United States Patent [19]

Hathaway et al.

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[54] **FACETED LIGHT PIPE**

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[21] Appl. No.: **589,325**

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[51] Int. Cl.⁵ G02B 6/00
[52] U.S. Cl. **385/33**; 362/309; 362/341; 362/27; 362/32; 362/31; 385/37; 385/146; 385/901; 359/48; 359/50
[58] Field of Search 350/96.10, 96.15, 96.18, 350/96.19; 362/309, 341, 27, 31, 32

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[57] **ABSTRACT**

A light pipe used for backlighting liquid crystal displays has a planar front surface and a stairstepped or faceted back surface. Light is injected from the ends of the light pipe from cold or hot cathode, apertured, fluorescent lamps. The cold cathode lamps are preferably insulated to raise their operating temperature. The back surface has a series of planar portions parallel to the front surface connected by facets, which are angled so that the injected light reflects off the facets and through the front surface. A reflector having a planar, highly reflective, highly scattering surface or a sawtoothed or grooved upper surface is located adjacent to and parallel with the light pipe back surface to reflect light escaping from the back surface back through the light pipe to exit the front surface. The axis of grooves is preferably slightly skewed from the facet axis to reduce moire pattern development. A low scattering or loss diffuser is located adjacent to and parallel with the light pipe front surface to reduce moire pattern development. The liquid crystal display is located over the low scattering diffuser. A separate injector may be located between the lamp and the light pipe to better couple the light into the light pipe.
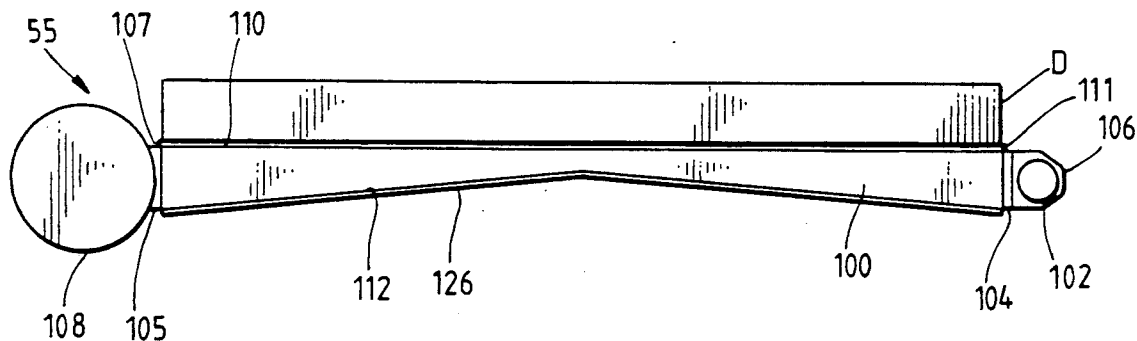
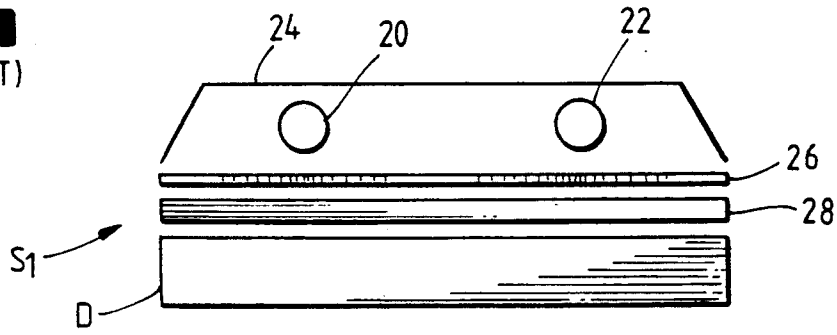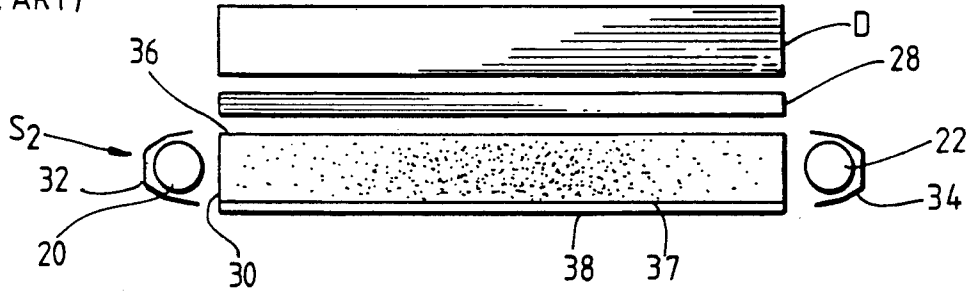**37 Claims, 6 Drawing Sheets**

