

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		2017-02-16
	First Named Inventor	Hsu, et al.	
	Art Unit		
	Examiner Name		
	Attorney Docket Number	251236-1700	

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	2	8496338	B2	2013-07-30	Ho, et al.	
	3	8498068	B2	2013-07-30	Yu, et al.	
	4	8503114	B2	2013-08-06	Lai, et al.	

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	1	20150198779	A1	2015-07-16	Cho, et al.	

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
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EXAMINER SIGNATURE

Examiner Signature		Date Considered	
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

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Application Number	
Filing Date	2017-02-16
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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Daniel R. McClure/	Date (YYYY-MM-DD)	2017-02-15
Name/Print	Daniel R. McClure	Registration Number	38,962

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:



Practitioners associated with Customer Number:

109673

OR

Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:



The address associated with Customer Number:

109673

OR

☐	Firm or Individual Name			
	Address			
	City			
	Country			
	Telephone		Email	

Assignee Name and Address: LARGAN PRECISION CO., LTD.

No. 11, Jingke Rd., Nantun Dist., Taichung City 408, Taiwan, R.O.C.

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	Chen, Chun-Shan	Date	2014.5.1
Name	Chen, Chun-Shan	Telephone	886-4-24002845
Title	Manager		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of
Invention

LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS

As the below named inventor, I hereby declare that:

This declaration
is directed to:



The attached application, or



United States application or PCT international application number _____
filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Chih-Wen HSU

Date (Optional): Feb 10, 2011

Signature: Chih-Wen Hsu

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)****Title of
Invention****LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC
APPARATUS**

As the below named inventor, I hereby declare that:

This declaration
is directed to:

The attached application, or



United States application or PCT international application number _____

filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001
by fine or imprisonment of not more than five (5) years, or both.**WARNING:**

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTORInventor: Chih-Wei CHENGDate (Optional): Feb. 09, 2017Signature: Chih-Wei CHENG

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form.
Use an additional PTO/AIA/01 form for each additional inventor.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of
Invention

LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS

As the below named inventor, I hereby declare that:

This declaration
is directed to:



The attached application, or



United States application or PCT International application number _____
filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTOR

Inventor: Ming-Ta CHOU

Date (Optional): Feb, 06, 2017

Signature: Ming-Ta Chou

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 116 and 37 CFR 1.83. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS			
First Named Inventor/Applicant Name:	Chih-Wen HSU			
Filer:	Daniel R. McClure/Brooke French			
Attorney Docket Number:	251236-1700			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
Pages:				
Claims:				
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	3	420	1260
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				2860

Electronic Acknowledgement Receipt

EFS ID:	28373341
Application Number:	15434163
International Application Number:	
Confirmation Number:	7080
Title of Invention:	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS
First Named Inventor/Applicant Name:	Chih-Wen HSU
Customer Number:	109673
Filer:	Daniel R. McClure/Brooke French
Filer Authorized By:	Daniel R. McClure
Attorney Docket Number:	251236-1700
Receipt Date:	16-FEB-2017
Filing Date:	
Time Stamp:	10:33:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 2860
RAM confirmation Number	021617INTEFSW10350000
Deposit Account	505954
Authorized User	Brooke French

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	00429308.PDF	1823111	no	9
			c7ca407a8d1b864263fd7136e586716e3b4ffc00		
Warnings:					
Information:					
2		00429300.PDF	166433	yes	45
			4b8238f4ad1394216821e47fccc220c264be07ef		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Abstract		45	45	
	Claims		39	44	
	Specification		1	38	
Warnings:					
Information:					
3	Drawings-only black and white line drawings	00429304.PDF	303689	no	25
			c591a880ac98eae9cf4a675b3a1e86686cde3929		
Warnings:					
Information:					
4	Transmittal Letter	00429709.PDF	115096	no	2
			24d6386f2904c1ddddd7a78ffaac420b71b8d441		
Warnings:					
Information:					
5	Information Disclosure Statement (IDS) Form (SB08)	00429311.PDF	1035160	no	4
			82f109502b7e009ae0696263c32ae1a1fd6dc4c2		

Warnings:					
Information:					
6	Power of Attorney	00429306.PDF	133309	no	1
			df0bf9ed8e9b656765c8c6820f3f0861e6903902		
Warnings:					
Information:					
7	Oath or Declaration filed	00429723.PDF	4869987	no	6
			2acba72f5973fc4d2fbf0acd538f9d927fd8e810		
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	37062	no	2
			d3f67dbe70955de7577ac5c7e995104a4c9d4b9e		
Warnings:					
Information:					
Total Files Size (in bytes):			8483847		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	251236-1700
		Application Number	
Title of Invention	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Chih-Wen		HSU			
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service						
City	Taichung City		Country of Residence ⁱ		TW	
Mailing Address of Inventor:						
Address 1		No.11, Jingke Rd., Nantun Dist.				
Address 2						
City	Taichung City		State/Province			
Postal Code	408		Country ⁱ	TW		
Inventor	2				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Chih-Wei		CHENG			
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service						
City	Taichung City		Country of Residence ⁱ		TW	
Mailing Address of Inventor:						
Address 1		No.11, Jingke Rd., Nantun Dist.				
Address 2						
City	Taichung City		State/Province			
Postal Code	408		Country ⁱ	TW		
Inventor	3				Remove	
Legal Name						

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	251236-1700
		Application Number	
Title of Invention	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS		

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ming-Ta		CHOU	
Residence Information (Select One) US Residency ☒ Non US Residency Active US Military Service				
City	Taichung City		Country of Residenceⁱ	TW

Mailing Address of Inventor:				
Address 1	No.11, Jingke Rd., Nantun Dist.			
Address 2				
City	Taichung City	State/Province		
Postal Code	408	Countryⁱ	TW	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add				

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence information of this application.			
Customer Number	109673		
Email Address	dan.mcclure@mqlaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS		
Attorney Docket Number	251236-1700	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	25	Suggested Figure for Publication (if any)	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Countryⁱ

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	251236-1700
		Application Number	
Title of Invention	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS		

Publication Information:

☐	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐	Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.			
Please Select One:	☒ Customer Number	US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	109673		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78. When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)¹ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	251236-1700
		Application Number	
Title of Invention	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS		

			Remove
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)
105137120	TW	2016-11-14	
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	251236-1700
	Application Number	
Title of Invention	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	251236-1700
		Application Number	
Title of Invention	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant	1		Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear			
☒ Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor	
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	LARGAN PRECISION CO., LTD.		
Mailing Address Information For Applicant:			
Address 1	No.11, Jingke Rd., Nantun Dist.		
Address 2			
City	Taichung City	State/Province	
Country	TW	Postal Code	408
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. Add			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	251236-1700
		Application Number	
Title of Invention	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				Add

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Daniel R. McClure/		Date (YYYY-MM-DD)	2017-02-15
First Name	Daniel	Last Name	McClure	Registration Number
				38,962
Additional Signature may be generated within this form by selecting the Add button.				Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	251236-1700
		Application Number	
Title of Invention	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

- 1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
- 2 A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
- 3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
- 4 A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
- 5 A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
- 6 A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
- 7 A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
- 8 A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
- 9 A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ABSTRACT

A light blocking sheet includes a first outer layer, a second outer layer, an inner substrate layer and a central axis. The first outer layer includes a first opening. The second outer layer includes a second opening. The inner substrate layer is disposed between the first outer layer and the second outer layer. The inner substrate layer connects the first outer layer to the second outer layer, and the inner substrate layer includes a substrate opening. The central axis is coaxial with the first opening, the second opening and the substrate opening.

WHAT IS CLAIMED IS:

1. A light blocking sheet, comprising:

a first outer layer comprising a first opening;

a second outer layer comprising a second opening;

an inner substrate layer disposed between the first outer layer and the second outer layer, wherein the inner substrate layer connects the first outer layer to the second outer layer, and the inner substrate layer comprises a substrate opening; and

a central axis coaxial with the first opening, the second opening and the substrate opening;

wherein a minimum diameter of the substrate opening is Φ_{smin} , a diameter of the first opening is Φ_1 , a diameter of the second opening is Φ_2 , and the following conditions are satisfied:

$\Phi_{smin} > \Phi_1$; and

$\Phi_{smin} > \Phi_2$.

2. The light blocking sheet of claim 1, wherein the inner substrate layer is made of a plastic material, and each of the first outer layer and the second outer layer is made of a black carbon-containing material.

3. The light blocking sheet of claim 2, wherein the minimum diameter of the substrate opening is Φ_{min} , the diameter of the first opening is Φ_1 , the diameter of the second opening is Φ_2 , and the following conditions are satisfied:

$$2.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi_1)/2 < 200 \mu\text{m}; \text{ and}$$

$$2.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi_2)/2 < 200 \mu\text{m}.$$

4. The light blocking sheet of claim 1, wherein the minimum diameter of the substrate opening is Φ_{min} , the diameter of the first opening is Φ_1 , the diameter of the second opening is Φ_2 , and the following conditions are satisfied:

$$3.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi_1)/2 < 85 \mu\text{m}; \text{ and}$$

$$3.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi_2)/2 < 85 \mu\text{m}.$$

5. The light blocking sheet of claim 1, further comprising:

an air layer located between the first outer layer and the second outer layer, wherein the air layer is close to the first opening and the second opening.

6. The light blocking sheet of claim 5, wherein a length parallel to the central axis of the air layer is d , and the following condition is satisfied:

$$5 \mu\text{m} < d < 49 \mu\text{m}.$$

7. The light blocking sheet of claim 5, wherein a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$5 \mu\text{m} < t < 49 \mu\text{m}.$$

8. The light blocking sheet of claim 5, wherein a length parallel to the central axis of the air layer is d , a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$0.12 < d/t < 0.67.$$

9. The light blocking sheet of claim 3, wherein the diameter of the first opening is $\Phi 1$, the diameter of the second opening is $\Phi 2$, and the following condition is satisfied:

$$0.93 < \Phi 1/\Phi 2 < 1.07.$$

10. The light blocking sheet of claim 3, wherein a maximum outer diameter of the light blocking sheet is Φ , a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$1 < 1000t/\Phi < 50.$$

11. An imaging lens module, comprising:

a barrel;

an optical lens assembly disposed in the barrel; and

the light blocking sheet of claim 1 disposed in the barrel.

12. The imaging lens module of claim 11, wherein the first outer layer of the light blocking sheet further comprises a first surface corresponding to an

object-side surface of the imaging lens module, the second outer layer of the light blocking sheet further comprises a second surface corresponding to an image-side surface of the imaging lens module, and at least one of the first surface and the second surface comprises an anti-reflection film coated thereon.

13. The imaging lens module of claim 12, wherein the anti-reflection film comprises a silicon dioxide material layer.

14. The imaging lens module of claim 12, wherein only one of the first surface and the second surface comprises the anti-reflection film coated thereon.

15. An electronic apparatus, comprising:
the imaging lens module of claim 11; and
an image sensor disposed on an image surface of the imaging lens module.

16. A light blocking sheet, comprising:
a first outer layer comprising a first opening;
a second outer layer comprising a second opening;
an inner substrate layer disposed between the first outer layer and the second outer layer, wherein the inner substrate layer connects the first outer layer to the second outer layer, and the inner substrate layer comprises a substrate opening;

an air layer located between the first outer layer and the second outer layer, wherein the air layer is close to the first opening and the second opening; and

a central axis coaxial with the first opening, the second opening and the substrate opening;

wherein a length parallel to the central axis of the air layer is d , and the following condition is satisfied:

$$5\ \mu\text{m} < d < 50\ \mu\text{m}.$$

17. The light blocking sheet of claim 16, wherein the inner substrate layer is made of a plastic material, and each of the first outer layer and the second outer layer is made of a black carbon-containing material.

18. The light blocking sheet of claim 17, wherein a thickness of each of the inner substrate layer, the first outer layer and the second outer layer is uniform.

19. The light blocking sheet of claim 17, wherein a minimum diameter of the substrate opening is Φ_{smin} , a diameter of the first opening is Φ_1 , a diameter of the second opening is Φ_2 , and the following conditions are satisfied:

$$3.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_1)/2 < 85\ \mu\text{m}; \text{ and}$$

$$3.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_2)/2 < 85\ \mu\text{m}.$$

20. The light blocking sheet of claim 17, wherein the length parallel to the central axis of the air layer is d , a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$0.12 < d/t < 0.67.$$

21. An imaging lens module, comprising:

a barrel;

an optical lens assembly disposed in the barrel; and

the light blocking sheet of claim 16 disposed in the barrel.

22. The imaging lens module of claim 21, wherein the first outer layer of the light blocking sheet further comprises a first surface corresponding to an object-side surface of the imaging lens module, the second outer layer of the light blocking sheet further comprises a second surface corresponding to an image-side surface of the imaging lens module, and at least one of the first surface and the second surface comprises an anti-reflection film coated thereon.

23. An electronic apparatus, comprising:

the imaging lens module of claim 21, and

an image sensor disposed on an image surface of the imaging lens module.

LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS

RELATED APPLICATIONS

This application claims priority to Taiwan Application Serial Number
5 105137120, filed November 14, 2016, which is herein incorporated by reference.

BACKGROUND

Technical Field

The present disclosure relates to a light blocking sheet and an imaging lens
10 module. More particularly, the present disclosure relates to a light blocking sheet
and an imaging lens module applicable to a portable electronic apparatus.

Description of Related Art

With the popularity of personal electronic products and mobile
15 communication products having camera functionalities, such as smart phones and
tablet personal computers, compact imaging lens modules are in popular. The
demand for compact imaging lens modules with high resolution and high image
quality has also been increasing significantly.

A light blocking sheet is used to block unnecessary lights in the imaging lens
20 module. The surface properties of the light blocking sheet are critical to the effect
of suppressing stray lights. Accordingly, the surface properties of the light
blocking sheet affect the image quality of the imaging lens module.

A conventional light blocking sheet is usually made of a composite material. The composite material has a substrate layer made of a plastic material, such as a polyethylene terephthalate (PET), sandwiched by two outer layers made of a carbon-containing material. The conventional composite material is widely used to enhance the material strength. The composite material with the outer layers made of the carbon-containing material can further absorb lights due to its black surfaces. The composite material can be in the form of a material band due to the manufacturing method, which has the advantage of a thin thickness. Moreover, it allows the composite material to have a uniform thickness by controlling the manufacturing process of the substrate layer. It is also favorable to prevent the composite material from warping and to obtain a flat composite material being a thin film. Furthermore, the conventional light blocking sheet usually has an inner hole formed by stamping. However, when the inner hole is formed by stamping, the surface of the inner hole is smooth and bright and has a high reflectivity. Accordingly, the stray lights cannot be eliminated effectively, and the demand for high image quality cannot be satisfied.

A structure of the conventional light blocking sheet can refer to Fig. 1A and Fig. 1B. Fig. 1A is a front schematic view of a conventional light blocking sheet 1. Fig. 1B is a partially cross-sectional view taken along line 1b-1b of the light blocking sheet 1 in Fig. 1A. As shown in Fig. 1A and Fig. 1B, the light blocking sheet 1 is annular and has a three-layer structure. The three layers are an outer layer L1, a substrate layer L3 and an outer layer L2, respectively. Each of the outer layer L1, the substrate layer L3 and the outer layer L2 has a circular inner

hole (the reference numerals are omitted). A diameter of the circular inner hole of the outer layer L1, a diameter of the circular inner hole of the substrate layer L3 and a diameter of the circular inner hole of the outer layer L2 are identical. In other words, a surface facing the circular inner hole of the outer layer L1, a surface
5 facing the circular inner hole of the substrate layer L3 and a surface facing the circular inner hole of the outer layer L2 are aligned with one another (the surfaces are called inner surfaces hereinafter, and the reference numerals of the inner surfaces are omitted). When an incident light M1 and an incident light M'1 strike one of the inner surfaces, a reflected light R1 and a reflected light R'1 are
10 generated. When the light blocking sheet 1 is applied to an imaging lens module, the reflected light R1 and the reflected light R'1 will enter into the imaging lens module and interfere the image. As a result, the conventional light blocking sheet 1 cannot eliminate stray lights effectively.

