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 sur-
face 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 reflec-
tive, highly scattering surface or a sawtoothed or
grooved upper surface is located adjacent to and paral-
lel with the light pipe back surface to reflect light escap-
ing 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 liq-
uid 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
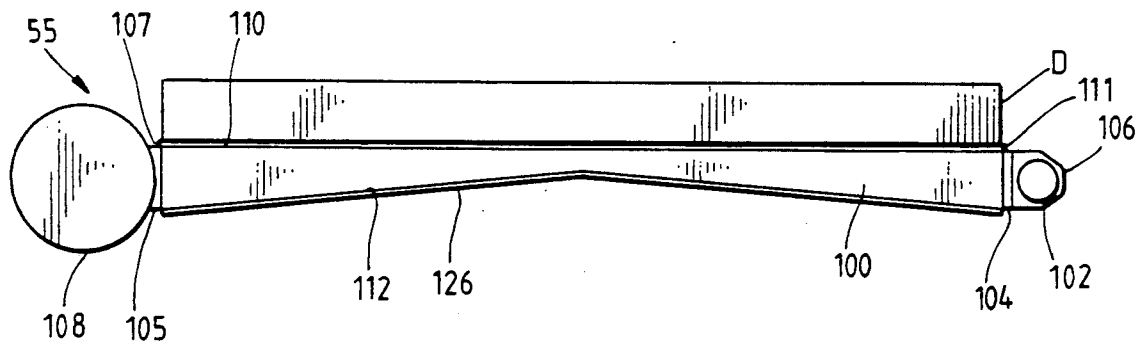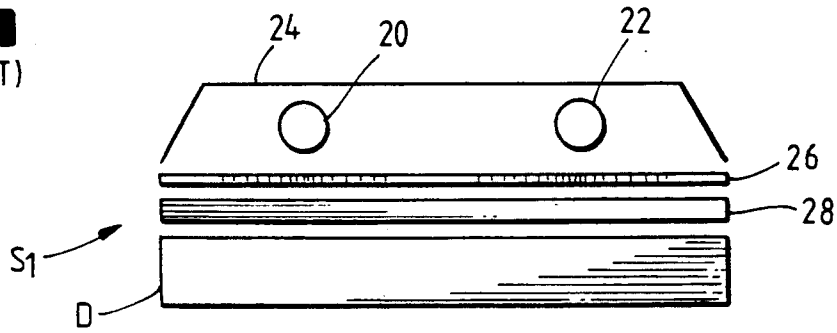into the light pipe.
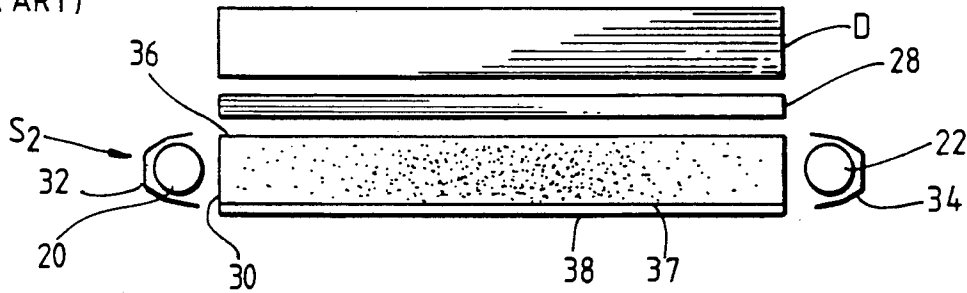
37 Claims, 6 Drawing Sheets

FIG.1
(PRIOR ART)

FIG.2
(PRIOR ART)

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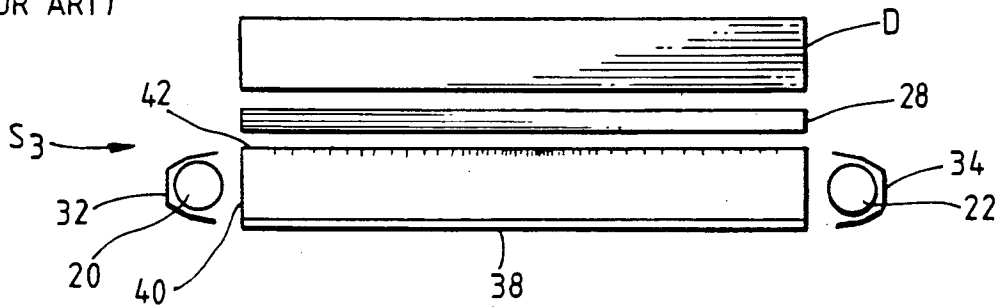
FIG.4
(PRIOR ART)

