

(12) **United States Patent**  
**Masaki et al.**

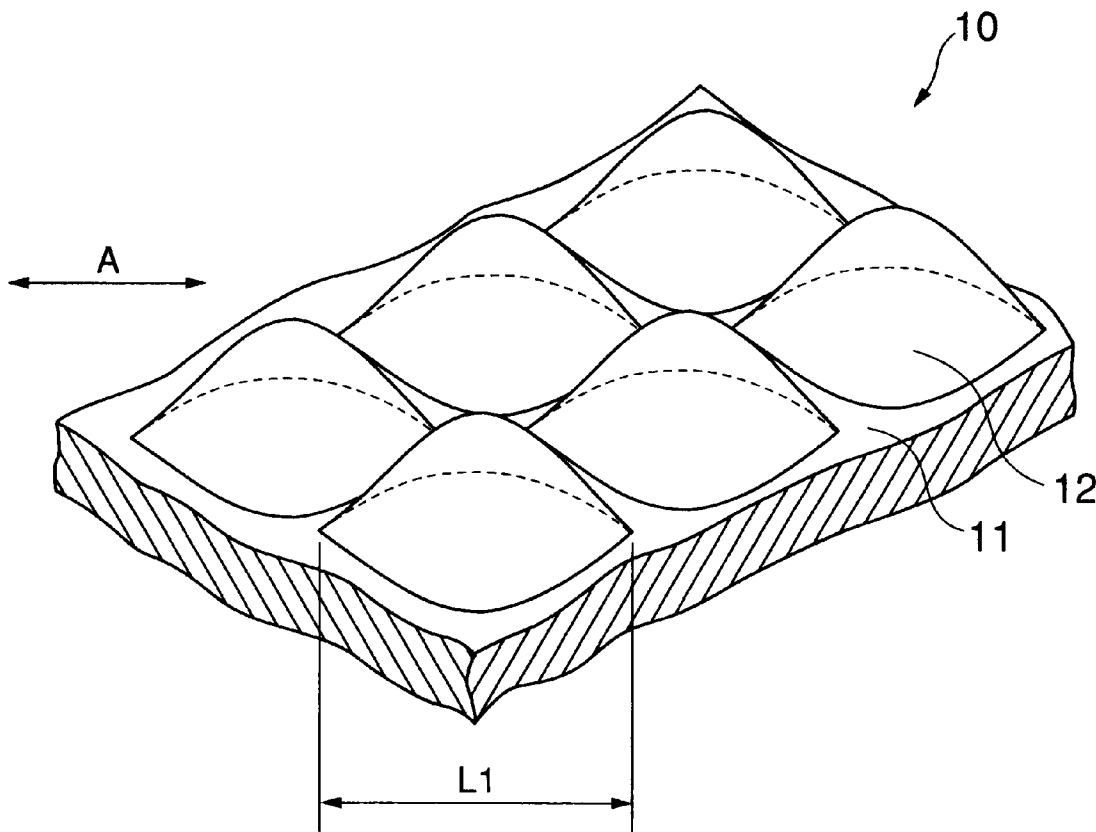
(10) **Patent No.:** **US 6,505,959 B2**  
(45) **Date of Patent:** **Jan. 14, 2003**

- (54) **DIRECTIONAL DIFFUSING FILM**
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Fumihiko Arakawa, Tokyo-To (JP)**
- (73) Assignee: **Dai Nippon Printing Co., Ltd. (JP)**
- (\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.
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- (51) **Int. Cl.<sup>7</sup>** ..... **F21V 5/02**
- (52) **U.S. Cl.** ..... **362/339; 362/31; 349/64;  
349/112; 264/167**
- (58) **Field of Search** ..... 362/26, 27, 31,  
362/337, 339; 349/64, 112; 359/599, 621,  
622, 623, 624; 264/467, 167

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*Primary Examiner*—Sandra O’Shea  
*Assistant Examiner*—Guiyoung Lee  
(74) *Attorney, Agent, or Firm*—Parkhurst & Wendel, L.L.P.