To sum up, how to improve the ability for eliminating stray lights of the light
15 blocking sheet so as to enhance the image quality of the compact imaging lens module has become one of the most important issues nowadays.

SUMMARY

According to one aspect of the present disclosure, a light blocking sheet
20 includes a first outer layer, a second outer layer, an inner substrate layer and a central axis. The first outer layer includes a first opening. The second outer layer includes a second opening. The inner substrate layer is disposed between the first outer layer and the second outer layer. The inner substrate layer

connects the first outer layer to the second outer layer, and the inner substrate layer includes a substrate opening. The central axis is coaxial with the first opening, the second opening and the substrate opening. When a minimum diameter of the substrate opening is Φ_{smin} , a diameter of the first opening is Φ_1 , and a diameter of the second opening is Φ_2 , the following conditions are satisfied:

$$\Phi_{\text{smin}} > \Phi_1; \text{ and}$$

$$\Phi_{\text{smin}} > \Phi_2.$$

According to another aspect of the present disclosure, an imaging lens module includes a barrel, an optical lens assembly and the light blocking sheet according to the aforementioned aspect. The optical lens assembly is disposed in the barrel. The light blocking sheet is disposed in the barrel.

According to yet another aspect of the present disclosure, an electronic apparatus includes the imaging lens module according to the aforementioned aspect and an image sensor. The image sensor is disposed on an image surface of the imaging lens module.

According to further another aspect of the present disclosure, a light blocking sheet includes a first outer layer, a second outer layer, an inner substrate layer, an air layer and a central axis. The first outer layer includes a first opening. The second outer layer includes a second opening. The inner substrate layer is disposed between the first outer layer and the second outer layer. The inner substrate layer connects the first outer layer to the second outer layer, and the inner substrate layer includes a substrate opening. The air layer is located between the first outer layer and the second outer layer, and the air layer is close

to the first opening and the second opening. The central axis is coaxial with the first opening, the second opening and the substrate opening. When a length parallel to the central axis of the air layer is d , the following condition is satisfied:

$$5\ \mu\text{m} < d < 50\ \mu\text{m}.$$

5 According to further another aspect of the present disclosure, an imaging lens module includes a barrel, an optical lens assembly and the light blocking sheet according to the aforementioned aspect. The optical lens assembly is disposed in the barrel. The light blocking sheet is disposed in the barrel.

10 According to further another aspect of the present disclosure, an electronic apparatus includes the imaging lens module according to the aforementioned aspect and an image sensor. The image sensor is disposed on an image surface of the imaging lens module.

BRIEF DESCRIPTION OF THE DRAWINGS

15 The present disclosure can be more fully understood by reading the following detailed description of the embodiments, with reference made to the accompanying drawings as follows:

Fig. 1A is a front schematic view of a conventional light blocking sheet;

20 Fig. 1B is a partially cross-sectional view taken along line 1b-1b of the light blocking sheet in Fig. 1A;

Fig. 2A is a front schematic view of a light blocking sheet according to one embodiment of the present disclosure;

Fig. 2B is a separation schematic view showing layers of the light blocking sheet in Fig. 2A;

Fig. 2C is a cross-sectional view taken along line 2c-2c of the light blocking sheet in Fig. 2A;

5 Fig. 2D is a schematic view of a composite material used to manufacture the light blocking sheet in Fig. 2A;

Fig. 2E is a partially separation schematic view of the composite material in Fig. 2D;

10 Fig. 3 is a cross-sectional view of a light blocking sheet according to another embodiment of the present disclosure;

Fig. 4 is a partially cross-sectional view of a light blocking sheet according to the 1st example of the present disclosure;

Fig. 5 is a partially cross-sectional view of a light blocking sheet according to the 2nd example of the present disclosure;

15 Fig. 6 is a partially cross-sectional view of a light blocking sheet according to the 3rd example of the present disclosure;

Fig. 7 is a partially cross-sectional view of a light blocking sheet according to the 4th example of the present disclosure;

20 Fig. 8 is a partially cross-sectional view of a light blocking sheet according to the 5th example of the present disclosure;

Fig. 9 is a partially cross-sectional view of a light blocking sheet according to the 6th example of the present disclosure;

Fig. 10 is a partially cross-sectional view of a light blocking sheet according to the 7th example of the present disclosure;

Fig. 11 is a partially cross-sectional view of a light blocking sheet according to the 8th example of the present disclosure;

5 Fig. 12 is a partially cross-sectional view of a light blocking sheet according to the 9th example of the present disclosure;

Fig. 13 is a schematic view of an imaging lens module according to yet another embodiment of the present disclosure;

10 Fig. 14 is a schematic view of an electronic apparatus according to further another embodiment of the present disclosure;

Fig. 15A is a schematic view of an image capturing device according to the 10th example of the present disclosure;

Fig. 15B is a schematic view showing the image capturing device in Fig. 15A connected with other modules;

15 Fig. 15C is another schematic view showing the image capturing device in Fig. 15A connected with other modules;

Fig. 16A is a perspective schematic view of an electronic apparatus according to the 11th example of the present disclosure;

20 Fig. 16B is a schematic view of the electronic apparatus in Fig. 16A from another view angle;

Fig. 17 is a schematic view of an electronic apparatus according to the 12th example of the present disclosure; and

Fig. 18 is a schematic view of an electronic apparatus according to the 13th example of the present disclosure.

DETAILED DESCRIPTION

<Light Blocking Sheet>

Fig. 2A is a front schematic view of a light blocking sheet 100 according to one embodiment of the present disclosure. Fig. 2B is a separation schematic view showing layers of the light blocking sheet 100 in Fig. 2A. Fig. 2C is a cross-sectional view taken along line 2c-2c of the light blocking sheet 100 in Fig. 2A. In Figs. 2A-2C, the light blocking sheet 100 includes a first outer layer 110, a second outer layer 120, an inner substrate layer 130 and a central axis Z.

Fig. 2D is a schematic view of a composite material used to manufacture the light blocking sheet 100 in Fig. 2A. Fig. 2E is a partially separation schematic view of the composite material in Fig. 2D. In Figs. 2D-2E, the composite material includes a first outer layer material 110A, a second outer layer material 120A and an inner substrate layer material 130A. In Fig. 2E, the first outer layer material 110A and the second outer layer material 120A are torn by an external force and are distorted due to a non-uniform extension, which intends to clearly show the first outer layer material 110A, the second outer layer material 120A and the inner substrate layer material 130A. However, under normal circumstance, the first outer layer material 110A is tightly connected with the second outer layer material 120A via the inner substrate layer material 130A as shown in Fig. 2D. Thus, the composite material can be a material band due to the manufacturing method,

which allows the composite material to have a uniform thickness by controlling the manufacturing process of the inner substrate layer 130. Moreover, it is favorable to prevent the composite material from warping and to obtain a flat composite material being a thin film, which is favorable to maintain a thin thickness of the light blocking sheet 100.

Referring back to Figs. 2A-2C, the first outer layer 110 includes a first opening 111, and the second outer layer 120 includes a second opening 121. The inner substrate layer 130 disposed between the first outer layer 110 and the second outer layer 120 connects the first outer layer 110 to the second outer layer 120, and the inner substrate layer 130 includes a substrate opening 131. The central axis Z is coaxial with the first opening 111, the second opening 121 and the substrate opening 131.

Specifically, the first outer layer 110 includes a first surface 112 facing outward and a second surface 113 facing inward. The second outer layer 120 includes a first surface 122 facing inward and a second surface 123 facing outward. The first outer layer 110 is connected with the inner substrate layer 130 via the second surface 113, and the second outer layer 120 is connected with the inner substrate layer 130 via the first surface 122. Moreover, the first opening 111, the second opening 121 and the substrate opening 131 are correspondent with one another.

When a minimum diameter of the substrate opening 131 is Φ_{min} , a diameter of the first opening 111 is Φ_1 , and a diameter of the second opening 121 is Φ_2 , the following conditions are satisfied: $\Phi_{\text{min}} > \Phi_1$; and $\Phi_{\text{min}} > \Phi_2$.

Therefore, an inner space (shown in Fig. 2C) is defined by the first outer layer 110, the second outer layer 120 and the inner substrate layer 130, and the inner space is communicated with the substrate opening 131. When no other materials are disposed in the inner space, the inner space is an air layer 140. In other words, the air layer 140 is located between the first outer layer 110 and the second outer layer 120. The air layer 140 is close to the first opening 111 and the second opening 121, and is communicated with the substrate opening 131. The description "the air layer 140 is close to the first opening 111 and the second opening 121" refers that the air layer 140 is closer to the first opening 111 and the second opening 121 than the inner substrate layer 130.

As shown in Fig. 2C, when an incident light M2 and an incident light M'2 strike a surface of the inner space (air layer 140), i.e. the surface of the inner substrate layer 130 facing the substrate opening 131, the second surface 113 of the first outer layer 110 or the first surface 122 of the second outer layer 120, a reflected light R2 and a reflected light R'2 generated thereby tend to reflect again in the inner space (air layer 140). Accordingly, the light blocking sheet 100 can effectively attenuate an intensity of the light reflected therefrom. When the light blocking sheet 100 is applied to an imaging lens module, the stray lights can be effectively reduced, and the image quality can be enhanced.

In the embodiment, the inner space is the air layer 140, so that the reflection of the stray lights can be reduced. In other embodiments, a material which can absorb lights or can reduce the reflected lights, such as a black powder or a black glue of a carbon-containing material or an anti-reflective coating material, can be

disposed in the inner space. The anti-reflective coating material can include TiO_2 and SiO_2 . Preferably, the material disposed in the inner space does not protrude from the inner space. Moreover, as shown in Fig. 2C, the surface of the inner substrate layer 130 facing the substrate opening 131 can be a rugged surface which is inclined with respect to the central axis Z, so that the intensity of the light reflected from the air layer 140 can be further attenuated. In other embodiments, the surface of the inner substrate layer 130 facing the substrate opening 131 can be a smooth surface which is inclined with respect to the central axis Z and is curve (such as that shown in Fig. 5 and Fig. 6). Alternatively, the surface of the inner substrate layer 130 facing the substrate opening 131 can be a concave surface (such as that shown in Fig. 7) or a convex surface (such as that shown in Fig. 8).

The inner substrate layer 130 can be made of a plastic material, and each of the first outer layer 110 and the second outer layer 120 can be made of a black carbon-containing material, such as black carbon fibers. Therefore, the light blocking sheet 100 is made of the composite material, which is favorable to reduce the thickness of the light blocking sheet 100. Moreover, when the first outer layer 110 and the second outer layer 120 are made of black carbon fibers, the strength and the ability for eliminating lights can be enhanced simultaneously. Specifically, the plastic material can be polycarbonate (PC), black or transparent polyethylene terephthalate (PET), polymethylmethacrylate (PMMA) or a combination thereof.

When the minimum diameter of the substrate opening 131 is Φ_{smin} , the diameter of the first opening 111 is Φ_1 , and the diameter of the second opening

121 is $\Phi 2$, the following conditions can be satisfied: $2.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi 1)/2 < 200 \mu\text{m}$; and $2.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi 2)/2 < 200 \mu\text{m}$. Therefore, the differences of diameters are proper, so that the reflected lights and the time for manufacturing the air layer 140 can be reduced simultaneously. Preferably, the following conditions
5 can be satisfied: $3.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi 1)/2 < 85 \mu\text{m}$; and $3.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi 2)/2 < 85 \mu\text{m}$.

When a length parallel to the central axis Z of the air layer 140 is d, the following condition can be satisfied: $5 \mu\text{m} < d < 50 \mu\text{m}$. Therefore, the travel path of the stray light can be reduced. Preferably, the following condition can be
10 satisfied: $5 \mu\text{m} < d < 49 \mu\text{m}$.

When a thickness of the light blocking sheet 100 is t, the following condition can be satisfied: $5 \mu\text{m} < t < 49 \mu\text{m}$. Therefore, the thickness of the light blocking sheet 100 is proper, which can reduce the time and cost for manufacturing the air layer 140.

15 When the length parallel to the central axis Z of the air layer 140 is d, and the thickness of the light blocking sheet 100 is t, the following condition can be satisfied: $0.12 < d/t < 0.67$. Therefore, the material consumption and the production cost of the process can be reduced.

When the diameter of the first opening 111 is $\Phi 1$, and the diameter of the
20 second opening 121 is $\Phi 2$, the following condition can be satisfied: $0.93 < \Phi 1/\Phi 2 < 1.07$. Therefore, it is favorable to form the first opening 111 and the second opening 121 by stamping or laser cutting, which can enhance the production efficiency.

When a maximum outer diameter of the light blocking sheet 100 is Φ , and the thickness of the light blocking sheet 100 is t , the following condition can be satisfied: $1 < 1000t/\Phi < 50$. Therefore, a larger light blocking range and a smaller volume can be provided.

5 A thickness of each of the inner substrate layer 130, the first outer layer 110 and the second outer layer 120 can be uniform. Therefore, the fast and mass production can be achieved. The raw material can be supplied in the form of material band, which is favorable for the subsequent processing. "The thickness can be uniform" refers that the thickness is identical. That is, the thickness of the
10 inner substrate layer 130 parallel to the central axis Z is identical except the substrate opening 131; the thickness of the first outer layer 110 parallel to the central axis Z is identical except the first opening 111; the thickness of the second outer layer 120 parallel to the central axis Z is identical except the second opening 121.

15 Fig. 3 is a cross-sectional view of a light blocking sheet 200 according to another embodiment of the present disclosure. In Fig. 3, the light blocking sheet 200 includes a first outer layer 210, a second outer layer 220, an inner substrate layer 230 and a central axis Z. The first outer layer 210 includes a first opening 211, and the second outer layer 220 includes a second opening 221. The inner
20 substrate layer 230 disposed between the first outer layer 210 and the second outer layer 220 connects the first outer layer 210 to the second outer layer 220. The inner substrate layer 230 includes a substrate opening 231. The central axis

Z is coaxial with the first opening 211, the second opening 221 and the substrate opening 231.

Specifically, the first outer layer 210 includes a first surface 212 facing outward and a second surface 213 facing inward. The second outer layer 220 includes a first surface 222 facing inward and a second surface 223 facing outward. The first outer layer 210 is connected with the inner substrate layer 230 via the second surface 213, and the second outer layer 220 is connected with the inner substrate layer 230 via the first surface 222. Moreover, the first opening 211, the second opening 221 and the substrate opening 231 are correspondent with one another. An inner space is defined by the first outer layer 210, the second outer layer 220 and the inner substrate layer 230, and the inner space is communicated with the substrate opening 231. In the embodiment, no other materials are disposed in the inner space. That is, the inner space is an air layer 240.

At least one of the first surface 212 of the first outer layer 210 and the second surface 223 of the second outer layer 220 can include an anti-reflection film 250 coated thereon. Therefore, the effect for attenuating reflected light of the light blocking sheet 200 can be enhanced, and the material used to manufacture the light blocking sheet 200 can be broadened.

