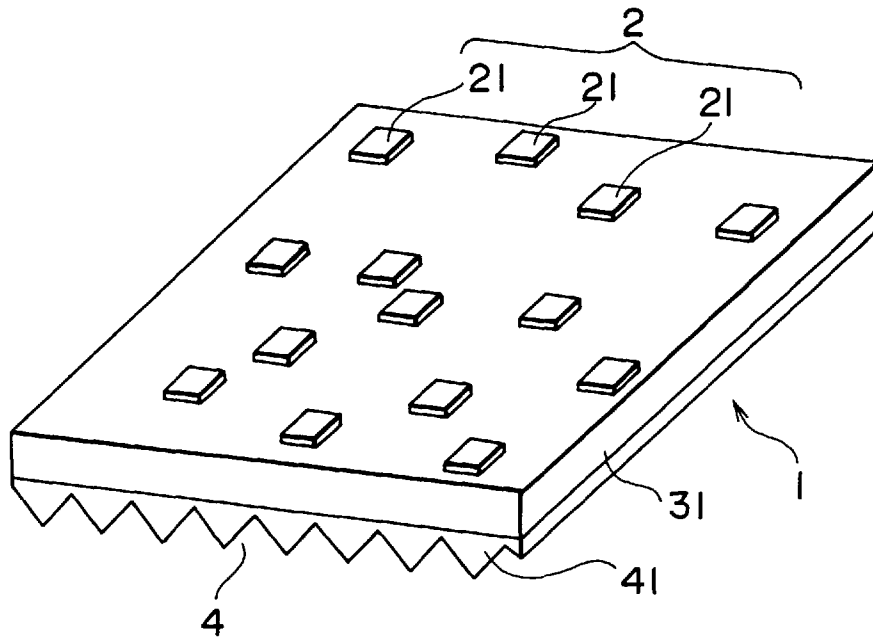


FIG. 1

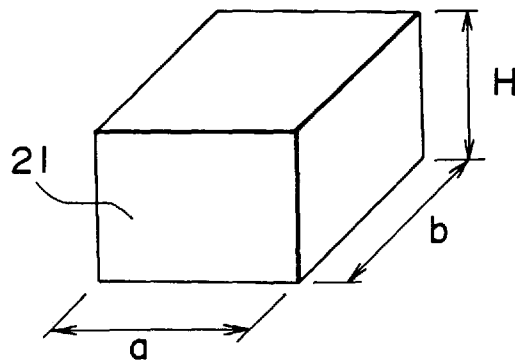


FIG. 2

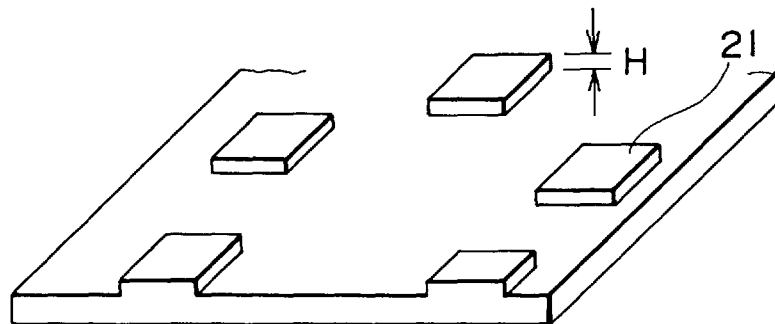


FIG. 3

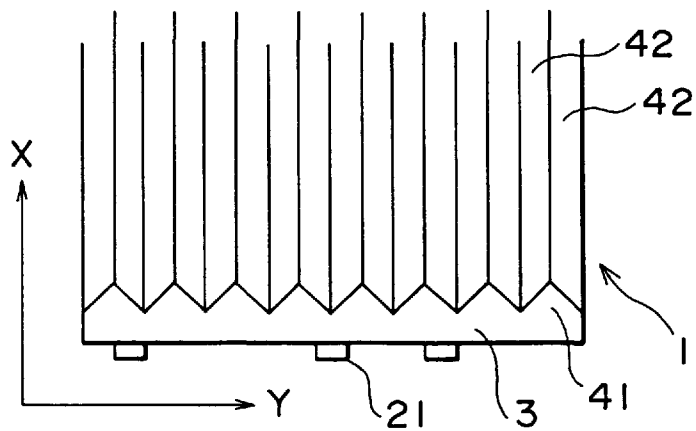


FIG. 4A

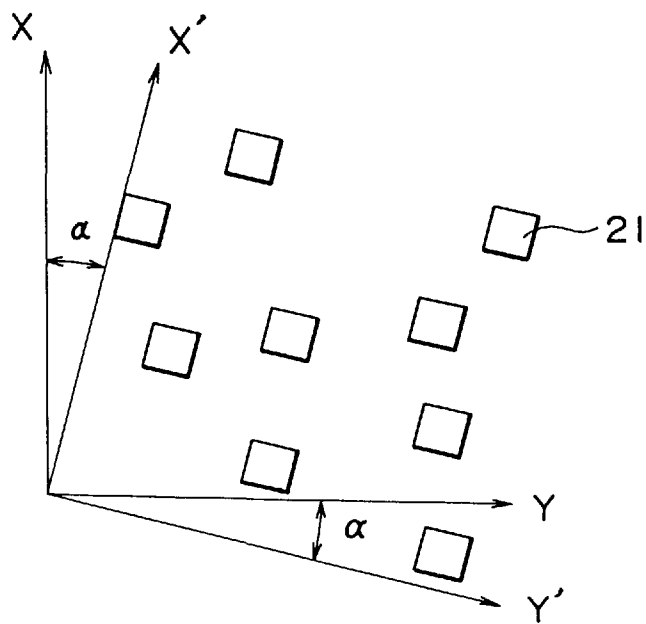


FIG. 4B

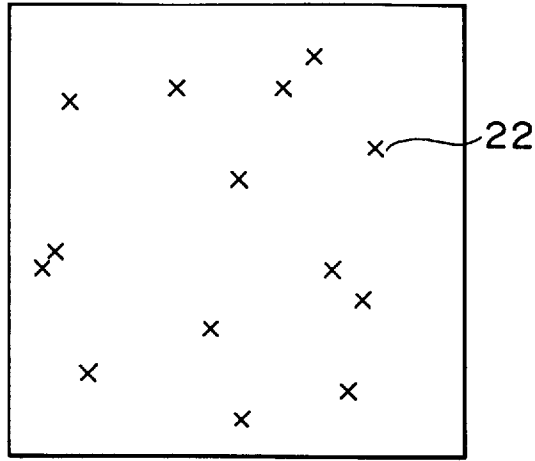