(57) **ABSTRACT**  
A directional diffusing film of the invention includes a base film, and a plurality of convex directionality-providing elements regularly arranged on at least one surface of the base film. A section of a first directionality-providing element in a first plane including a top of the directionality-providing element has a shape of a substantially triangle, and a section of the directionality-providing element in a second plane including the top of the directionality-providing element and perpendicular to the first plane has a top of a second directionality-providing element and a shape of a continuous wave. The directional diffusing film having characteristics specified by the invention can diffuse light in proper directionally diffused light, while maintaining high light-diffusing ability. The directional diffusing film utilizes light highly efficiently as compared with conventional diffusing films.

**11 Claims, 7 Drawing Sheets**



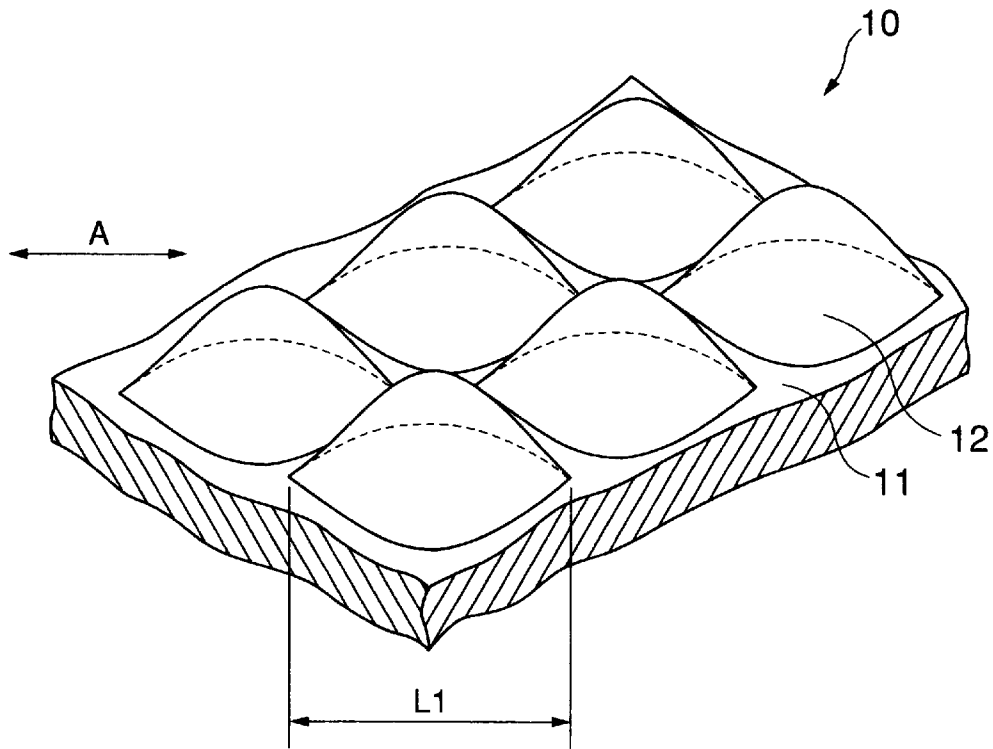


FIG.1A

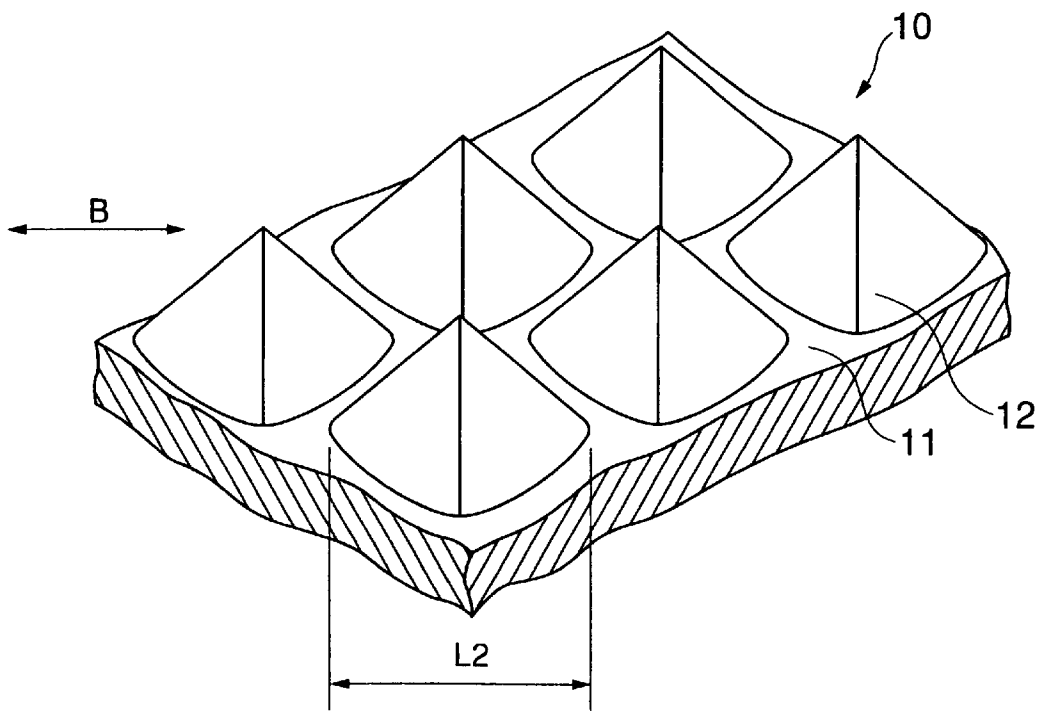


FIG.1B