In the embodiment, the anti-reflection film 250 can be coated only on the first surface 212 of the first outer layer 210. In other embodiments, the anti-reflection film 250 can be coated only on the second surface 223 of the second outer layer 220. Therefore, the effect for identifying front and back can be provided.

In other embodiments, the anti-reflection films 250 can be coated on the first surface 212 of the first outer layer 210 and the second surface 223 of the second outer layer 220. Therefore, the effect for attenuating reflected light of the light blocking sheet 200 can be further enhanced, and the material used to manufacture the light blocking sheet 200 can be further broadened.

The anti-reflection film 250 can include a silicon dioxide material layer. Therefore, the anti-oxidation effect of the light blocking sheet 200 can be enhanced, which can reduce the extra influence of processing. Specifically, the anti-reflection film 250 can be a multi-film structure, which includes at least one silicon dioxide material layer.

The other details of the light blocking sheet 200 can be the same as that of the light blocking sheet 100 in Figs. 2A-2C, and will not be repeated herein.

<Imaging Lens Module>

Fig. 13 is a schematic view of an imaging lens module 2000 according to yet another embodiment of the present disclosure. In Fig. 13, the imaging lens module 2000 includes a barrel 2100, an optical lens assembly 2200 and the light blocking sheet 100. The optical lens assembly 2200 is disposed in the barrel 2100, and the light blocking sheet 100 is disposed in the barrel 2100. Therefore, the light can be effectively blocked, and the reflected intensity of the stray light into the imaging lens module 2000 can be reduced. Accordingly, the image quality of the imaging lens module 2000 can be improved.

Specifically, the imaging lens module 2000 can further include an object-side surface 2300, an image-side surface 2400 and an image surface 2500. The object-side surface 2300 faces an imaged object (not shown), and the image-side surface 2400 faces the image surface 2500. The optical lens assembly 2200 can include at least two lens elements (2210, 2220, 2230, 2240, 2250, 2260), and the light blocking sheet 100 is adjacent to at least one of the lens elements (2210, 2220, 2230, 2240, 2250, 2260). Other spacing elements (2610, 2620, 2630, 2640) can be disposed between two of the lens elements (2210, 2220, 2230, 2240, 2250, 2260).

More specifically, the optical lens assembly 2200 can include a first lens element 2210, a second lens element 2220, a third lens element 2230, a fourth lens element 2240, a fifth lens element 2250 and a sixth lens element 2260. The light blocking sheet 100 is disposed between the third lens element 2230 and the fourth lens element 2240. The first surface 112 (shown in Fig. 2C) of first outer layer 110 of the light blocking sheet 100 corresponds to the object-side surface 2300 of the imaging lens module 2000. The second surface 123 (shown in Fig. 2C) of second outer layer 120 of the light blocking sheet 100 corresponds to the image-side surface 2400 of the imaging lens module 2000. A spacing element 2610 is disposed between the first lens element 2210 and the second lens element 2220. A spacing element 2620 is disposed between the second lens element 2220 and the third lens element 2230. A spacing element 2630 is disposed between the fourth lens element 2240 and the fifth lens element 2250. A spacing element 2640 is disposed between the fifth lens element 2250 and the sixth lens

element 2260. In the embodiment, the position and the number of the light blocking sheet 100 is only exemplary. In practical, the light blocking sheet 100 can be disposed between any two of the first lens element 2210, the second lens element 2220, the third lens element 2230, the fourth lens element 2240, the fifth lens element 2250 and the sixth lens element 2260. Moreover, the spacing element 2610, the spacing element 2620, the spacing element 2630 and/or the spacing element 2640 can be replaced by the light blocking sheet 100.

Furthermore, at least one of the first surface 112 of first outer layer 110 and the second surface 123 of second outer layer 120 of the light blocking sheet 100 can include an anti-reflection film (not shown) coated thereon. The details of the anti-reflection film can be the same as that in Fig. 3, and will not be repeated herein. Therefore, the reflection of lights can be reduced, and the image quality of the imaging lens module 2000 can be enhanced.

<Electronic Apparatus>

Fig. 14 is a schematic view of an electronic apparatus 3000 according to further another embodiment of the present disclosure. In Fig. 14, the electronic apparatus 3000 includes the imaging lens module 2000 in Fig. 13 and an image sensor 3100. The image sensor 3100 is disposed on the image surface 2500 of the imaging lens module 2000. Therefore, the reflection of the stray light can be effectively reduced, and the image quality can be maintained, so that the demand for high-end image specifications of the electronic apparatus 3000 can be satisfied. The electronic apparatus 3000 can further include but not limited to a display, a

control unit, a storage unit, a random access memory unit (RAM), a read only memory unit (ROM) or a combination thereof. Moreover, the electronic apparatus 3000 can be applied to but is not limited to a 3D (three-dimensional) image capturing applications, in products such as digital cameras, mobile devices, digital tablets, smart TV, surveillance devices, game consoles with motion sensing function, vehicle cameras such as driving recording systems and rear view camera systems, aerial photography devices, sports photography equipment, all kinds of smart electronics and wearable devices.

<1st Example>

Fig. 4 is a partially cross-sectional view of a light blocking sheet 300 according to the 1st example of the present disclosure. A view angle of Fig. 4 is the same as that in Fig. 2C, and Fig. 4 only shows a half of the cross section of the light blocking sheet 300. In Fig. 4, the light blocking sheet 300 includes a first outer layer 310, a second outer layer 320, an inner substrate layer 330, an air layer 340 and a central axis Z. The first outer layer 310 includes a first opening 311. The second outer layer 320 includes a second opening 321. The inner substrate layer 330 disposed between the first outer layer 310 and the second outer layer 320 connects the first outer layer 310 to the second outer layer 320. The inner substrate layer 330 includes a substrate opening 331. The air layer 340 is located between the first outer layer 310 and the second outer layer 320, and is close to the first opening 311 and the second opening 321. The central axis Z is coaxial with the first opening 311, the second opening 321 and the substrate opening 331.

Specifically, the first outer layer 310 includes a first surface 312 facing outward and a second surface 313 facing inward. The second outer layer 320 includes a first surface 322 facing inward and a second surface 323 facing outward. The first outer layer 310 is connected with the inner substrate layer 330 via the second surface 313, and the second outer layer 320 is connected with the inner substrate layer 330 via the first surface 322. Moreover, a thickness of each of the first outer layer 310, the second outer layer 320 and the inner substrate layer 330 is uniform.

Each of the first outer layer 310 and the second outer layer 320 can be made of a black carbon-containing material, and the inner substrate layer 330 can be made of a plastic material. Each of the first surface 312 of the first outer layer 310 and the second surface 323 of the second outer layer 320 can include an anti-reflection film (shown in Fig. 3) coated thereon. The anti-reflection film can include a silicon dioxide material layer.

In the light blocking sheet 300 according to the 1st example, a length parallel to the central axis Z of the air layer 340 is d, a thickness of the light blocking sheet 300 is t, a diameter of the first opening 311 is Φ_1 , a diameter of the second opening 321 is Φ_2 , a minimum diameter of the substrate opening 331 is Φ_{smin} , and a maximum outer diameter of the light blocking sheet 300 is Φ . The parameters of d, t, Φ_1 , Φ_2 , Φ_{smin} , and Φ can refer to Fig. 2C. The values of d, t, d/t, Φ_1 , Φ_2 , Φ_{smin} , Φ , $(\Phi_{smin}-\Phi_1)/2$, $(\Phi_{smin}-\Phi_2)/2$, Φ_1/Φ_2 and $1000t/\Phi$ of the 1st example are listed in Table 1.

Table 1, 1st Example

d (μm)	17.5	Φ (mm)	3.25
t (μm)	29.5	(Φsmin-Φ1)/2 (μm)	6
d/t	0.59	(Φsmin-Φ2)/2 (μm)	6
Φ1 (mm)	2.5	Φ1/Φ2	1
Φ2 (mm)	2.5	1000t/Φ	9.08
Φsmin (mm)	2.5120		

<2nd Example>

Fig. 5 is a partially cross-sectional view of a light blocking sheet 400 according to the 2nd example of the present disclosure. A view angle of Fig. 5 is the same as that in Fig. 2C, and Fig. 5 only shows a half of the cross section of the light blocking sheet 400. In Fig. 5, the light blocking sheet 400 includes a first outer layer 410, a second outer layer 420, an inner substrate layer 430, an air layer 440 and a central axis Z. The first outer layer 410 includes a first opening 411. The second outer layer 420 includes a second opening 421. The inner substrate layer 430 disposed between the first outer layer 410 and the second outer layer 420 connects the first outer layer 410 to the second outer layer 420. The inner substrate layer 430 includes a substrate opening 431. The air layer 440 is located between the first outer layer 410 and the second outer layer 420, and is close to the first opening 411 and the second opening 421. The central axis Z is coaxial with the first opening 411, the second opening 421 and the substrate opening 431.

Specifically, the first outer layer 410 includes a first surface 412 facing outward and a second surface 413 facing inward. The second outer layer 420 includes a first surface 422 facing inward and a second surface 423 facing outward. The first outer layer 410 is connected with the inner substrate layer 430 via the second surface 413, and the second outer layer 420 is connected with the inner

substrate layer 430 via the first surface 422. Moreover, a thickness of each of the first outer layer 410, the second outer layer 420 and the inner substrate layer 430 is uniform.

Each of the first outer layer 410 and the second outer layer 420 can be made of a black carbon-containing material, and the inner substrate layer 430 can be made of a plastic material. Each of the first surface 412 of the first outer layer 410 and the second surface 423 of the second outer layer 420 can include an anti-reflection film (shown in Fig. 3) coated thereon. The anti-reflection film can include a silicon dioxide material layer.

In the light blocking sheet 400 according to the 2nd example, a length parallel to the central axis Z of the air layer 440 is d, a thickness of the light blocking sheet 400 is t, a diameter of the first opening 411 is $\Phi 1$, a diameter of the second opening 421 is $\Phi 2$, a minimum diameter of the substrate opening 431 is Φ_{smin} , and a maximum outer diameter of the light blocking sheet 400 is Φ . The parameters of d, t, $\Phi 1$, $\Phi 2$, Φ_{smin} , and Φ can refer to Fig. 2C. The values of d, t, d/t, $\Phi 1$, $\Phi 2$, Φ_{smin} , Φ , $(\Phi_{smin}-\Phi 1)/2$, $(\Phi_{smin}-\Phi 2)/2$, $\Phi 1/\Phi 2$ and $1000t/\Phi$ of the 2nd example are listed in Table 2.

Table 2, 2nd Example			
d (μm)	29.5	Φ (mm)	3.05
t (μm)	37.5	$(\Phi_{smin}-\Phi 1)/2$ (μm)	15.95
d/t	0.79	$(\Phi_{smin}-\Phi 2)/2$ (μm)	15.95
$\Phi 1$ (mm)	1.65	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	1.65	$1000t/\Phi$	12.30
Φ_{smin} (mm)	1.6819		

<3rd Example>

Fig. 6 is a partially cross-sectional view of a light blocking sheet 500 according to the 3rd example of the present disclosure. A view angle of Fig. 6 is the same as that in Fig. 2C, and Fig. 6 only shows a half of the cross section of the light blocking sheet 500. In Fig. 6, the light blocking sheet 500 includes a first
5 outer layer 510, a second outer layer 520, an inner substrate layer 530, an air layer 540 and a central axis Z. The first outer layer 510 includes a first opening 511. The second outer layer 520 includes a second opening 521. The inner substrate layer 530 disposed between the first outer layer 510 and the second outer layer 520 connects the first outer layer 510 to the second outer layer 520. The inner
10 substrate layer 530 includes a substrate opening 531. The air layer 540 is located between the first outer layer 510 and the second outer layer 520, and is close to the first opening 511 and the second opening 521. The central axis Z is coaxial with the first opening 511, the second opening 521 and the substrate opening 531.

Specifically, the first outer layer 510 includes a first surface 512 facing
15 outward and a second surface 513 facing inward. The second outer layer 520 includes a first surface 522 facing inward and a second surface 523 facing outward. The first outer layer 510 is connected with the inner substrate layer 530 via the second surface 513, and the second outer layer 520 is connected with the inner substrate layer 530 via the first surface 522. Moreover, a thickness of each of the
20 first outer layer 510, the second outer layer 520 and the inner substrate layer 530 is uniform.

Each of the first outer layer 510 and the second outer layer 520 can be made of black carbon fibers, and the inner substrate layer 530 can be made of a

black plastic material of PET. Each of the first surface 512 of the first outer layer 510 and the second surface 523 of the second outer layer 520 can include an anti-reflection film (shown in Fig. 3) coated thereon. The anti-reflection film can include a silicon dioxide material layer.

In the light blocking sheet 500 according to the 3rd example, a length parallel to the central axis Z of the air layer 540 is d, a thickness of the light blocking sheet 500 is t, a diameter of the first opening 511 is $\Phi 1$, a diameter of the second opening 521 is $\Phi 2$, a minimum diameter of the substrate opening 531 is Φ_{smin} , and a maximum outer diameter of the light blocking sheet 500 is Φ . The parameters of d, t, $\Phi 1$, $\Phi 2$, Φ_{smin} , and Φ can refer to Fig. 2C. The values of d, t, d/t, $\Phi 1$, $\Phi 2$, Φ_{smin} , Φ , $(\Phi_{smin}-\Phi 1)/2$, $(\Phi_{smin}-\Phi 2)/2$, $\Phi 1/\Phi 2$ and $1000t/\Phi$ of the 3rd example are listed in Table 3.

Table 3, 3rd Example			
d (μm)	9	Φ (mm)	3.55
t (μm)	17	$(\Phi_{smin}-\Phi 1)/2$ (μm)	15.95
d/t	0.53	$(\Phi_{smin}-\Phi 2)/2$ (μm)	15.95
$\Phi 1$ (mm)	3.04	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	3.04	$1000t/\Phi$	4.79
Φ_{smin} (mm)	3.0719		

<4th Example>

Fig. 7 is a partially cross-sectional view of a light blocking sheet 600 according to the 4th example of the present disclosure. A view angle of Fig. 7 is the same as that in Fig. 2C, and Fig. 7 only shows a half of the cross section of the light blocking sheet 600. In Fig. 7, the light blocking sheet 600 includes a first outer layer 610, a second outer layer 620, an inner substrate layer 630, an air layer

640 and a central axis Z. The first outer layer 610 includes a first opening 611. The second outer layer 620 includes a second opening 621. The inner substrate layer 630 disposed between the first outer layer 610 and the second outer layer 620 connects the first outer layer 610 to the second outer layer 620. The inner
5 substrate layer 630 includes a substrate opening 631. The air layer 640 is located between the first outer layer 610 and the second outer layer 620, and is close to the first opening 611 and the second opening 621. The central axis Z is coaxial with the first opening 611, the second opening 621 and the substrate opening 631.

Specifically, the first outer layer 610 includes a first surface 612 facing
10 outward and a second surface 613 facing inward. The second outer layer 620 includes a first surface 622 facing inward and a second surface 623 facing outward. The first outer layer 610 is connected with the inner substrate layer 630 via the second surface 613, and the second outer layer 620 is connected with the inner substrate layer 630 via the first surface 622. Moreover, a thickness of each of the
15 first outer layer 610, the second outer layer 620 and the inner substrate layer 630 is uniform.

Each of the first outer layer 610 and the second outer layer 620 can be made of black carbon fibers, and the inner substrate layer 630 can be made of a transparent plastic material of PET. Each of the first surface 612 of the first outer
20 layer 610 and the second surface 623 of the second outer layer 620 can include an anti-reflection film (shown in Fig. 3) coated thereon. The anti-reflection film can include a silicon dioxide material layer.

