

湾曲した光ファイバを用いたシースルー面状光源

A see-through planar illuminator utilizing a curved optical fiber

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複数の溝を側面に形成した POF (Plastic Optical Fiber) を基板に実装し, これを反射板と拡散板とで挟むことで, 面状光源を構成できる[1]. 発光部の形や面積に関わる設計の自由度が大きく, レーザーとの相性が良い. これらの特徴を備えながら薄型化に有利な新構成を図 1 に示す. 湾曲した POF から光を透明基板の中へ漏洩させ, 表面の微細構造により光を外部へ取り出す. 市販の部材で試作した光源 (照明部 $9.5\text{cm} \times 9.5\text{cm}$, 厚さ 3mm) の写真を図 2 に示す. 現状では, 輝度の均一性, 外光の回折, POF の視認, 等の課題があり, 設計の精査が必要である. 図 1 の構成は, 液晶ディスプレイのシースルー化, 屋外での視認性向上と省電力化, 等への応用が期待される.

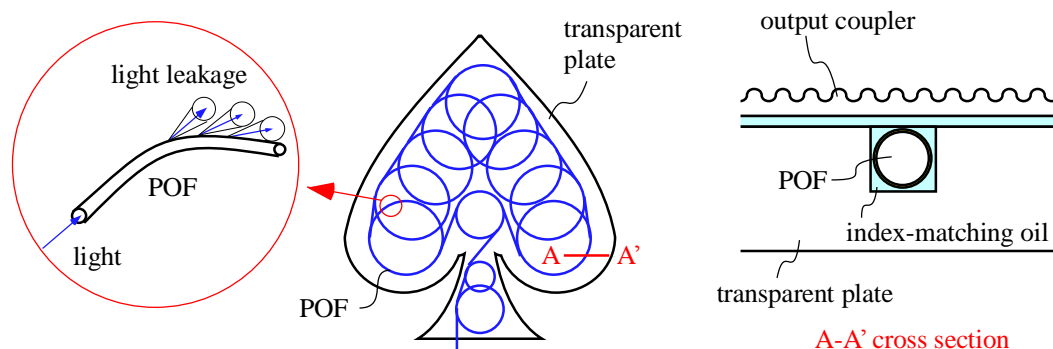


Fig. 1. Configuration of the proposed illuminator. The light inside a plastic optical fiber (POF) leaks out from its curved portions into the transparent plate on which an output coupler film is attached. The space around the POF is filled with index-matching oil so that the whole structure becomes transparent.

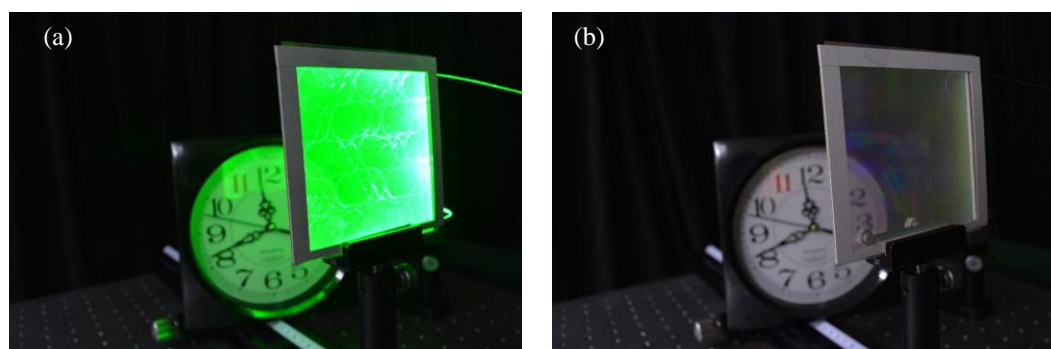


Fig. 2. A 3mm-thick square illuminator constructed with off-the-shell components. A grating film is used for the output coupler. (a) When a green laser light is introduced into the POF, it is emitted from the whole area. (b) When the laser is turned off, the clock behind the illuminator becomes visible. Also noticeable are the traces of the POF and the rainbow-colored diffracted light, which should be alleviated by a careful optical design in future.

[1] Y. Okuda, et al., Opt. Eng. **51**, 074001 (2012).