FIG.6

FIG.7

FIG.5

FIG.8

FIG.10

FIG.11

FIG.12

FIG.13
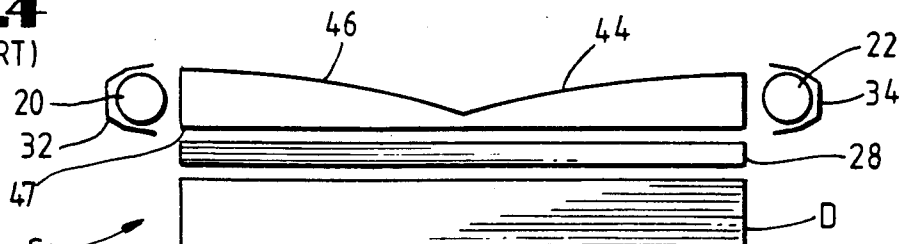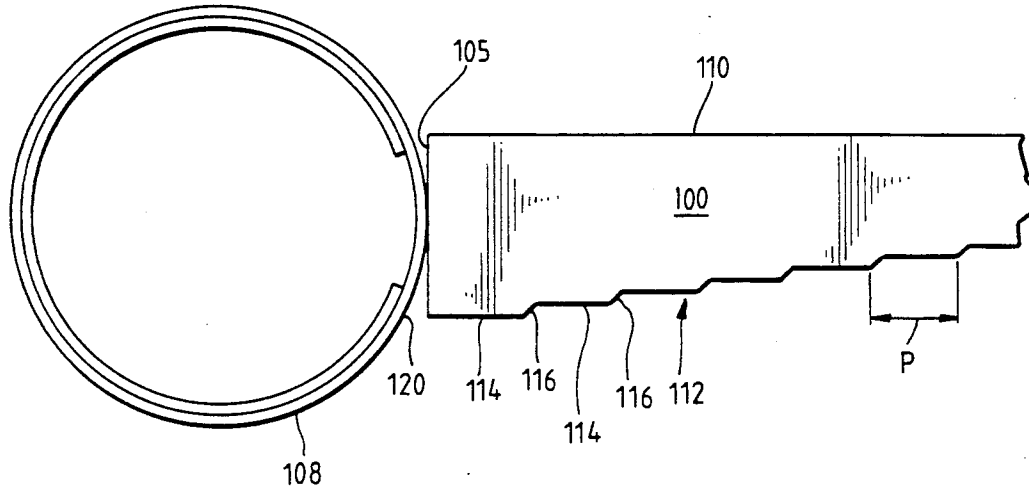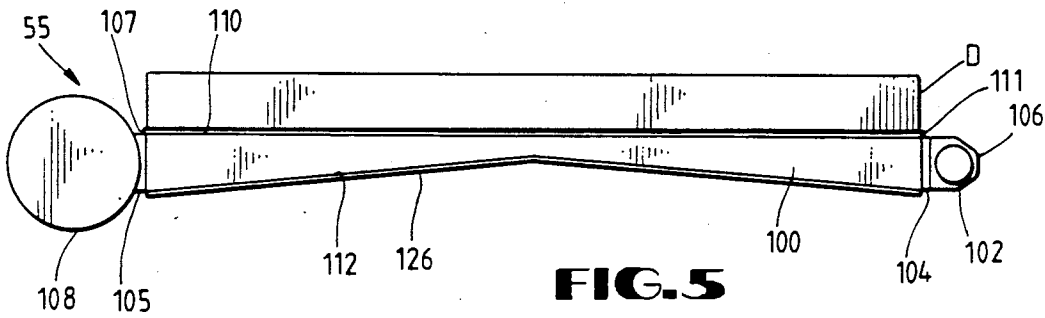