In the light blocking sheet 600 according to the 4th example, a length parallel to the central axis Z of the air layer 640 is d, a thickness of the light blocking sheet 600 is t, a diameter of the first opening 611 is $\Phi 1$, a diameter of the second opening 621 is $\Phi 2$, a minimum diameter of the substrate opening 631 is Φ_{min} , and a maximum outer diameter of the light blocking sheet 600 is Φ . The parameters of d, t, $\Phi 1$, $\Phi 2$, Φ_{min} , and Φ can refer to Fig. 2C. The values of d, t, d/t, $\Phi 1$, $\Phi 2$, Φ_{min} , Φ , $(\Phi_{\text{min}}-\Phi 1)/2$, $(\Phi_{\text{min}}-\Phi 2)/2$, $\Phi 1/\Phi 2$ and $1000t/\Phi$ of the 4th example are listed in Table 4.

Table 4, 4th Example			
d (μm)	40	Φ (mm)	5.35
t (μm)	48	$(\Phi_{\text{min}}-\Phi 1)/2$ (μm)	36.64
d/t	0.83	$(\Phi_{\text{min}}-\Phi 2)/2$ (μm)	36.64
$\Phi 1$ (mm)	4.14	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	4.14	$1000t/\Phi$	8.97
Φ_{min} (mm)	4.2133		

<5th Example>

Fig. 8 is a partially cross-sectional view of a light blocking sheet 700 according to the 5th example of the present disclosure. A view angle of Fig. 8 is the same as that in Fig. 2C, and Fig. 8 only shows a half of the cross section of the light blocking sheet 700. In Fig. 8, the light blocking sheet 700 includes a first outer layer 710, a second outer layer 720, an inner substrate layer 730, an air layer 740 and a central axis Z. The first outer layer 710 includes a first opening 711. The second outer layer 720 includes a second opening 721. The inner substrate layer 730 disposed between the first outer layer 710 and the second outer layer 720 connects the first outer layer 710 to the second outer layer 720. The inner

substrate layer 730 includes a substrate opening 731. The air layer 740 is located between the first outer layer 710 and the second outer layer 720, and is close to the first opening 711 and the second opening 721. The central axis Z is coaxial with the first opening 711, the second opening 721 and the substrate opening 731.

5 Specifically, the first outer layer 710 includes a first surface 712 facing outward and a second surface 713 facing inward. The second outer layer 720 includes a first surface 722 facing inward and a second surface 723 facing outward. The first outer layer 710 is connected with the inner substrate layer 730 via the second surface 713, and the second outer layer 720 is connected with the inner
10 substrate layer 730 via the first surface 722. Moreover, a thickness of each of the first outer layer 710, the second outer layer 720 and the inner substrate layer 730 is uniform.

Each of the first outer layer 710 and the second outer layer 720 can be made of a black carbon-containing material, and the inner substrate layer 730 can
15 be made of a plastic material. Each of the first surface 712 of the first outer layer 710 and the second surface 723 of the second outer layer 720 can include an anti-reflection film (shown in Fig. 3) coated thereon. The anti-reflection film can include a silicon dioxide material layer.

In the light blocking sheet 700 according to the 5th example, a length
20 parallel to the central axis Z of the air layer 740 is d, a thickness of the light blocking sheet 700 is t, a diameter of the first opening 711 is Φ_1 , a diameter of the second opening 721 is Φ_2 , a minimum diameter of the substrate opening 731 is Φ_{min} , and a maximum outer diameter of the light blocking sheet 700 is Φ . The

parameters of d , t , $\Phi 1$, $\Phi 2$, Φ_{min} , and Φ can refer to Fig. 2C. The values of d , t , d/t , $\Phi 1$, $\Phi 2$, Φ_{min} , Φ , $(\Phi_{\text{min}}-\Phi 1)/2$, $(\Phi_{\text{min}}-\Phi 2)/2$, $\Phi 1/\Phi 2$ and $1000t/\Phi$ of the 5th example are listed in Table 5.

Table 5, 5th Example			
d (μm)	20	Φ (mm)	5.55
t (μm)	28	$(\Phi_{\text{min}}-\Phi 1)/2$ (μm)	92
d/t	0.71	$(\Phi_{\text{min}}-\Phi 2)/2$ (μm)	92
$\Phi 1$ (mm)	4.14	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	4.14	$1000t/\Phi$	5.05
Φ_{min} (mm)	4.3240		

5

<6th Example>

Fig. 9 is a partially cross-sectional view of a light blocking sheet 800 according to the 6th example of the present disclosure. A view angle of Fig. 9 is the same as that in Fig. 2C, and Fig. 9 only shows a half of the cross section of the light blocking sheet 800. In Fig. 9, the light blocking sheet 800 includes a first
10 outer layer 810, a second outer layer 820, an inner substrate layer 830, an air layer 840 and a central axis Z. The first outer layer 810 includes a first opening 811. The second outer layer 820 includes a second opening 821. The inner substrate layer 830 disposed between the first outer layer 810 and the second outer layer 820 connects the first outer layer 810 to the second outer layer 820. The inner
15 substrate layer 830 includes a substrate opening 831. The air layer 840 is located between the first outer layer 810 and the second outer layer 820, and is close to the first opening 811 and the second opening 821. The central axis Z is coaxial with the first opening 811, the second opening 821 and the substrate opening 831.

Specifically, the first outer layer 810 includes a first surface 812 facing outward and a second surface 813 facing inward. The second outer layer 820 includes a first surface 822 facing inward and a second surface 823 facing outward. The first outer layer 810 is connected with the inner substrate layer 830 via the second surface 813, and the second outer layer 820 is connected with the inner substrate layer 830 via the first surface 822. Moreover, a thickness of each of the first outer layer 810, the second outer layer 820 and the inner substrate layer 830 is uniform.

Each of the first outer layer 810 and the second outer layer 820 can be made of a black carbon-containing material, and the inner substrate layer 830 can be made of a plastic material. Each of the first surface 812 of the first outer layer 810 and the second surface 823 of the second outer layer 820 can include an anti-reflection film (shown in Fig. 3) coated thereon. The anti-reflection film can include a silicon dioxide material layer.

In the light blocking sheet 800 according to the 6th example, a length parallel to the central axis Z of the air layer 840 is d, a thickness of the light blocking sheet 800 is t, a diameter of the first opening 811 is Φ_1 , a diameter of the second opening 821 is Φ_2 , a minimum diameter of the substrate opening 831 is Φ_{smin} , and a maximum outer diameter of the light blocking sheet 800 is Φ . The parameters of d, t, Φ_1 , Φ_2 , Φ_{smin} , and Φ can refer to Fig. 2C. The values of d, t, d/t, Φ_1 , Φ_2 , Φ_{smin} , Φ , $(\Phi_{smin}-\Phi_1)/2$, $(\Phi_{smin}-\Phi_2)/2$, Φ_1/Φ_2 and $1000t/\Phi$ of the 6th example are listed in Table 6. In 6th Example, lengths parallel to the central axis Z of the air layer 840 are different (i.e., the values of d are different), and the

value recorded in Table 6 is the minimum length (i.e., the minimum value of all the values of d).

Table 6, 6th Example			
d (μm)	7.15	Φ (mm)	5.55
t (μm)	28	$(\Phi_{\text{smin}} - \Phi 1)/2$ (μm)	91.8
d/t	0.26	$(\Phi_{\text{smin}} - \Phi 2)/2$ (μm)	91.8
$\Phi 1$ (mm)	4.14	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	4.14	$1000t/\Phi$	5.05
Φ_{smin} (mm)	4.3236		

<7th Example>

5 Fig. 10 is a partially cross-sectional view of a light blocking sheet 900 according to the 7th example of the present disclosure. A view angle of Fig. 10 is the same as that in Fig. 2C, and Fig. 10 only shows a half of the cross section of the light blocking sheet 900. In Fig. 10, the light blocking sheet 900 includes a first outer layer 910, a second outer layer 920, an inner substrate layer 930, an air layer 940 and a central axis Z. The first outer layer 910 includes a first opening 911. The second outer layer 920 includes a second opening 921. The inner substrate layer 930 disposed between the first outer layer 910 and the second outer layer 920 connects the first outer layer 910 to the second outer layer 920. The inner substrate layer 930 includes a substrate opening 931. The air layer 940 is located between the first outer layer 910 and the second outer layer 920, and is close to the first opening 911 and the second opening 921. The central axis Z is coaxial with the first opening 911, the second opening 921 and the substrate opening 931.

Specifically, the first outer layer 910 includes a first surface 912 facing outward and a second surface 913 facing inward. The second outer layer 920 includes a first surface 922 facing inward and a second surface 923 facing outward. The first outer layer 910 is connected with the inner substrate layer 930 via the second surface 913, and the second outer layer 920 is connected with the inner substrate layer 930 via the first surface 922. Moreover, a thickness of each of the first outer layer 910, the second outer layer 920 and the inner substrate layer 930 is uniform.

Each of the first outer layer 910 and the second outer layer 920 can be made of a black carbon-containing material, and the inner substrate layer 930 can be made of a plastic material. Each of the first surface 912 of the first outer layer 910 and the second surface 923 of the second outer layer 920 can include an anti-reflection film (shown in Fig. 3) coated thereon. The anti-reflection film can include a silicon dioxide material layer.

In the light blocking sheet 900 according to the 7th example, a length parallel to the central axis Z of the air layer 940 is d, a thickness of the light blocking sheet 900 is t, a diameter of the first opening 911 is Φ_1 , a diameter of the second opening 921 is Φ_2 , a minimum diameter of the substrate opening 931 is Φ_{smin} , and a maximum outer diameter of the light blocking sheet 900 is Φ . The parameters of d, t, Φ_1 , Φ_2 , Φ_{smin} , and Φ can refer to Fig. 2C. The values of d, t, d/t, Φ_1 , Φ_2 , Φ_{smin} , Φ , $(\Phi_{smin}-\Phi_1)/2$, $(\Phi_{smin}-\Phi_2)/2$, Φ_1/Φ_2 and $1000t/\Phi$ of the 7th example are listed in Table 7.

Table 7, 7th Example

d (μm)	17.68	Φ (mm)	3.25
t (μm)	29.5	(Φ _{smin} -Φ ₁)/2 (μm)	36
d/t	0.60	(Φ _{smin} -Φ ₂)/2 (μm)	36
Φ ₁ (mm)	2.5	Φ ₁ /Φ ₂	1
Φ ₂ (mm)	2.5	1000t/Φ	9.08
Φ _{smin} (mm)	2.5720		

<8th Example>

Fig. 11 is a partially cross-sectional view of a light blocking sheet 1000 according to the 8th example of the present disclosure. A view angle of Fig. 11 is the same as that in Fig. 2C, and Fig. 11 only shows a half of the cross section of the light blocking sheet 1000. In Fig. 11, the light blocking sheet 1000 includes a first outer layer 1010, a second outer layer 1020, an inner substrate layer 1030, an air layer 1040 and a central axis Z. The first outer layer 1010 includes a first opening 1011. The second outer layer 1020 includes a second opening 1021. The inner substrate layer 1030 disposed between the first outer layer 1010 and the second outer layer 1020 connects the first outer layer 1010 to the second outer layer 1020. The inner substrate layer 1030 includes a substrate opening 1031. The air layer 1040 is located between the first outer layer 1010 and the second outer layer 1020, and is close to the first opening 1011 and the second opening 1021. The central axis Z is coaxial with the first opening 1011, the second opening 1021 and the substrate opening 1031.

Specifically, the first outer layer 1010 includes a first surface 1012 facing outward and a second surface 1013 facing inward. The second outer layer 1020 includes a first surface 1022 facing inward and a second surface 1023 facing outward. The first outer layer 1010 is connected with the inner substrate layer

1030 via the second surface 1013, and the second outer layer 1020 is connected with the inner substrate layer 1030 via the first surface 1022. Moreover, a thickness of each of the first outer layer 1010, the second outer layer 1020 and the inner substrate layer 1030 is uniform.

Each of the first outer layer 1010 and the second outer layer 1020 can be made of a black carbon-containing material, and the inner substrate layer 1030 can be made of a plastic material. Each of the first surface 1012 of the first outer layer 1010 and the second surface 1023 of the second outer layer 1020 can include an anti-reflection film (shown in Fig. 3) coated thereon. The anti-reflection film can include a silicon dioxide material layer.

In the light blocking sheet 1000 according to the 8th example, a length parallel to the central axis Z of the air layer 1040 is d, a thickness of the light blocking sheet 1000 is t, a diameter of the first opening 1011 is $\Phi 1$, a diameter of the second opening 1021 is $\Phi 2$, a minimum diameter of the substrate opening 1031 is Φ_{smin} , and a maximum outer diameter of the light blocking sheet 1000 is Φ . The parameters of d, t, $\Phi 1$, $\Phi 2$, Φ_{smin} , and Φ can refer to Fig. 2C. The values of d, t, d/t, $\Phi 1$, $\Phi 2$, Φ_{smin} , Φ , $(\Phi_{\text{smin}}-\Phi 1)/2$, $(\Phi_{\text{smin}}-\Phi 2)/2$, $\Phi 1/\Phi 2$ and $1000t/\Phi$ of the 8th example are listed in Table 8.

Table 8, 8th Example			
d (μm)	29.5	Φ (mm)	3.05
t (μm)	37.5	$(\Phi_{\text{smin}}-\Phi 1)/2$ (μm)	30.95
d/t	0.79	$(\Phi_{\text{smin}}-\Phi 2)/2$ (μm)	15.95
$\Phi 1$ (mm)	1.62	$\Phi 1/\Phi 2$	0.98
$\Phi 2$ (mm)	1.65	$1000t/\Phi$	12.30
Φ_{smin} (mm)	1.6819		

<9th Example>

Fig. 12 is a partially cross-sectional view of a light blocking sheet 1100 according to the 9th example of the present disclosure. A view angle of Fig. 12 is the same as that in Fig. 2C, and Fig. 12 only shows a half of the cross section of the light blocking sheet 1100. In Fig. 12, the light blocking sheet 1100 includes a first outer layer 1110, a second outer layer 1120, an inner substrate layer 1130, an air layer 1140 and a central axis Z. The first outer layer 1110 includes a first opening 1111. The second outer layer 1120 includes a second opening 1121. The inner substrate layer 1130 disposed between the first outer layer 1110 and the second outer layer 1120 connects the first outer layer 1110 to the second outer layer 1120. The inner substrate layer 1130 includes a substrate opening 1131. The air layer 1140 is located between the first outer layer 1110 and the second outer layer 1120, and is close to the first opening 1111 and the second opening 1121. The central axis Z is coaxial with the first opening 1111, the second opening 1121 and the substrate opening 1131.

Specifically, the first outer layer 1110 includes a first surface 1112 facing outward and a second surface 1113 facing inward. The second outer layer 1120 includes a first surface 1122 facing inward and a second surface 1123 facing outward. The first outer layer 1110 is connected with the inner substrate layer 1130 via the second surface 1113, and the second outer layer 1120 is connected with the inner substrate layer 1130 via the first surface 1122. Moreover, a thickness of each of the first outer layer 1110, the second outer layer 1120 and the inner substrate layer 1130 is uniform.

Each of the first outer layer 1110 and the second outer layer 1120 can be made of a black carbon-containing material, and the inner substrate layer 1130 can be made of a plastic material. Each of the first surface 1112 of the first outer layer 1110 and the second surface 1123 of the second outer layer 1120 can include an anti-reflection film (shown in Fig. 3) coated thereon. The anti-reflection film can include a silicon dioxide material layer.

