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Ohta et al.

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(54) **OPTICAL SCANNING DEVICE, AND IMAGE FORMING APPARATUS EQUIPPED WITH THE SAME**

USPC 359/205.1, 196.1-226.3; 347/257
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|----------------|--------|------------------|-----------------------|
| 6,437,817 B1 | 8/2002 | Ohta et al. | 347/254 |
| 7,230,638 B2 | 6/2007 | Fukutomi | 347/243 |
| 7,253,935 B2 * | 8/2007 | Kobayashi et al. | 359/196.1 |
| 7,355,771 B2 | 4/2008 | Tomita et al. | 359/205 |
| 7,414,645 B2 * | 8/2008 | Sakai | B41J 2/473 347/244 |

FOREIGN PATENT DOCUMENTS

| | | |
|----|-------------|--------|
| JP | 10-246862 | 9/1998 |
| JP | 2004-021138 | 1/2004 |
| JP | 2011-170217 | 9/2011 |

* cited by examiner

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(57) **ABSTRACT**

An optical scanner includes a polygonal mirror; a mirror for reflecting the beam from the polygonal mirror; an optical box having a cap and containing the mirror; a first mirror regulating portion in a direction of a normal line of the mirror, the first regulating portion being provided opposed to such a surface of the reflecting surface and a back surface as is closer to the cap; and a second mirror regulating portion in a beam sub-scanning direction, the second regulating portion being provided opposed to such a surface of the mirror as is closer to the cap; wherein the mirror has a plurality of apex lines, and the first regulating portion and the second regulating portion are disposed at positions which are remoter from the cap than the apex line that is closest to the cap, with respect to a direction perpendicular to a main scan direction.

9 Claims, 12 Drawing Sheets

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(51) **Int. Cl.**

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|-------------------|-----------|
| G02B 26/12 | (2006.01) |
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CPC **G02B 26/125** (2013.01); **G02B 7/182** (2013.01); **G03G 15/04072** (2013.01); **G02B 26/124** (2013.01)

(58) **Field of Classification Search**

CPC **G02B 26/125**; **G02B 7/182**; **G02B 26/124**; **G02B 16/0005**

