UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ABILITY OPTO-ELECTRONICS TECHNOLOGY CO., LTD.,

Petitioner,

v.

LARGAN PRECISION CO., LTD.,

Patent Owner.

U.S. Patent No. 8,988,796

Filing Date: December 13, 2013
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Title: Image Capturing Lens System, Imaging Device and Mobile Terminal

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DECLARATION OF WILLIAM T. PLUMMER, Ph.D.

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3. Element 1b: "a second lens element with positive refractive power having a convex image-side surface in a paraxial region thereof;"....52
4. Element 1c: "a third lens element with negative refractive power having a concave object-side surface in a paraxial region thereof and a convex image-side surface in a paraxial region thereof; and"....56

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5. Element 1d: "a fourth lens element with refractive power having a concave image-side surface in a paraxial region thereof, wherein both of an object-side surface and the image-side surface of the fourth lens element are aspheric, and the image-side surface of the fourth lens element has at least one convex shape in an off-axis region thereof;" 61

6. Element 1e: "wherein the image capturing lens system has a total of four lens elements with refractive power," 69

7. Element 1f: "an axial distance between an object-side surface of the first lens element and the image-side surface of the fourth lens element is Td, half of a maximal field of view of the image capturing lens system is HFOV, a focal length of the image capturing lens system is f, a focal length of the fourth lens element is f4, a focal length of the second lens element is f2, a focal length of the third lens element is f3, and the following conditions are satisfied: 0.5 mm<Td<3.2 mm; 1.0 mm<Td/tan(HFOV)<3.75 mm; |f/f4|<1.20; and f2/f3<-0.65." 71

8. Conclusion for Claim 1 76

B. Claim 2: "The image capturing lens system of claim 1, wherein the fourth lens element has the object-side surface being convex in a paraxial region thereof." 76

1. Conclusion for Claim 2 78

C. Claim 3: "The image capturing lens system of claim 2, wherein the focal length of the image capturing lens system is f, a focal length of the first lens element is f1, and the following condition is satisfied: -0.25<f/f1<0.75." 78

1. Conclusion for Claim 3 79

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D. Claim 4: "The image capturing lens system of claim 2, wherein the axial distance between the object-side surface of the first lens element and the image-side surface of the fourth lens element is Td, and the following condition is satisfied: 0.8 mm<Td<2.5 mm." 79

1. Conclusion for Claim 4 80

E. Claim 6: "The image capturing lens system of claim 2, wherein a curvature radius of the object-side surface of the second lens element is R3, a curvature radius of the image-side surface of the second lens element is R4, and the following condition is satisfied: 0.5<(R3+R4)/(R3-R4)<2.5." 80

1. Conclusion for Claim 6 81

F. Claim 7: "The image capturing lens system of claim 2, wherein the focal length of the image capturing lens system is f, and the following condition is satisfied: 0.5 mm<f<2.0 mm." 81

1. Conclusion for Claim 7 82

G. Claim 8: "The image capturing lens system of claim 1, wherein the first lens element has a convex object-side surface in a paraxial region thereof." 82

1. Conclusion for Claim 8 85

H. Claim 9: "The image capturing lens system of claim 8, wherein the axial distance between the object-side surface of the first lens element and the image-side surface of the fourth lens element is Td, half of the maximal field of view of the image capturing lens system is HFOV, and the following condition is satisfied: 1.2 mm<Td/tan(HFOV)<2.75 mm." 85

1. Conclusion for Claim 9 86

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I. Claim 10: "The image capturing lens system of claim 8, wherein a sum of the central thicknesses of the first lens element, the second lens element, the third lens element, and the fourth lens element is ∑CT, the axial distance between the object-side surface of the first lens element and the image-side surface of the fourth lens element is Td, and the following condition is satisfied: 0.80<∑CT/Td<0.95." 86

1. Conclusion for Claim 10 88

J. Claim 11: "The image capturing lens system of claim 8, wherein an Abbe number of the first lens element is V1, and the following condition is satisfied: 45<V1." 88

1. Conclusion for Claim 11 89

K. Claim 15 89

1. Preamble: "An image capturing lens system comprising, in order from an object side to an image side:" 89

2. Element 15a: "a first lens element having refractive power;" 90

3. Element 15b: "a second lens element with positive refractive power having a convex image-side surface in a paraxial region thereof;" 90

4. Element 15c: "a third lens element with negative refractive power having a concave object-side surface in a paraxial region thereof and a convex image-side surface in a paraxial region thereof; and" 90

5. Element 15d: "a fourth lens element with refractive power having a concave image-side surface in a paraxial region thereof, wherein both of an object-side surface and the image-side surface of the fourth lens element are aspheric, and the image-side surface of the fourth lens element has at least one convex shape in an off-axis region thereof;" 91

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