In the light blocking sheet 1100 according to the 9th example, a length parallel to the central axis Z of the air layer 1140 is d, a thickness of the light blocking sheet 1100 is t, a diameter of the first opening 1111 is $\Phi 1$, a diameter of the second opening 1121 is $\Phi 2$, a minimum diameter of the substrate opening 1131 is Φ_{smin} , and a maximum outer diameter of the light blocking sheet 1100 is Φ . The parameters of d, t, $\Phi 1$, $\Phi 2$, Φ_{smin} , and Φ can refer to Fig. 2C. The values of d, t, d/t, $\Phi 1$, $\Phi 2$, Φ_{smin} , Φ , $(\Phi_{smin}-\Phi 1)/2$, $(\Phi_{smin}-\Phi 2)/2$, $\Phi 1/\Phi 2$ and $1000t/\Phi$ of the 9th example are listed in Table 9.

Table 9, 9th Example			
d (μm)	4.5	Φ (mm)	3.55
t (μm)	11.5	$(\Phi_{smin}-\Phi 1)/2$ (μm)	15.95
d/t	0.39	$(\Phi_{smin}-\Phi 2)/2$ (μm)	15.95
$\Phi 1$ (mm)	3.04	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	3.04	$1000t/\Phi$	3.24
Φ_{smin} (mm)	3.0719		

<10th Example>

Fig. 15A is a schematic view of an image capturing device 10 according to the 10th example of the present disclosure. The image capturing device 10 of the 10th example is a camera module. The image capturing device 10 includes an

imaging lens module 11, a driving assembly 12, an image sensor 13 and a conductor circuit 14. The imaging lens module 11 includes an optical lens assembly (not shown herein), the light blocking sheet of the 1st example of the present disclosure (not shown herein) and a barrel (its reference numeral is
5 omitted). The optical lens assembly and the light blocking sheet are disposed in the barrel. In the image capturing device 10, lights are focused by the imaging lens module 11 for generating an image, the driving assembly 12 is used to assist the imaging lens module 11 into focus, then the image is formed on the image sensor 13, and the data of the image is outputted by the conductor circuit 14.

10 The driving assembly 12 can be an auto-focus module, and a driving method thereof can use a voice coil motor (VCM), a micro electro-mechanical system (MEMS), a piezoelectric system or a shape memory alloy system. The driving assembly 12 enables the imaging lens module 11 to obtain a preferable imaging position, so that the imaged object in different object distances can be
15 imaged clearly. Moreover, the driving assembly 12 can be coordinated with a kinetic energy sensing element, such as an accelerator, a gyro or a Hall effect sensor. By adjusting the changes in different axial directions of the optical lens assembly, the blurry image resulting in the shaking of the shooting moment can be compensated, so that the image quality of dynamic scenes or low-light scenes can
20 be enhanced. For example, an optical image stabilization (OIS) or an electronic image stabilization (EIS) can be featured with the driving assembly 12. Moreover, the image sensor 13 of the image capturing device 10 disposed on the image surface of the imaging lens module 11 can have the properties of high light

sensitivity and low noise (such as CMOS and CCD), so that the excellent image quality of the imaging lens module 11 can be truly presented.

In practical, the image capturing device 10 can be connected with other modules for giving the image capturing device 10 required functions. Fig. 15B is a schematic view showing the image capturing device 10 in Fig. 15A connected with other modules. In Fig. 15B, the image capturing device 10 is connected with the flash module 22 via a conductor circuit 15. Therefore, a light compensation function can be provided by the flash module 22, which is favorable for optimizing the image quality. Fig. 15C is another schematic view showing the image capturing device 10 in Fig. 15A connected with other modules. In Fig. 15C, the image capturing device 10 is connected with the auxiliary focusing module 23 via a conductor circuit 16. Therefore, the object distance of the imaged object can be provided by the auxiliary focusing module 23, which is favorable for the image capturing device 10 to focus quickly. In Fig. 15B and Fig. 15C, the flash module 22 and the auxiliary focusing module 23 are only exemplary, and can be replaced by other modules according to practical demands. Moreover, the image capturing device 10 can be connected with only one module or can be connected with a plurality modules. Each of the conductor circuit 14, the conductor circuit 15 and the conductor circuit 16 can be but is not limited to a flexible printing circuit (FPC).

<11th Example>

Fig. 16A is a perspective schematic view of an electronic apparatus 20 according to the 11th example of the present disclosure. Fig. 16B is a schematic

view of the electronic apparatus 20 in Fig. 16A from another view angle. The electronic apparatus 20 of the 11th example is a smart phone. The electronic apparatus 20 includes the image capturing device 10 of the 10th example, the flash module 22, the auxiliary focusing module 23, an image signal processor 24 and a user interface 25 (shown in Fig. 16B), wherein the image capturing device 10 is electrically connected with the flash module 22, the auxiliary focusing module 23, the image signal processor 24 and the user interface 25. When a user shoots with the electronic apparatus 20 via the user interface 25, lights are focused by the image capturing device 10 for generating an image, a light compensation function is provided by the flash module 22, the object distance of the imaged object is provided by the auxiliary focusing module 23 for focusing quickly, and an optimizing image processing is provided by the image signal processor 24, so that the image quality can be further enhanced. The auxiliary focusing module 23 can adopt an infrared auxiliary focusing system or a laser auxiliary focusing system for focusing quickly. The user interface 25 can adopt a touch screen or a physical shooting button, and an image processing software can be coordinated with the user interface 25 for providing a variety of shooting modes and a variety of image processings.

<12th Example>

Fig. 17 is a schematic view of an electronic apparatus 30 according to the 12th example of the present disclosure. In Fig. 17, the electronic apparatus 30 of the 12th embodiment is a tablet personal computer. The electronic apparatus 30

includes an image capturing device 31. The image capturing device 31 can be the same as that of the 10th example, and will not be repeated herein.

<13th Example>

5 Fig. 18 is a schematic view of an electronic apparatus 40 according to the 13th example of the present disclosure. In Fig. 18, the electronic apparatus 40 of the 13th embodiment is a head-mounted display (HMD). The electronic apparatus 40 includes an image capturing device 41. The image capturing device 41 can be the same as that of the 10th example, and will not be repeated herein.

10 It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present disclosure without departing from the scope or spirit of the disclosure. In view of the foregoing, it is intended that the present disclosure cover modifications and variations of this disclosure provided they fall within the scope of the following claims.

15

1

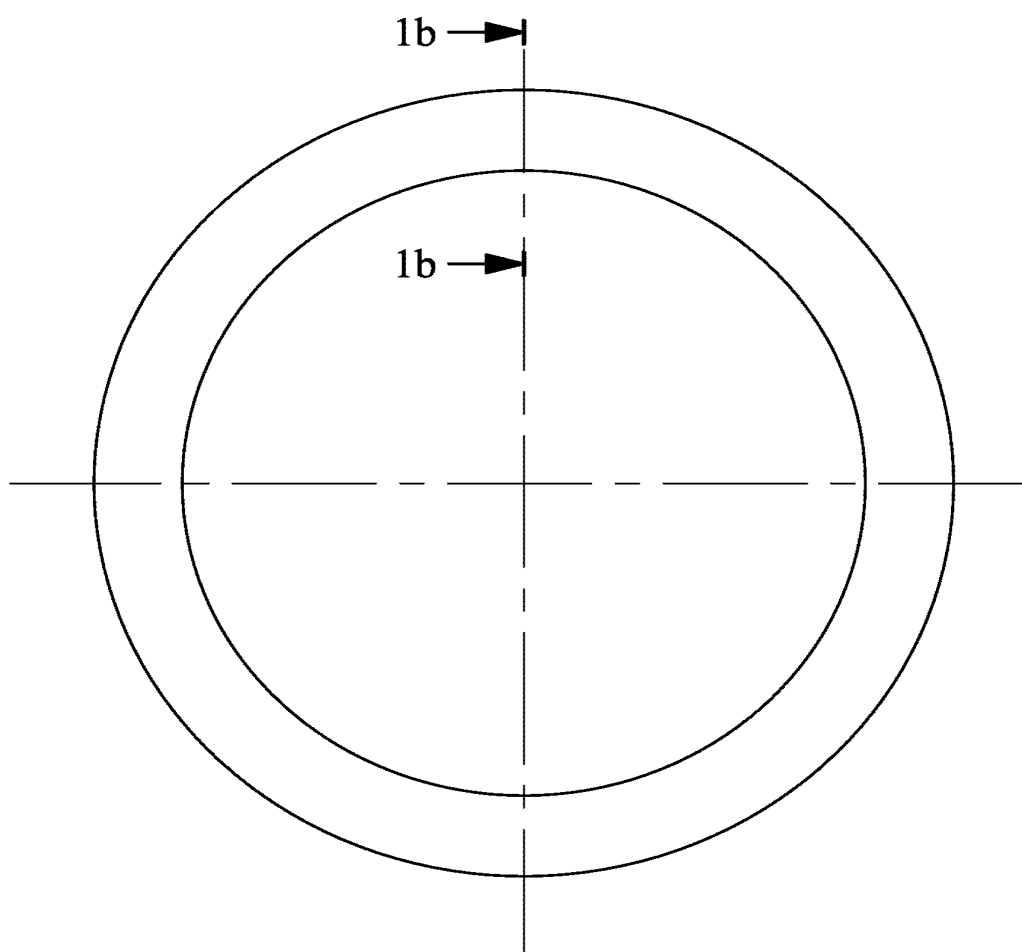


Fig. 1A (prior art)

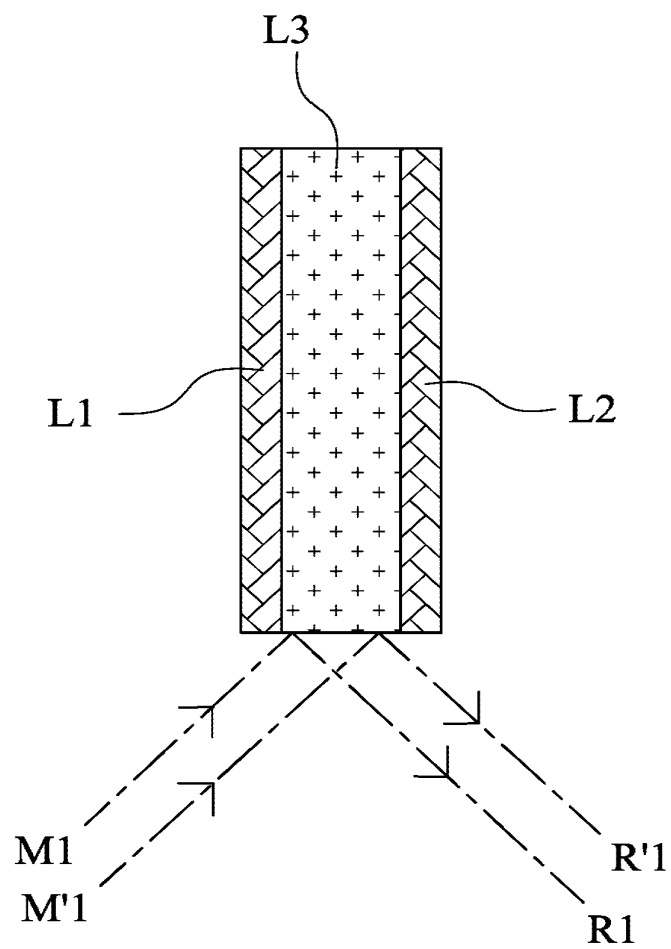


Fig. 1B (prior art)