FIG.1
(PRIOR ART)

FIG.2
(PRIOR ART)

FIG.3
(PRIOR ART)
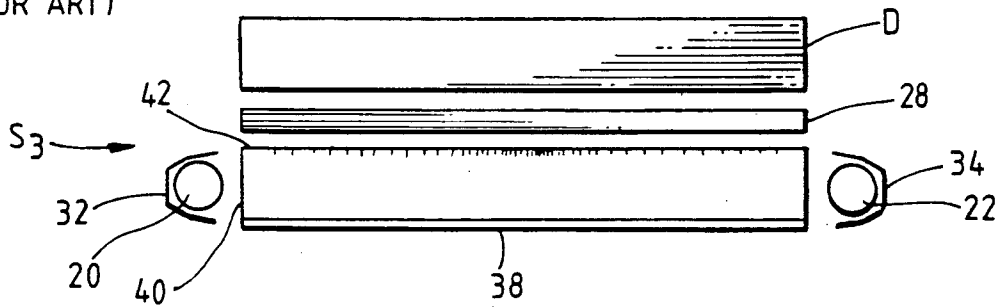
FIG.4
(PRIOR ART)

FIG.6

FIG.7

FIG.5

FIG.8

FIG.10

FIG.11

FIG.12

FIG.13
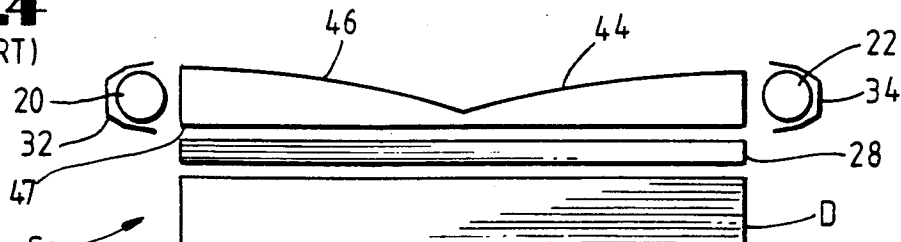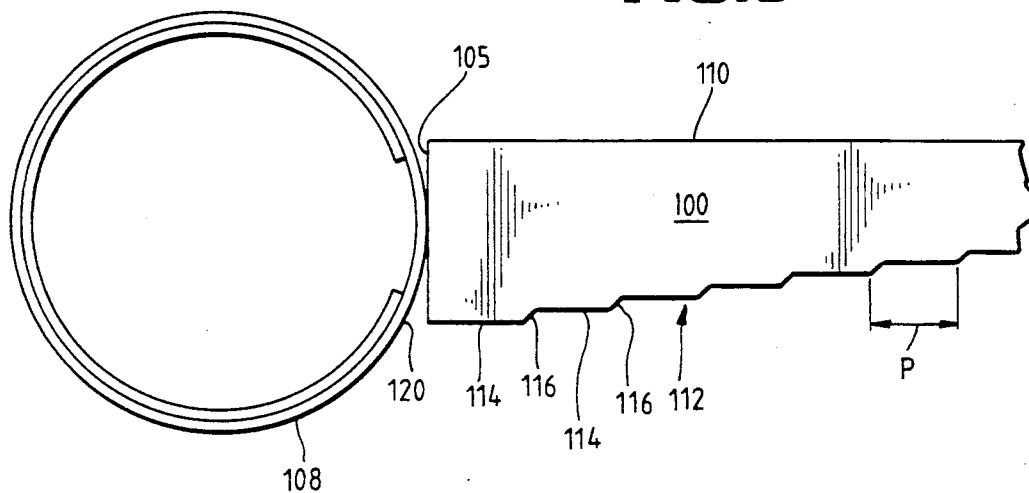