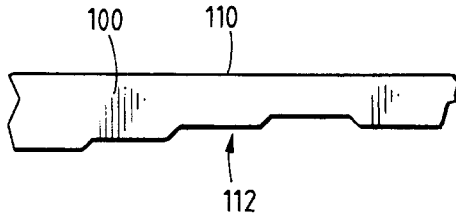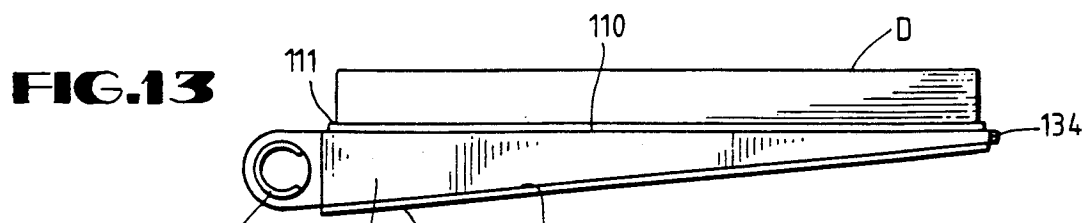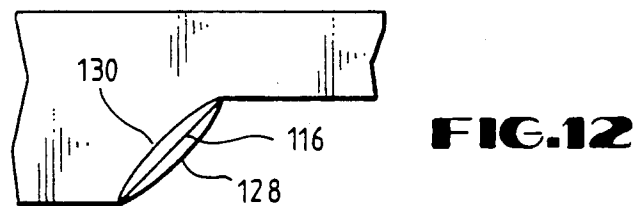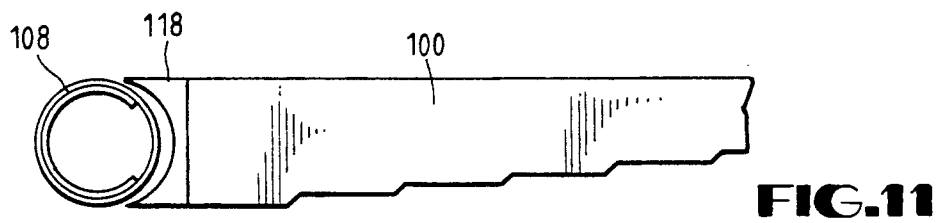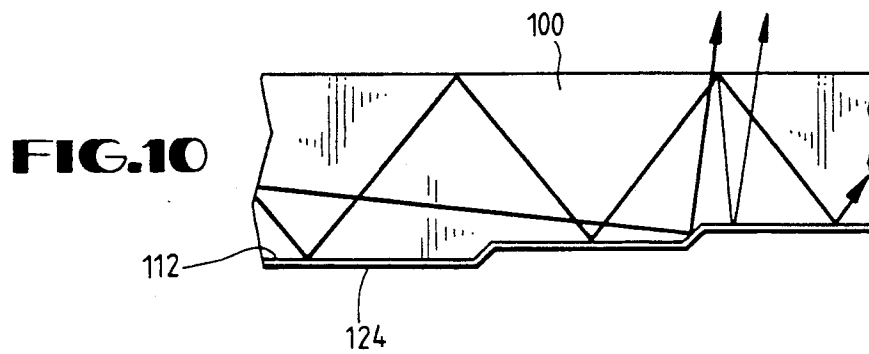
FIG.9A