100

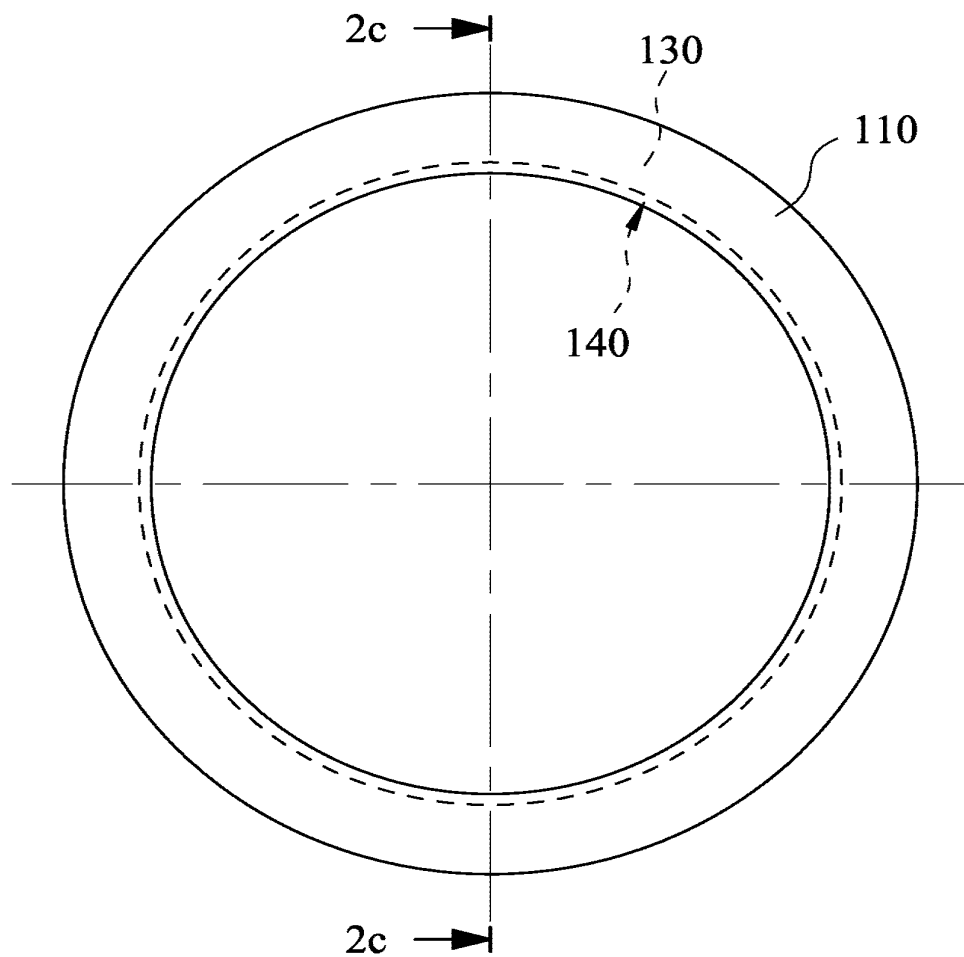


Fig. 2A

100

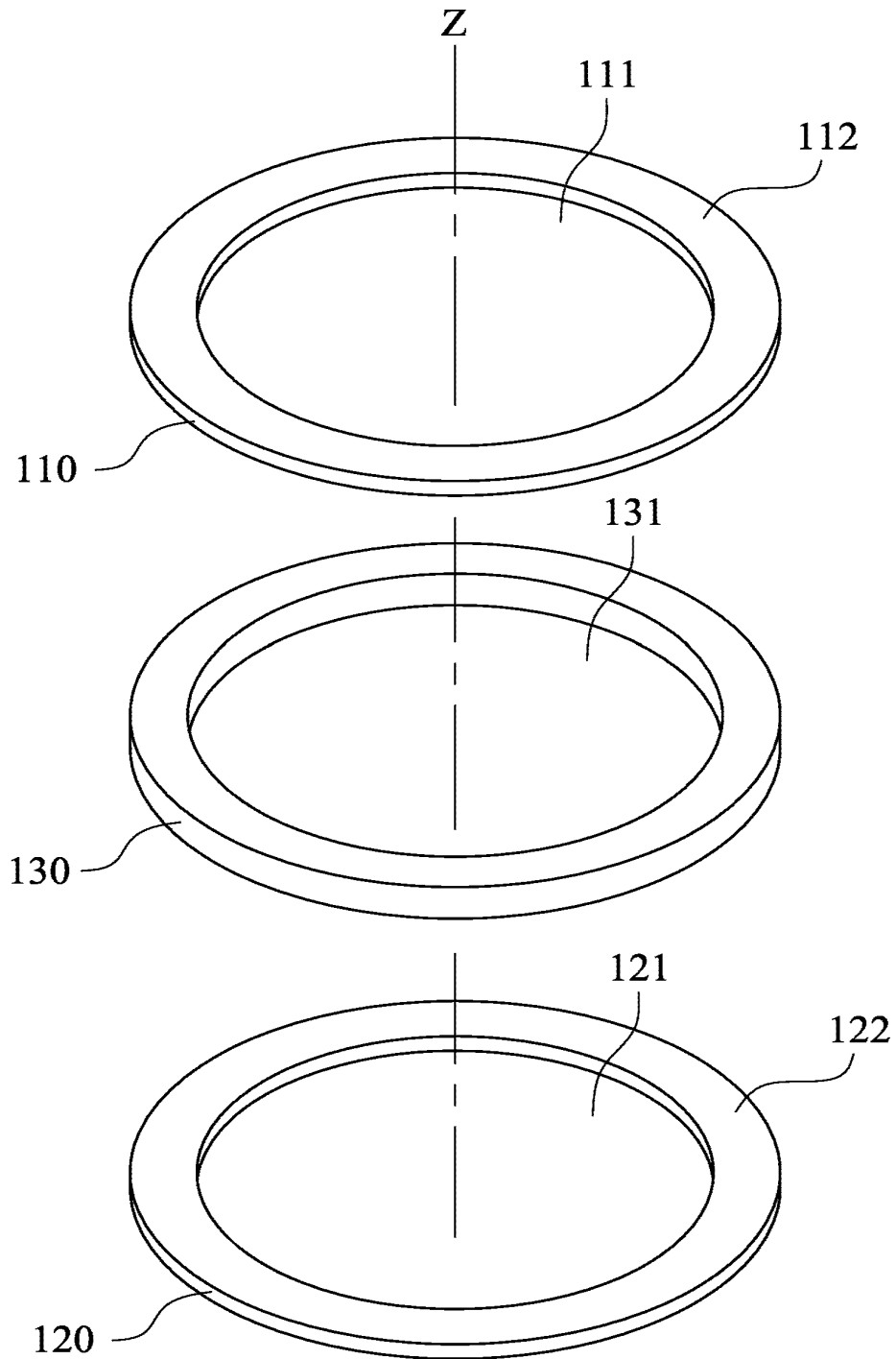


Fig. 2B

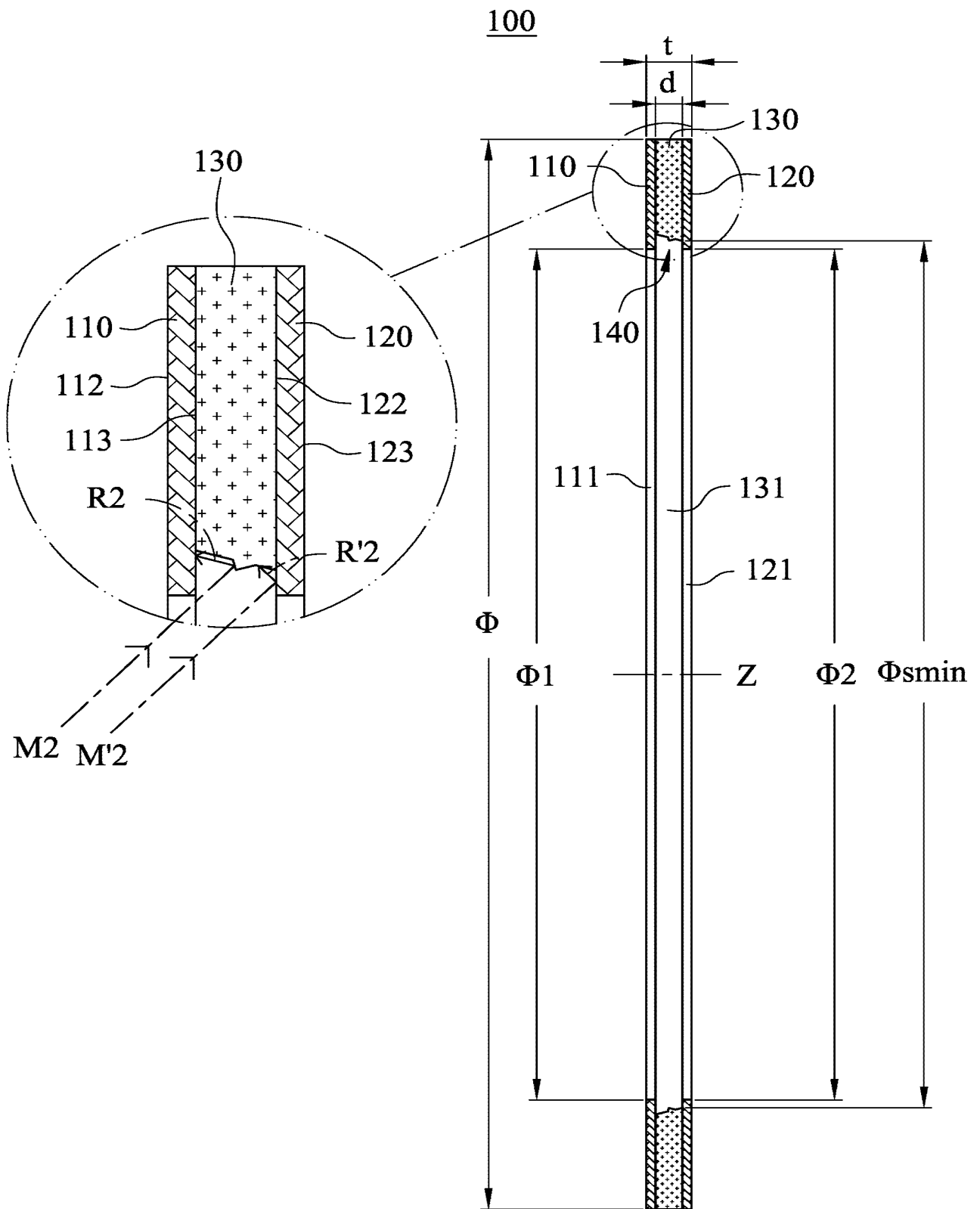


Fig. 2C

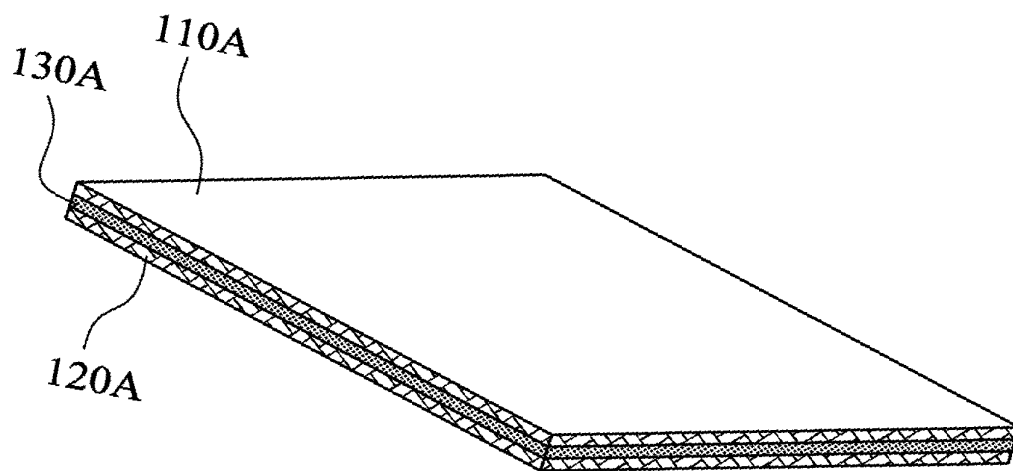


Fig. 2D

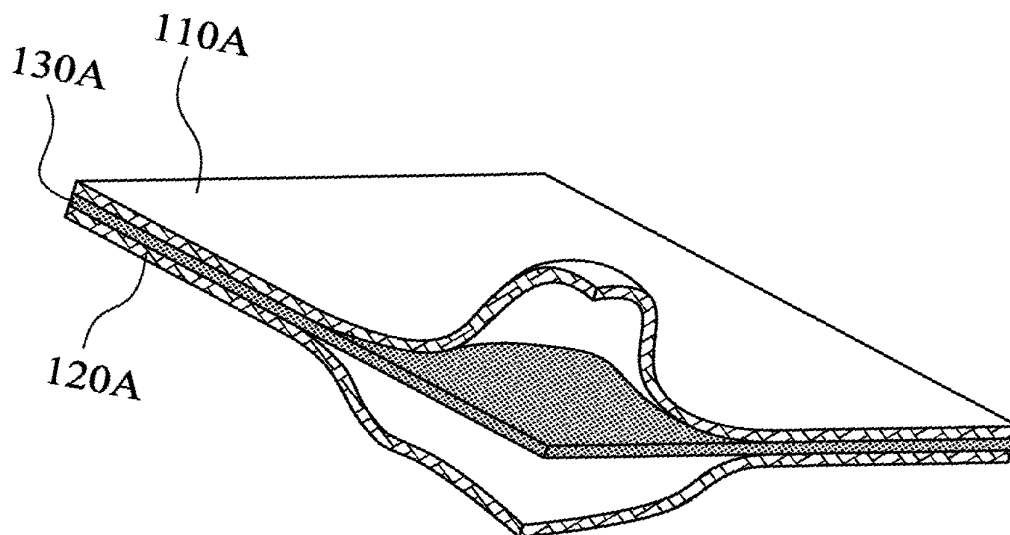


Fig. 2E