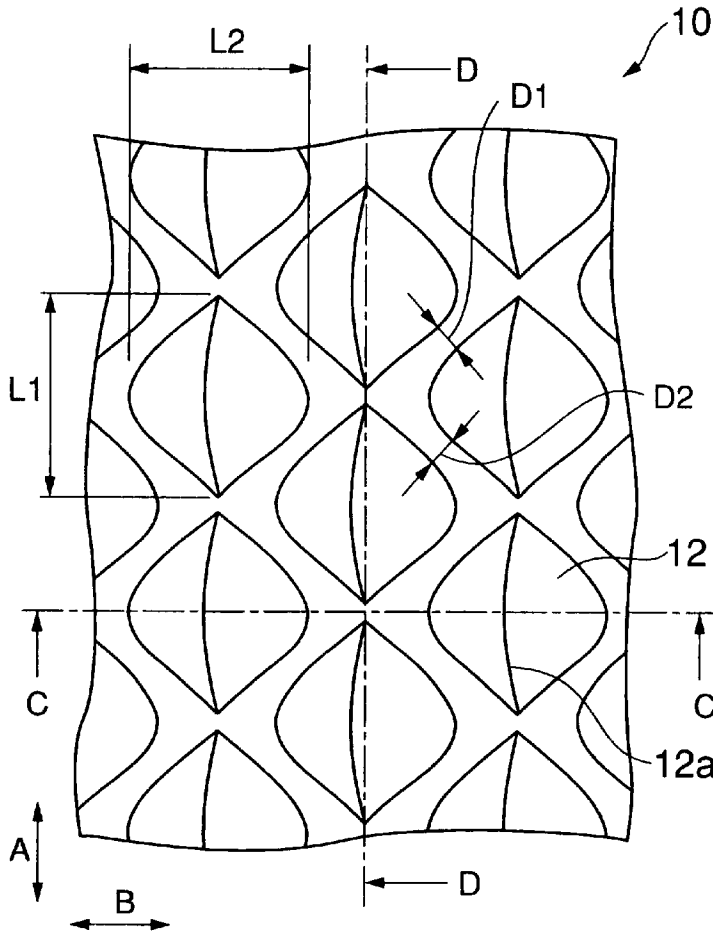


FIG. 2A

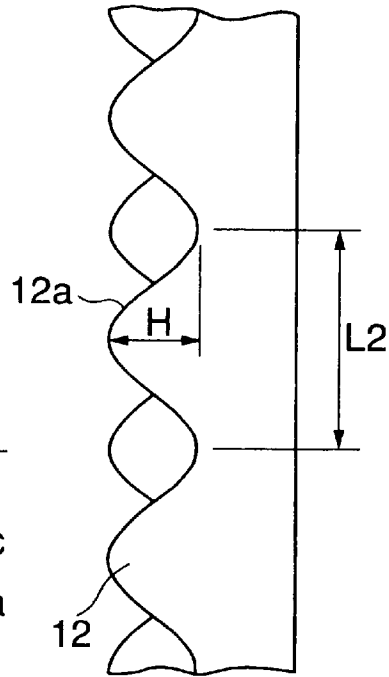


FIG. 2C

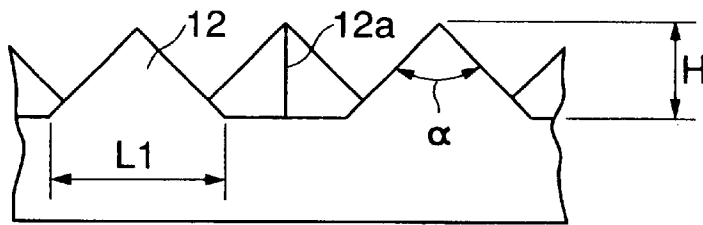


FIG. 2B

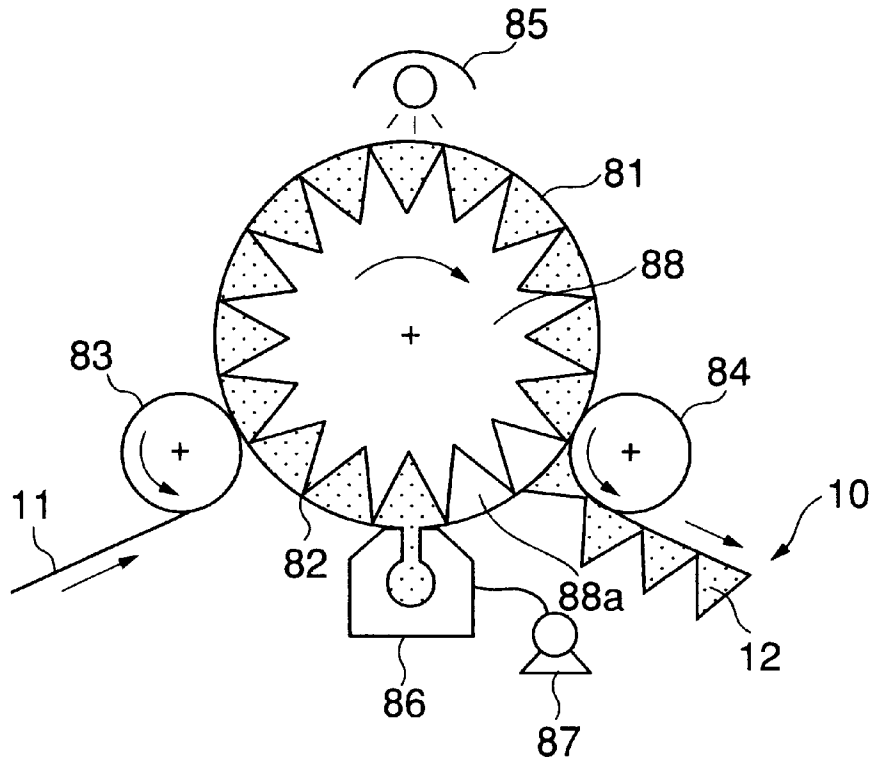


FIG. 3

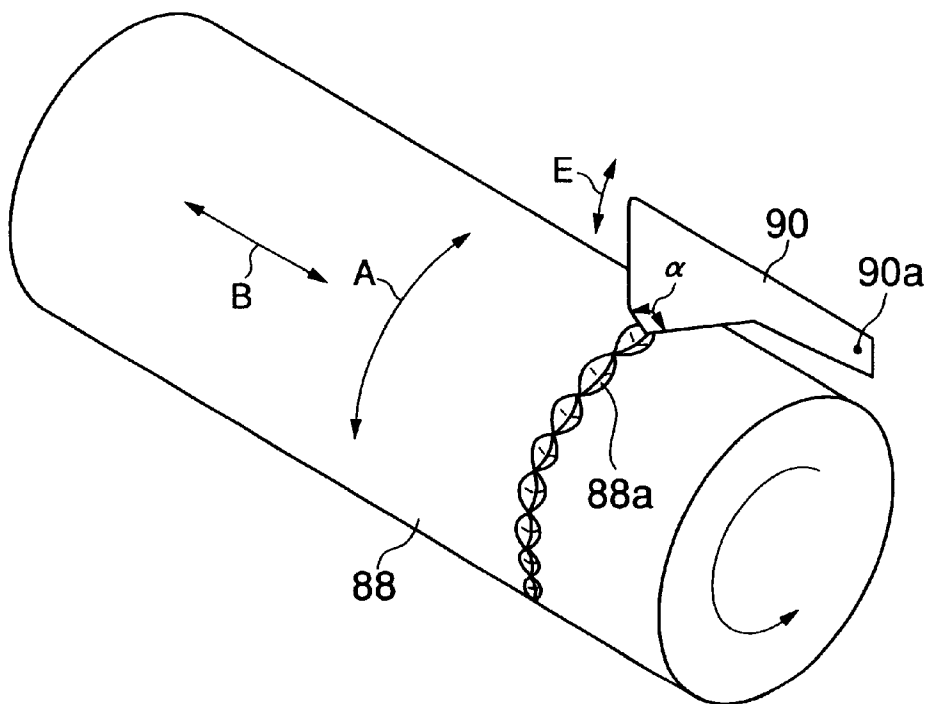


FIG. 4

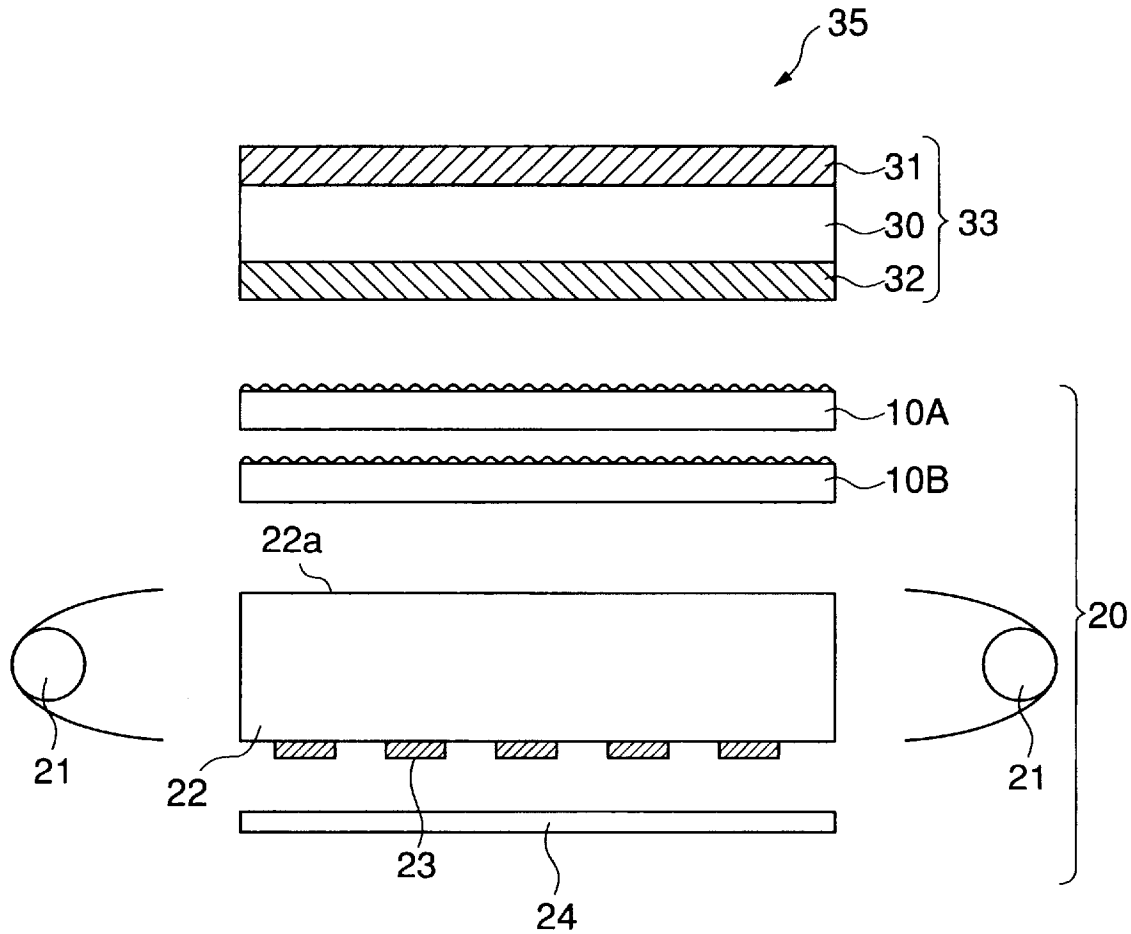


FIG.5

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