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Avivi et al.

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(54) **ELECTROMAGNETIC ACTUATORS FOR DIGITAL CAMERAS**

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H02K 41/0356 (2013.01)

(71) Applicant: **Corephotonics Ltd.**, Tel-Aviv (IL)

(58) **Field of Classification Search**

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See application file for complete search history.

(72) Inventors: **Gal Avivi**, Haifa (IL); **Ephraim Goldenberg**, Ashdod (IL); **Jamil Nasser**, Haifa (IL); **Gil Bachar**, Tel-Aviv (IL); **Gal Shabtay**, Tel Aviv (IL)

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(73) Assignee: **Corephotonics Ltd.**, Tel-Aviv (IL)

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(74) *Attorney, Agent, or Firm* — Nathan & Associates Patent Agents Ltd.; Menachem Nathan

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(57) **ABSTRACT**

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Electro-magnetic actuators used to provide a displacement of an optical element such as a lens carrier comprise at least one ferromagnetic frame associated with a large air gap and at least one ferromagnetic member parallel to and separated from an elongated section of a frame by a small air gap. Actuation causes a magnetic circuit that appears in the at least one frame, the at least one member and small air gaps and by-passes or bridges the large air gap. In some embodiments, the resultant magnetic force moves the at least one member and leads to the displacement of an optical element attached thereto. In some embodiments, at least one frame and at least one member are arranged to provide a center hole and are dimensioned to enable insertion of a lens carrier in the hole. In some embodiments, the displacement is for auto-focus. In other embodiments, the displacement is for optical image stabilization.

Related U.S. Application Data

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20 Claims, 14 Drawing Sheets