FIG. 5A

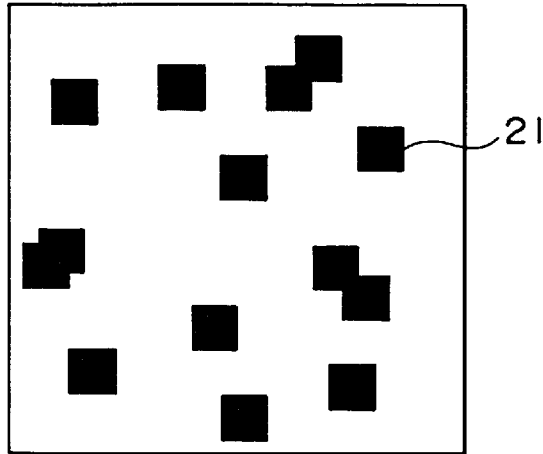


FIG. 5B

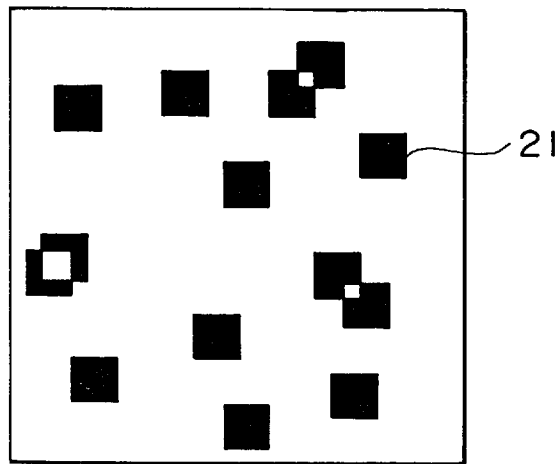


FIG. 5C

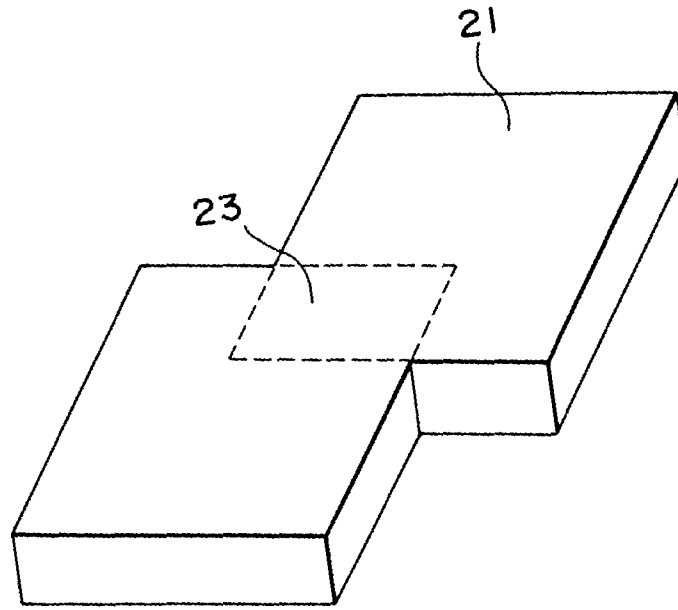


FIG. 6A

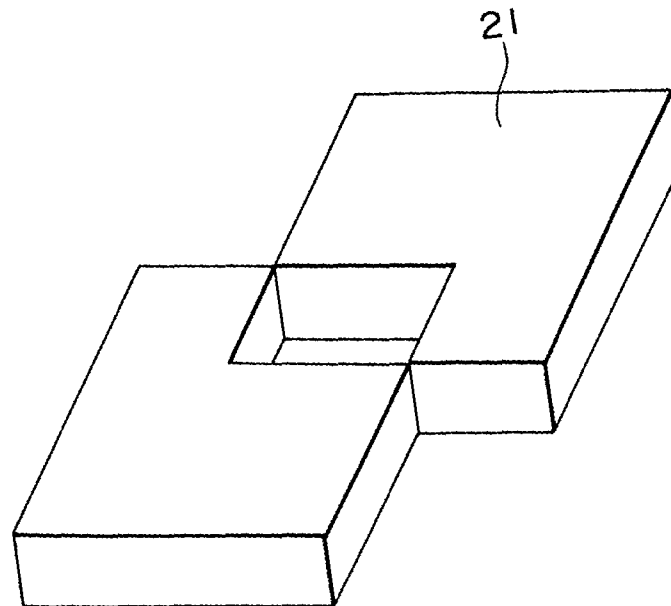


FIG. 6B

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