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Hagiwara

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(54) **PHOTOGRAPHING LENS AND ELECTRONIC APPARATUS**

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CPC ***G02B 13/0045*** (2013.01); ***G02B 9/62*** (2013.01); ***G02B 13/18*** (2013.01)

(58) **Field of Classification Search**
CPC G02B 13/18; G02B 9/62; G02B 13/0045
USPC 359/713, 757, 752, 756
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2012/0188654	A1	7/2012	Huang	
2013/0033762	A1*	2/2013	Tsai et al.	359/713
2013/0176469	A1	7/2013	Sano et al.	
2013/0235473	A1*	9/2013	Chen et al.	359/713
2013/0329306	A1*	12/2013	Tsai	G02B 13/0045 359/713
2013/0342918	A1*	12/2013	Kubota et al.	359/713
2014/0347745	A1*	11/2014	Shinohara	G02B 9/62 359/713

FOREIGN PATENT DOCUMENTS

JP	2012-155223	A	8/2012
KR	10-2010-0040357	A	4/2010
KR	10-2011-0024872	A	5/2011
WO	WO 2010/024198	A1	5/2010

* cited by examiner

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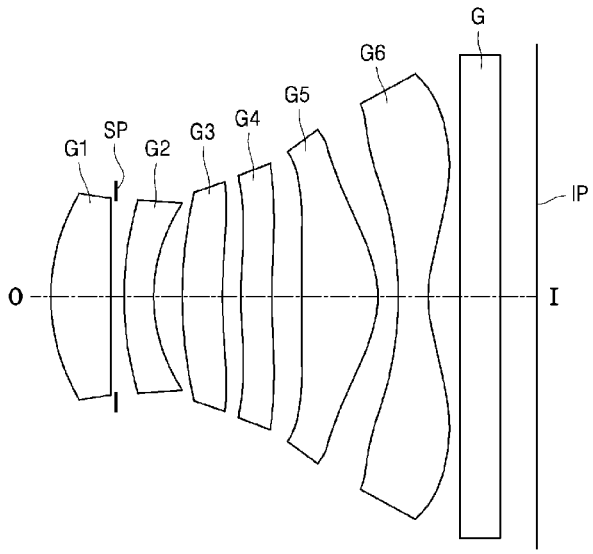
(57) **ABSTRACT**

Provided are photographing optical lens assembly and an electronic apparatus. The photographing optical lens assembly includes a first lens having a positive refractive power, a second lens having a negative refractive power, a third lens; a fourth lens, a fifth lens having a positive refractive power, and a sixth lens having a negative refractive power. The first to sixth lenses are sequentially arranged from an object side to an image side, and the sixth lens has a concave image-side surface in a region around an optical axis.

15 Claims, 9 Drawing Sheets