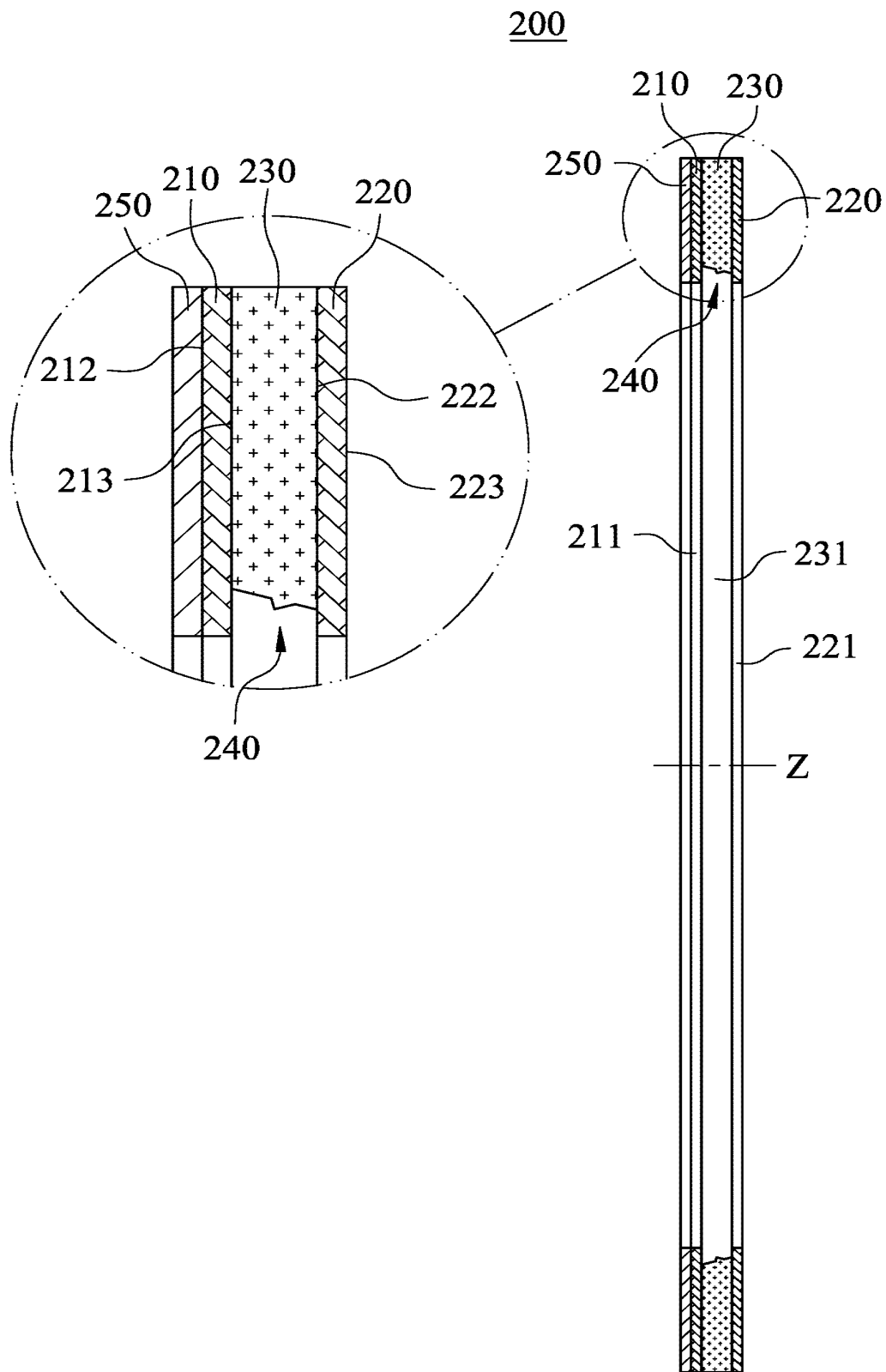


Fig. 3

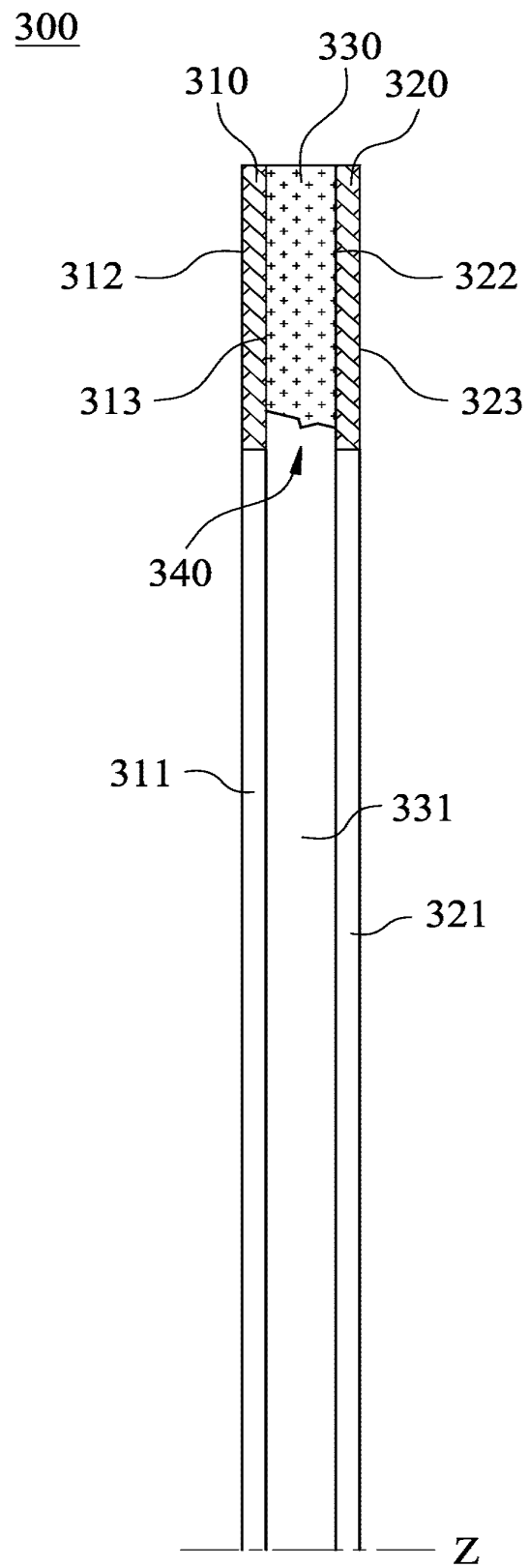


Fig. 4

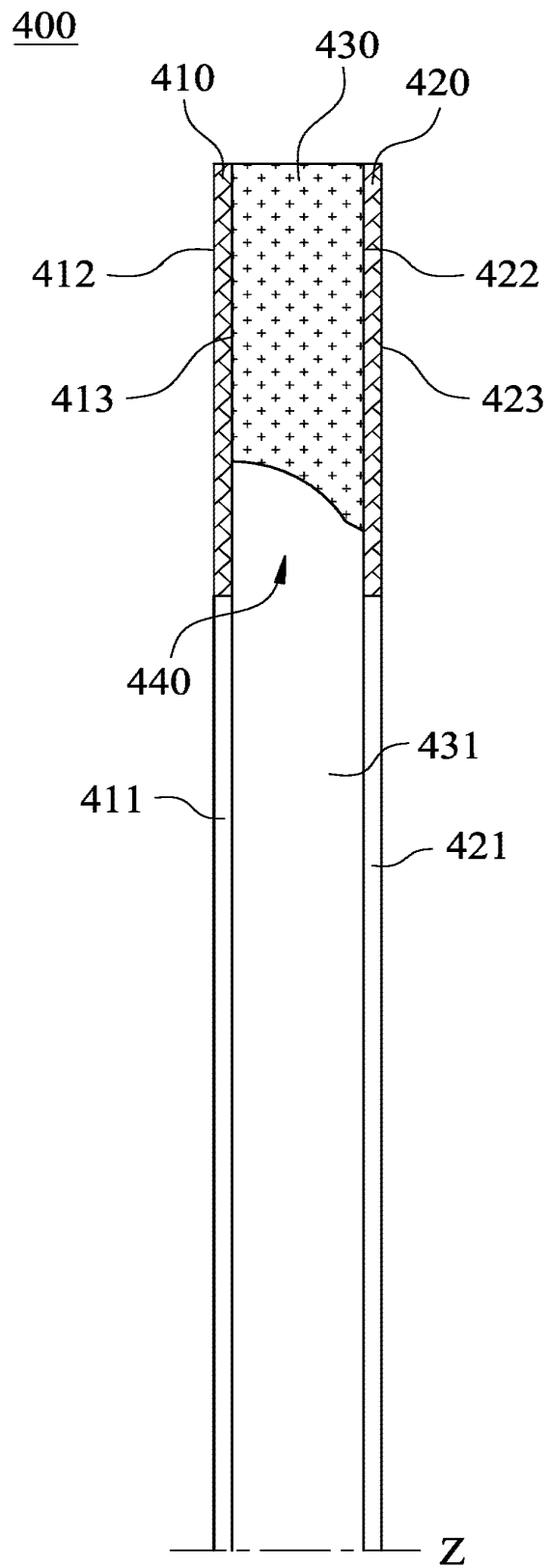


Fig. 5

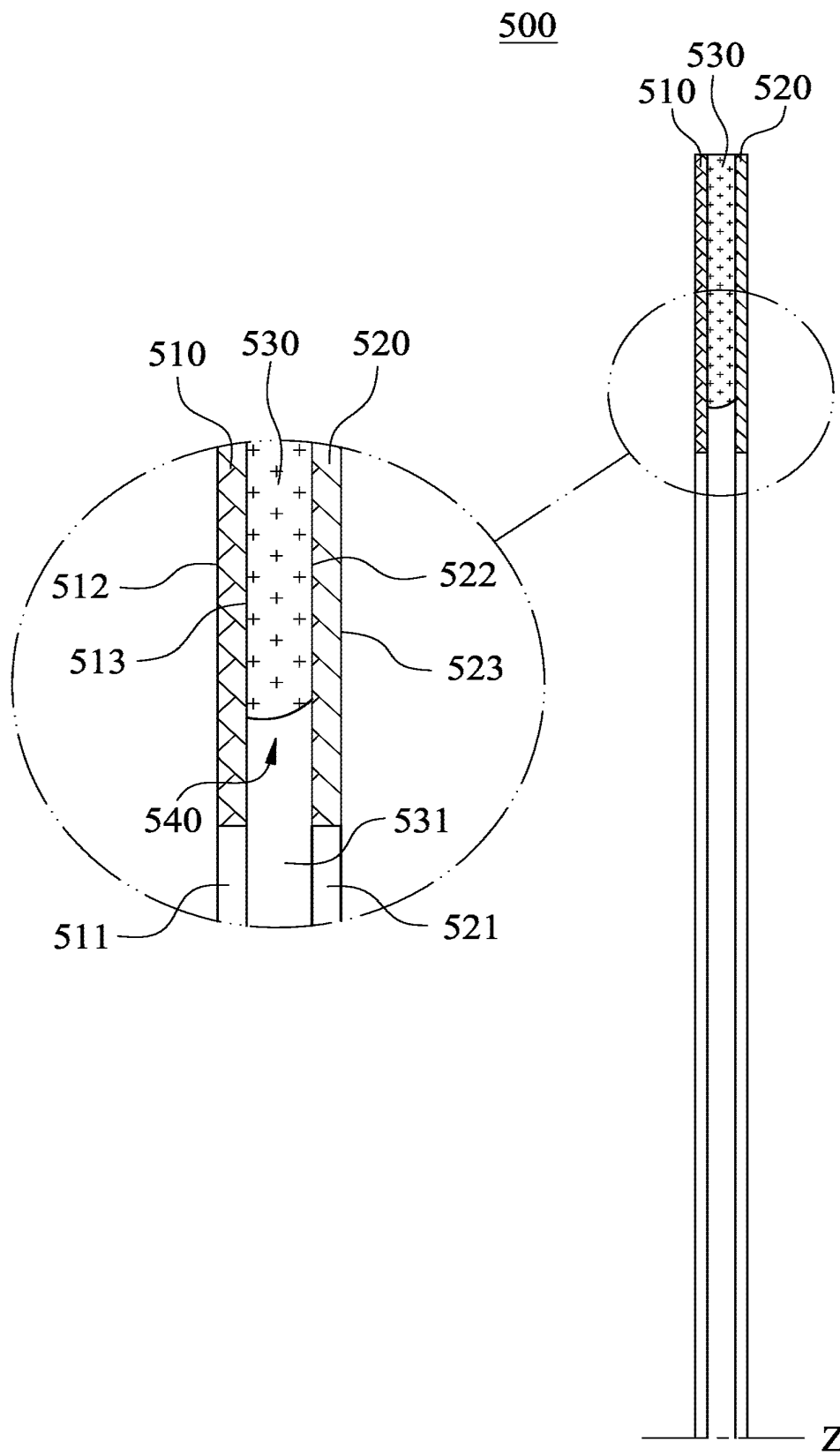


Fig. 6

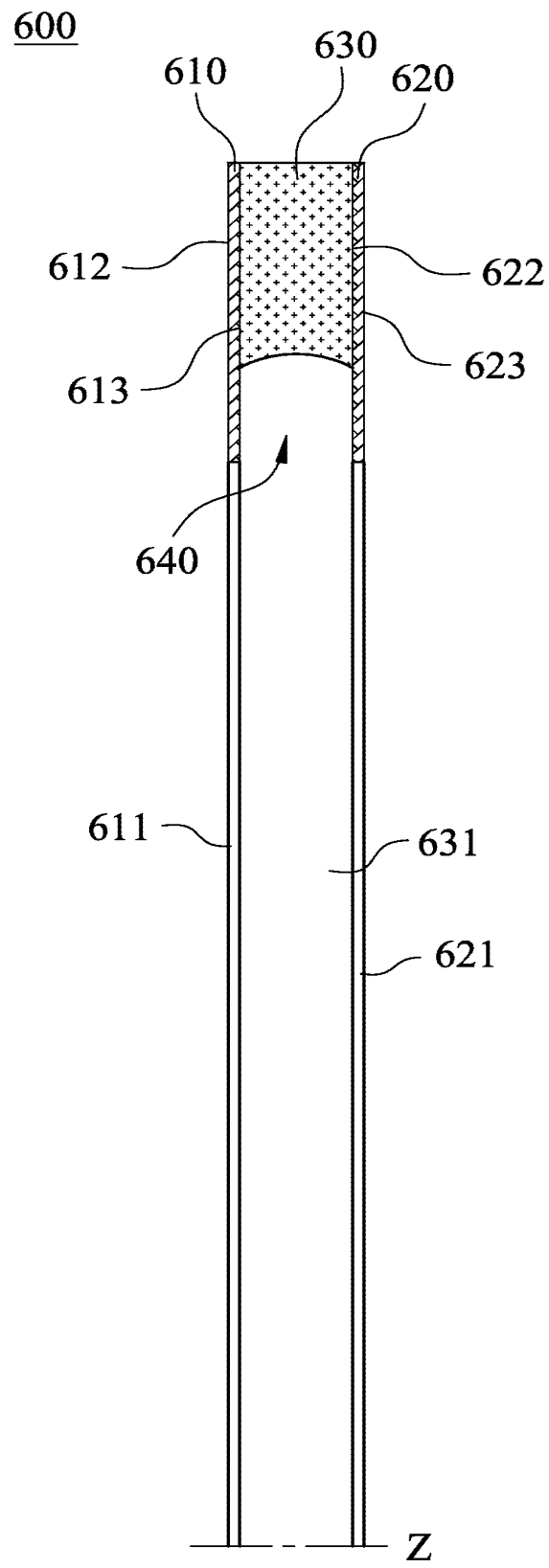


Fig. 7

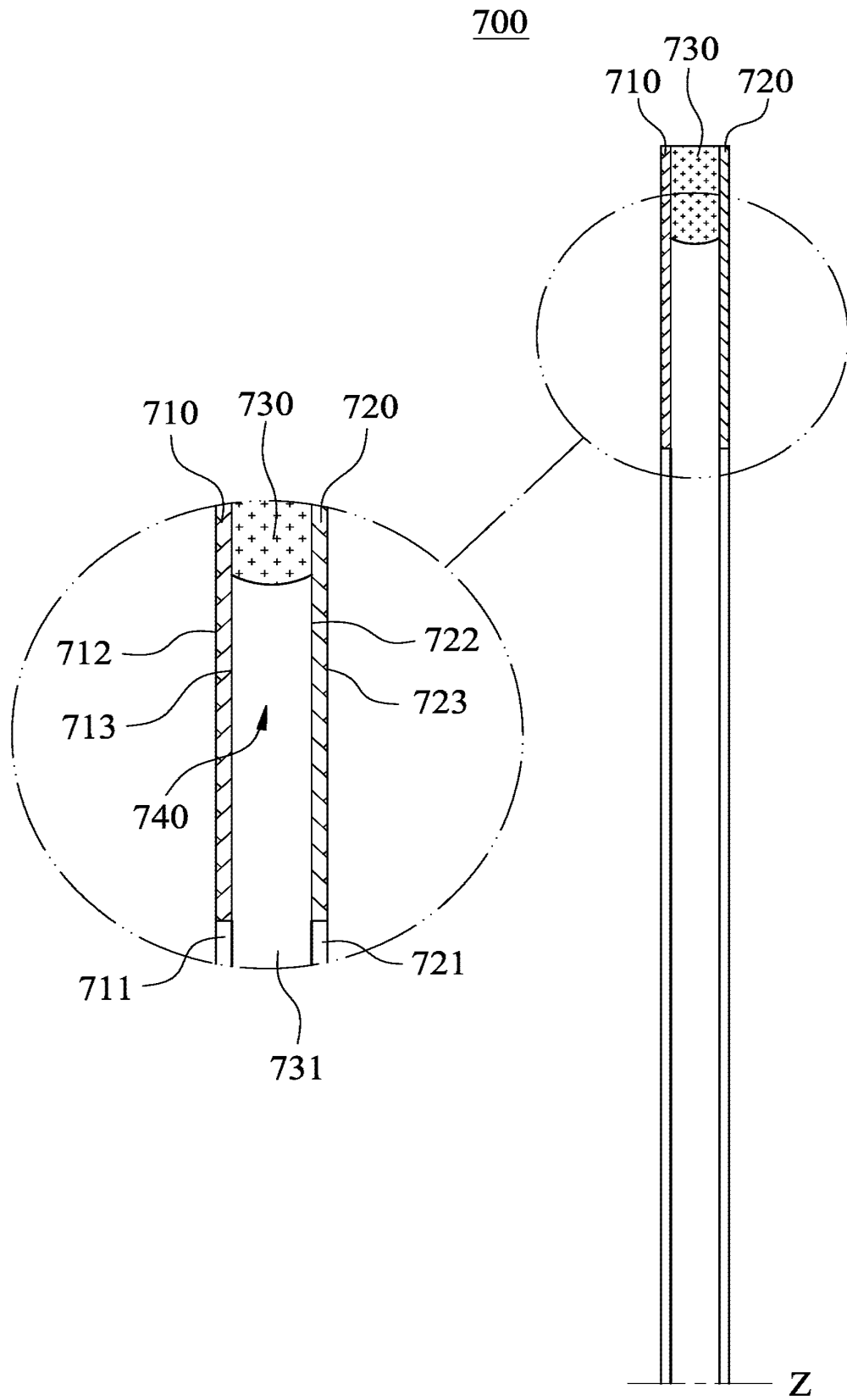