FIG.9B

DOCKET ALARM
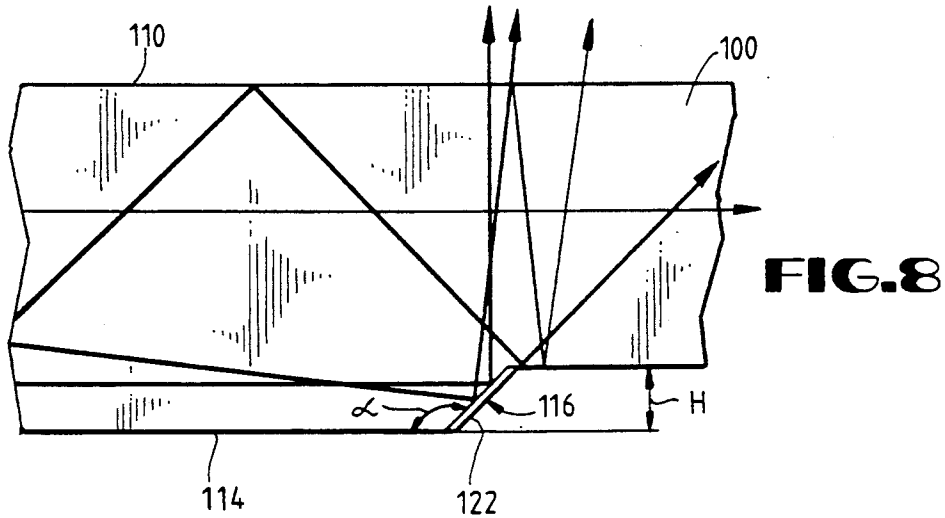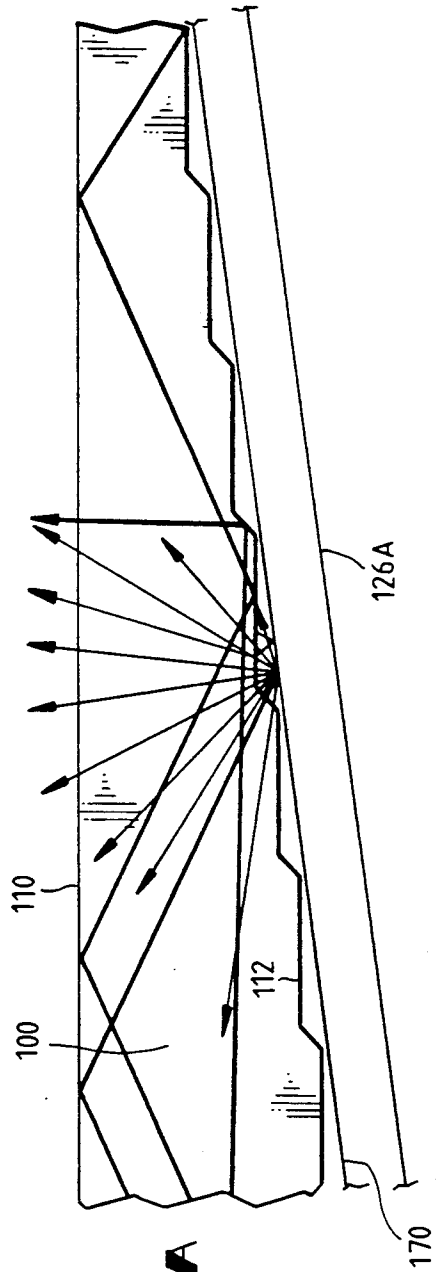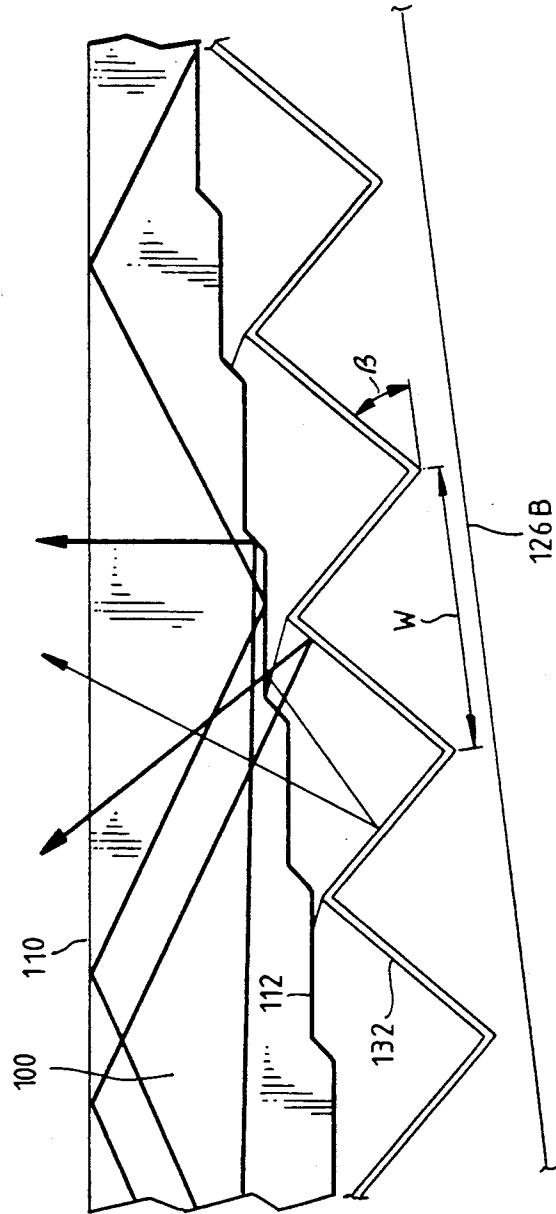
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