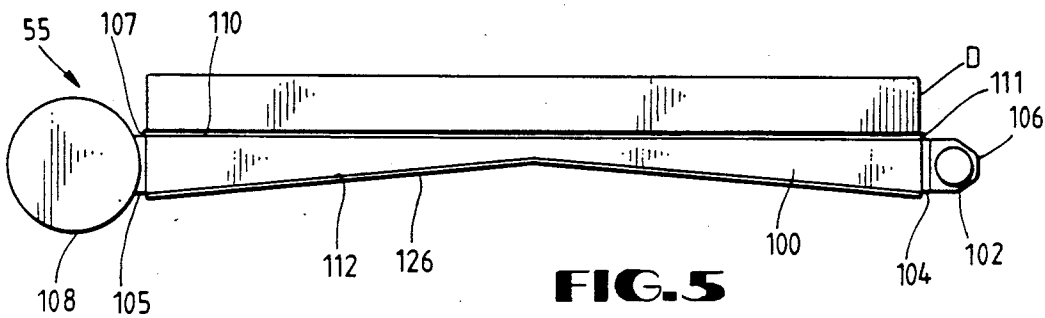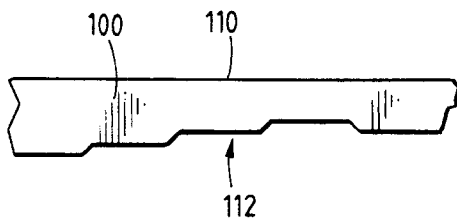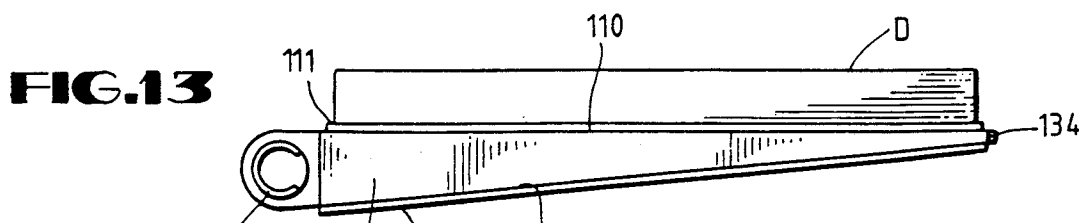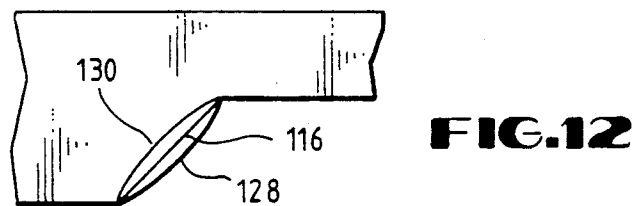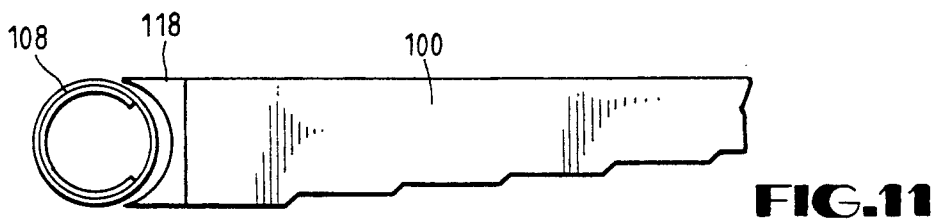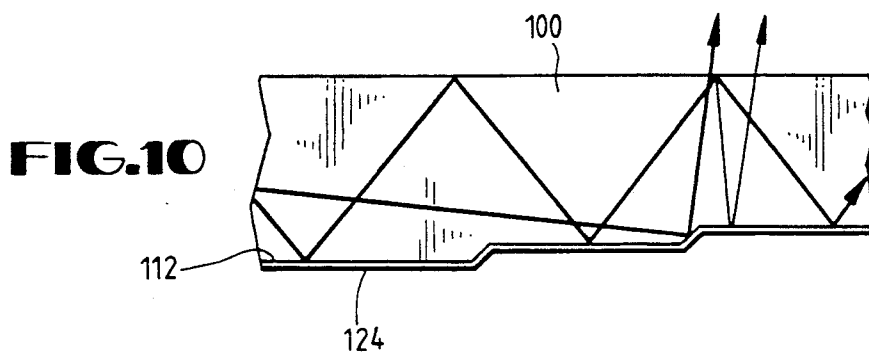
FIG.9A

