



June 20, 2020

Certification

Park IP Translations

TRANSLATOR'S DECLARATION:

I, Jian Zhang, hereby declare under penalty of perjury under the laws of the United States of America:

That I possess advanced knowledge of the Chinese (Traditional) and English languages. The attached Chinese (Traditional) into English translation has been translated by me and to the best of my knowledge and belief, it is a true and accurate translation of:

Taiwan Application No. 102131525

I declare that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on June 20, 2020

Jian Zhang

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This is to certify that annexed is a true copy from the records of this office of the application as originally filed which is identified hereunder :

Application Date	Sep. 2, 2013
Application No.	102131525
Applicant(s)	Ability Opto-Electronics Technology Co., Ltd.
Inventor(s)	Hung-Kuo Yu

Director General

Meihua Wang

Oct. 14, 2013

Abstract

※ Application Number:

※ Application Date:

※ IPC Classification:

Title of the Invention: Thin wide-angle four-piece imaging lens assembly

[Chinese]

A thin wide-angle four-piece imaging lens assembly comprises a lens set and a fixed diaphragm, wherein the lens set comprises, sequentially from an object side to an image side along an optical axis, a first lens, a second lens, a third lens, and a fourth lens with the refractive power being positive, positive, negative, and positive, the surface of the first lens facing the object side and adjacent to the central optical axis is a convex surface, the surface of the second lens facing the image side and adjacent to the central optical axis is a convex surface, the surface of the third lens facing the object side and adjacent to the central optical axis is a concave surface and the surface thereof facing the image side and adjacent to the central optical axis is a convex surface, and the surface of the fourth lens facing the image side and adjacent to the central optical axis is a concave surface, and the fourth lens has at least one inflection point located between the optical axis and the aspherical end point; the fixed diaphragm is located between the object side and the second lens and satisfies $15 < \text{HFOV}/f < 50$, wherein HFOV represents one half of a maximum angle of view of the lens assembly, and f represents a focal length of the lens assembly; and a higher HFOV value and a lower f value can make the volume of the entire lens assembly denser and improve the resolving power. Therefore, the present invention has advantages of both compact and thin design and high performance.

[English]

[Representative Image]

[The designated representative image in this case] Figure (1).

[Brief explanation of component legends in this image]

1.....lens set
11.....first lens
12.....second lens
13.....third lens

14fourth lens
2fixed diaphragm
ct1-ct4thickness

[If there are chemical formulae in this case, please disclose a chemical formula that can best illustrate the features of the invention]:

Specification of Invention Patent
(Please do not alter the format or sequence of this specification)

[Title of the Invention] Thin wide-angle four-piece imaging lens assembly

[Field of the Invention]

[0001] The present invention relates to an imaging lens assembly, and in particular to a thin wide-angle four-piece imaging lens assembly.

[Description of the Prior Art]

[0002] A conventional imaging lens assembly is an imaging lens assembly adopted in an electronic product, such as a mobile phone, a smart phone, a tablet computer, a notebook computer, a camera, and the like. With the continuous improvement of electronic products, a gradual trend appears toward compact and thin design while achieving high performance. As a result, imaging lens assemblies are developed to have thin dimensions and become more compact as a whole. On the other hand, to improve the resolving power, imaging lens assemblies need to be developed to have a wider angle.

[0003] While conventional imaging lens assemblies, such as those according to the patents TW201215941A, TW201224568A, and TW201239443A, are disclosed to be four-piece imaging lens assemblies, none of the embodiments in the patents further meet the requirements for a thin and wide-angle design.

[0004] Therefore, in order to enable an electronic device to achieve advantages of both compact and thin design and high performance, a wide-angle imaging lens assembly having thin dimensions that make the overall assembly more compact and capable of improving the resolving power is currently desired on the market.

[Summary of the Invention]

[0005] Therefore, the objective of the present invention is to provide a thin wide-angle four-piece imaging lens assembly having thin dimensions that make the overall assembly more compact and capable of improving the resolving power.

[0006] Accordingly, the thin wide-angle four-piece imaging lens assembly of the present invention comprises a lens set and a fixed diaphragm. The lens set includes a first lens, a second lens, a third lens, and a fourth lens arranged in sequence from an object side to an image side along an optical axis. The first lens has a positive refractive power adjacent to the central optical axis and has a convex surface that faces the object side, and the first lens has at least one surface that is an aspherical surface. The second lens has a positive refractive power adjacent to the central optical axis and has a convex surface that faces the image side, and the second lens has at least one surface that is an aspherical surface. The third lens has a negative refractive power adjacent to the central optical axis and has a concave surface that faces the object side and a convex surface that faces the image side, and the third lens has at least one surface that is an aspherical surface. The fourth lens has a positive refractive power adjacent to the central optical axis and has a concave surface that faces the image side, both surfaces of the fourth lens are aspherical surfaces, and at least one of the two surfaces has at least one inflection point located between the optical axis and the aspherical end point. The fixed diaphragm is located between the object side and the second lens. Here, the thin wide-angle four-piece imaging lens assembly satisfies the following condition:

Application No. 102121525

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