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(71) Applicant: **2PI INC.** [US/US]; 678 Mass Ave., Suite 400, Cambridge, MA 02139 (US).

(72) Inventors: **GU, Tian**; 678 Mass Ave., Suite 400, Cambridge, MA 02139 (US). **HU, Juejun**; 678 Mass Ave., Suite 400, Cambridge, MA 02139 (US). **SUN, Xiaochen**; 678 Mass Ave., Suite 400, Cambridge, MA 02139 (US). **LIN, Hung-I**; 678 Mass Ave., Suite 400, Cambridge, MA 02139 (US). **YANG, Fan**; 678 Mass Ave., Suite 400, Cambridge, MA 02139 (US).

(74) Agent: **CHEN, Ying**; Chen Yoshimura LLP, 750 W Hamilton Ave Unit C, San Pedro, CA 90731 (US).

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(54) Title: PATTERN PROJECTION AND DETECTION USING FLAT OPTICS

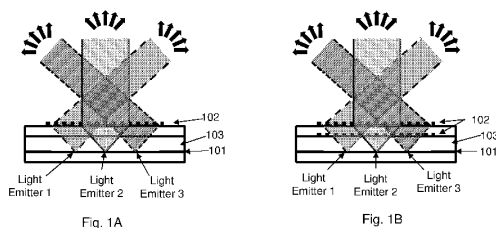


Fig. 1C



Fig. 1D

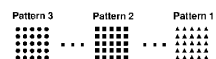
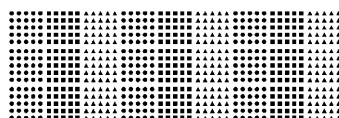


Fig. 1E



(57) Abstract: An optical pattern projection device includes a light emitter or light emitter array and one or more flat optics layers configured to project and split light beams from the light emitters to generate a projected light pattern including multiple sub-patterns each corresponding to one of the light emitters. The flat optics layers may include a single optical metasurface containing superposed beam shaping and/or projection phase profile and a beam splitting phase profile. Alternatively, the flat optics layers may include two optical metasurfaces each containing a light shaping and/or projection phase profile, which together produce a linear relationship between light emitter position and corresponding beam projection angle, and one or both of the metasurfaces further contains a superposed beam splitting phase profile. The light shaping and/or projection phase profile may have a function similar to a micro-lens array. A structured light camera combining optical pattern projection and detection is also provided.

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