FIG.9B

DOCKET ALARM
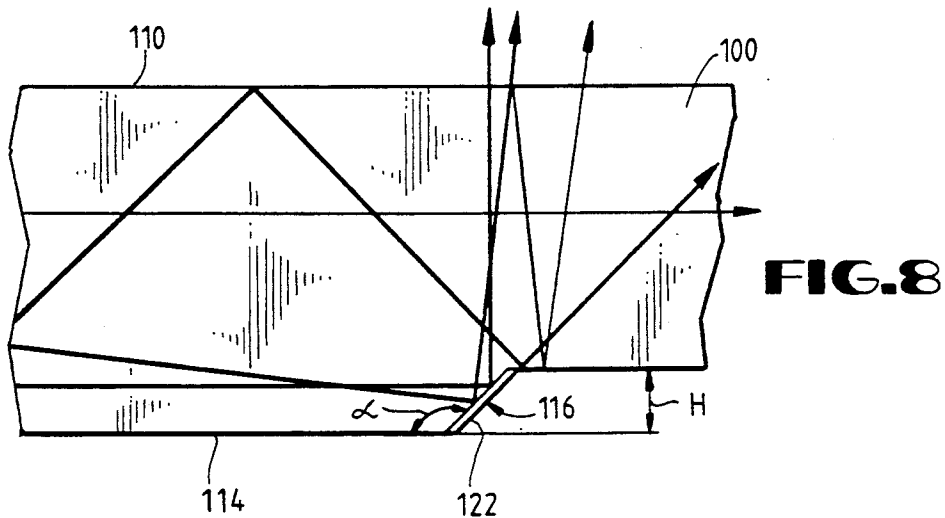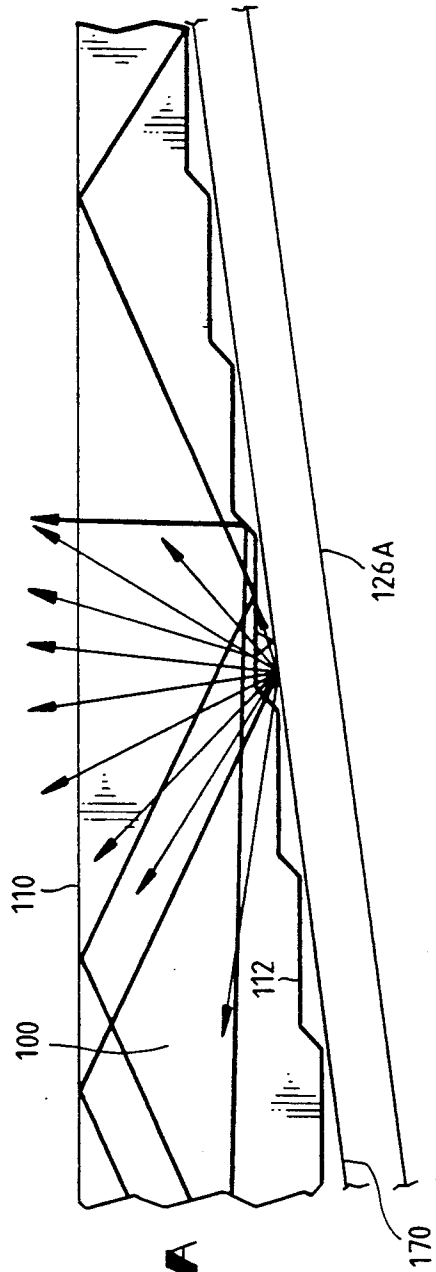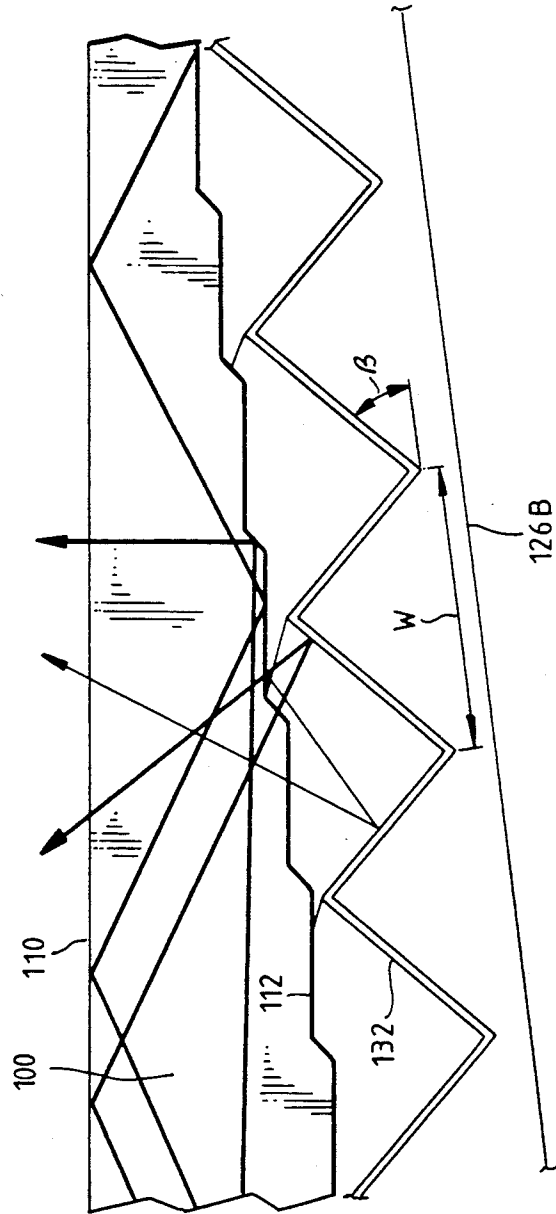
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