Fig. 8

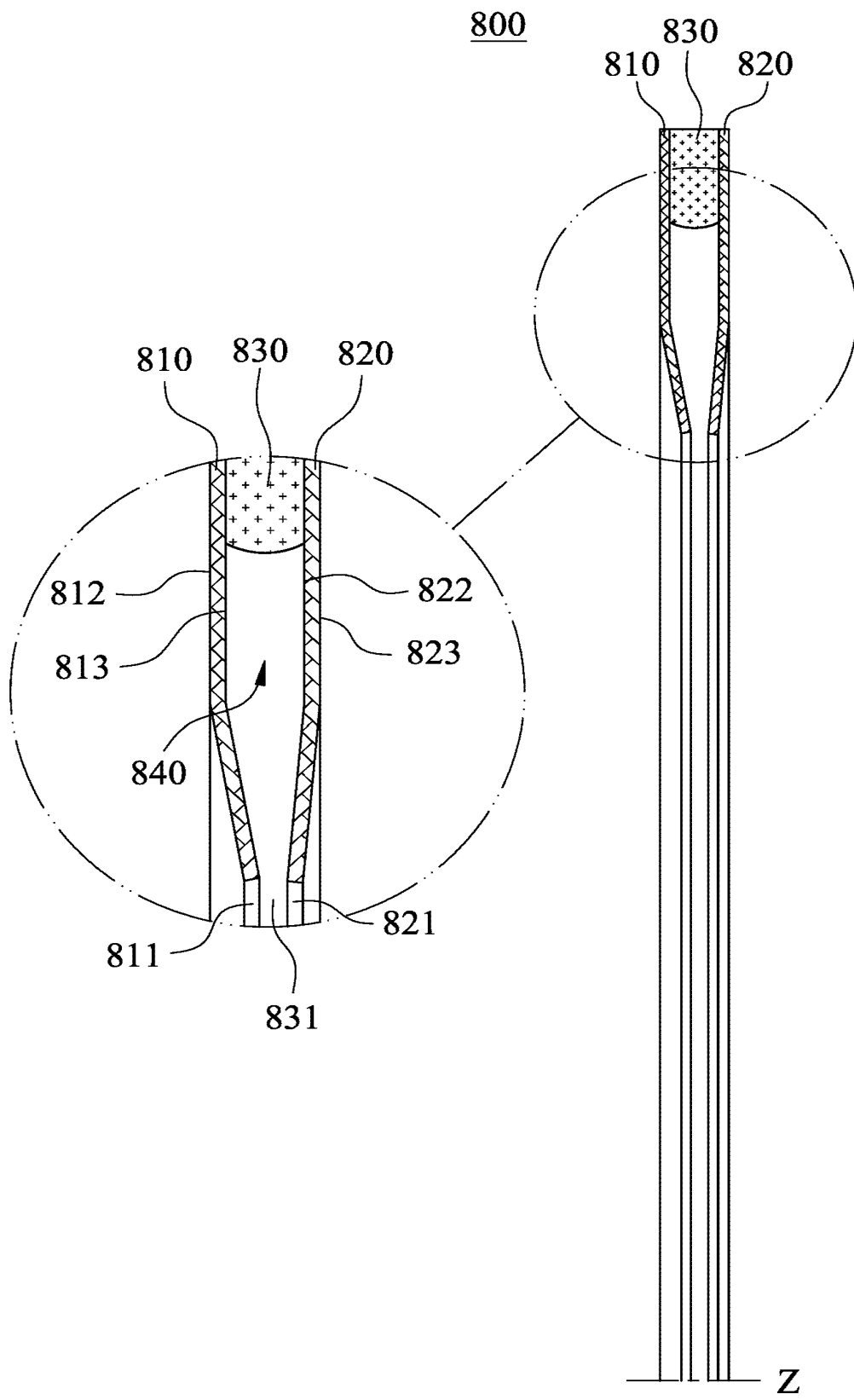


Fig. 9

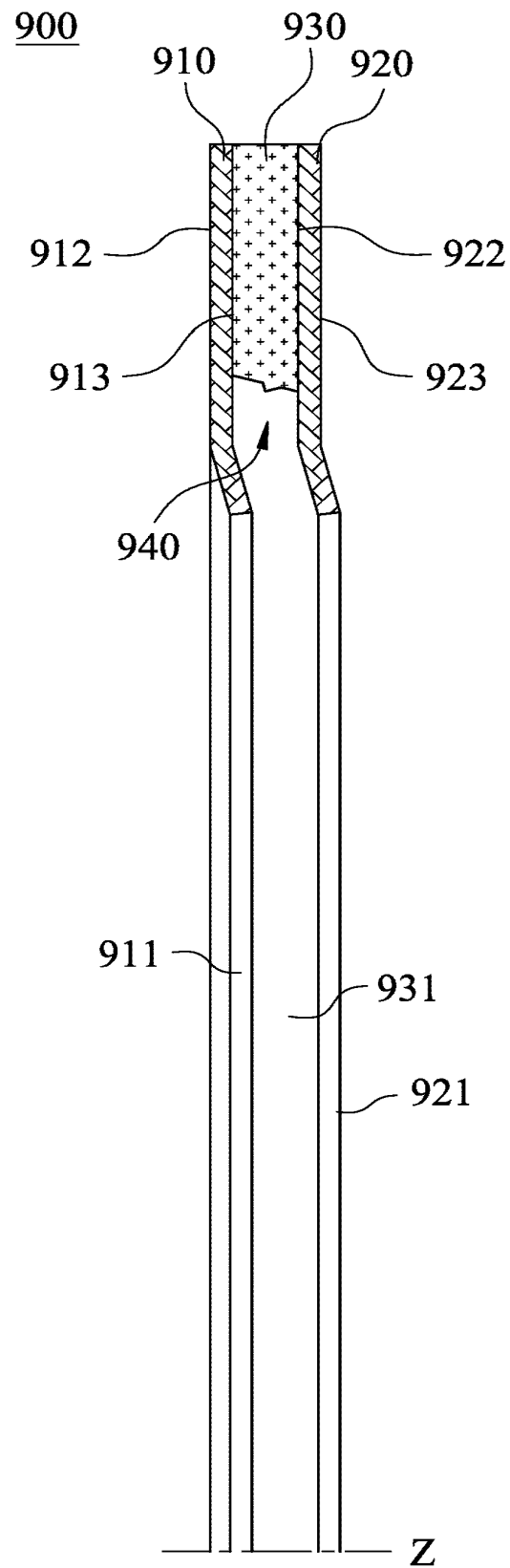


Fig. 10

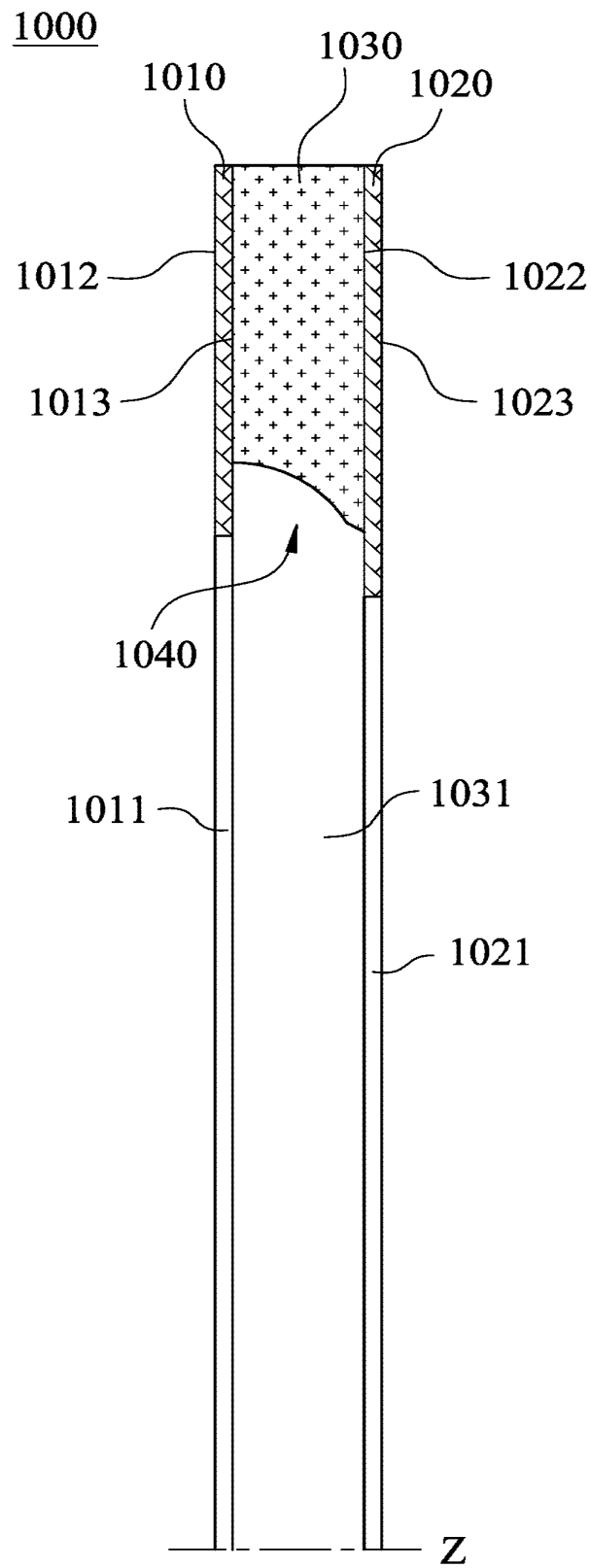


Fig. 11

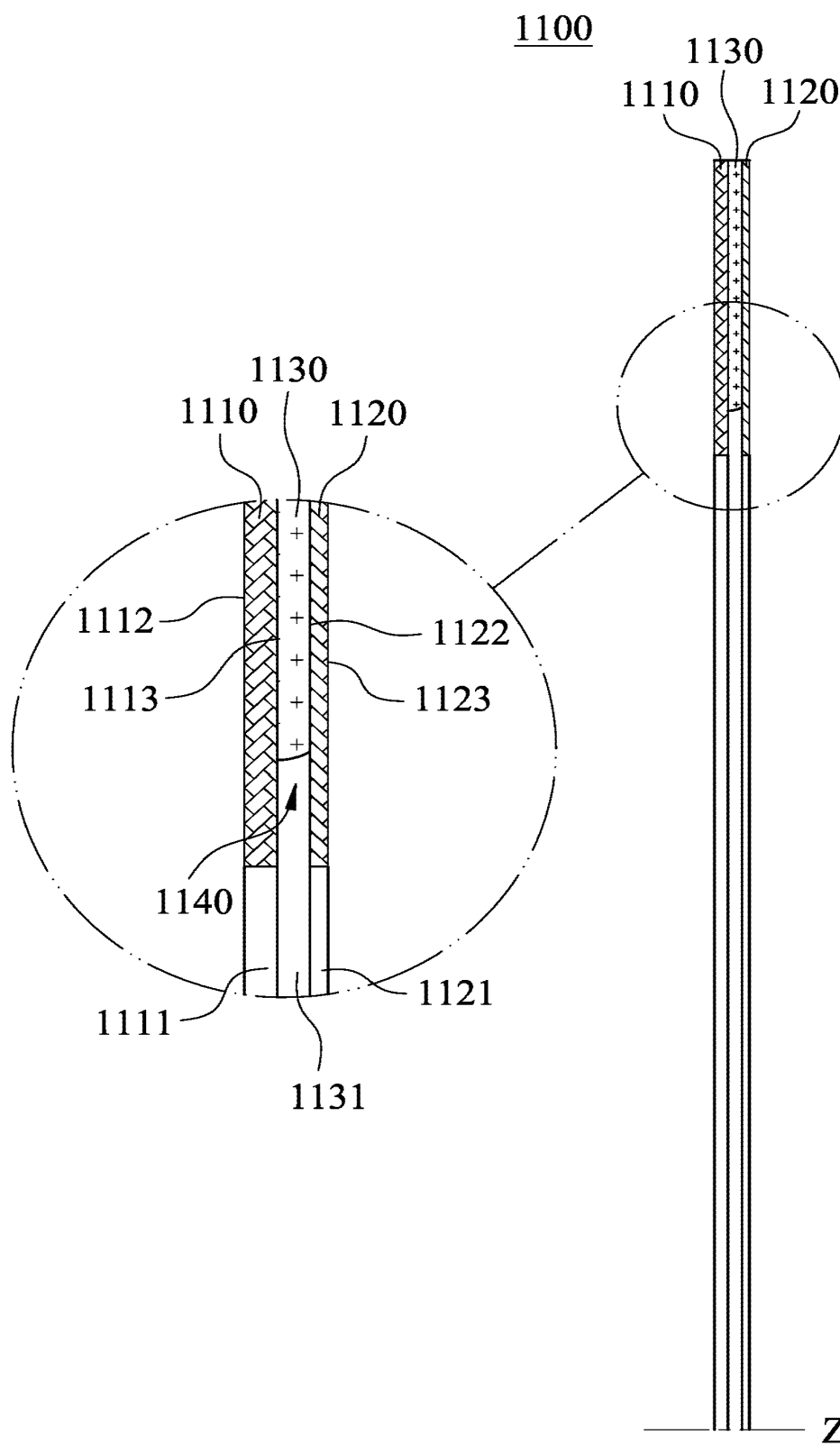


Fig. 12

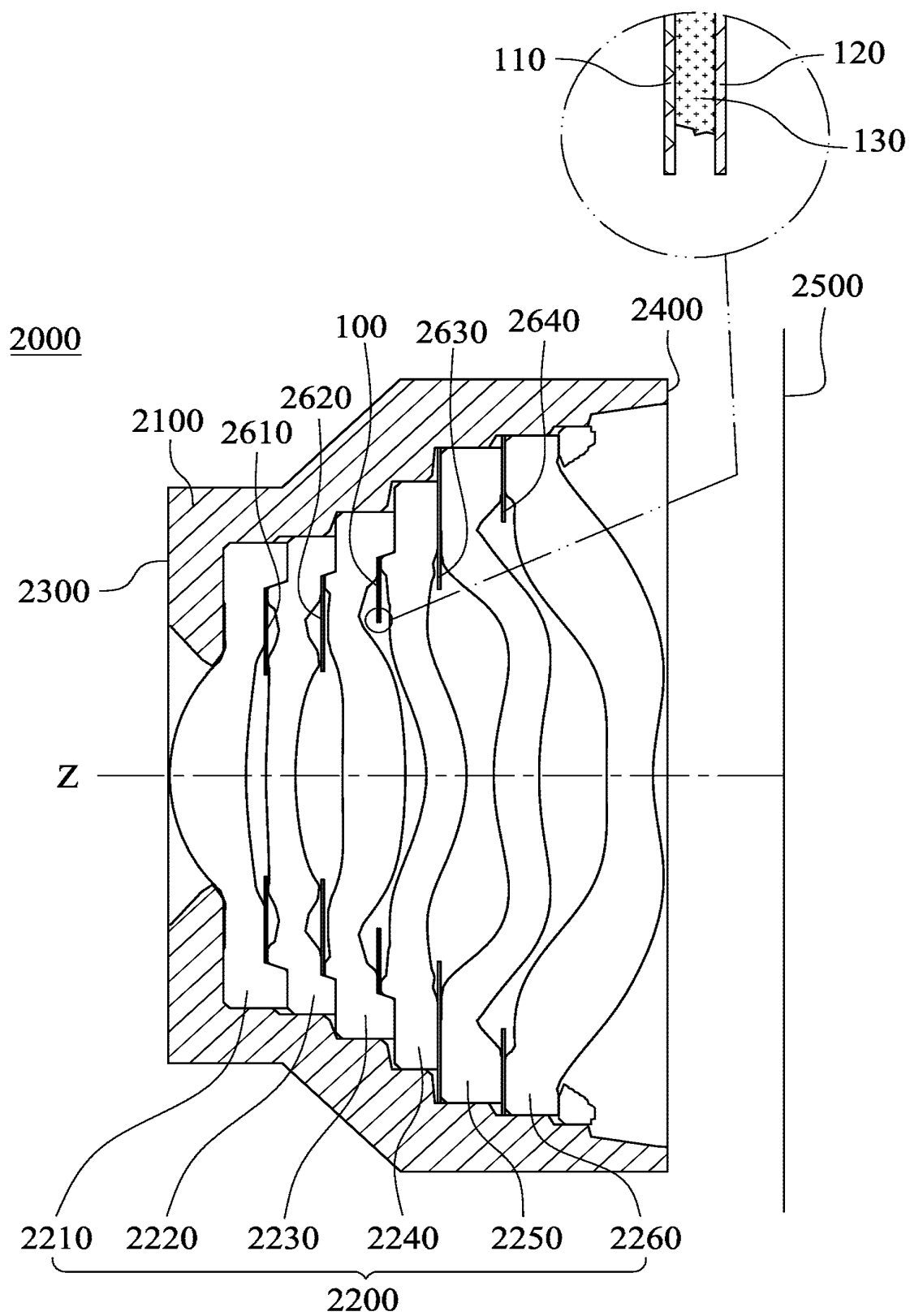


Fig. 13

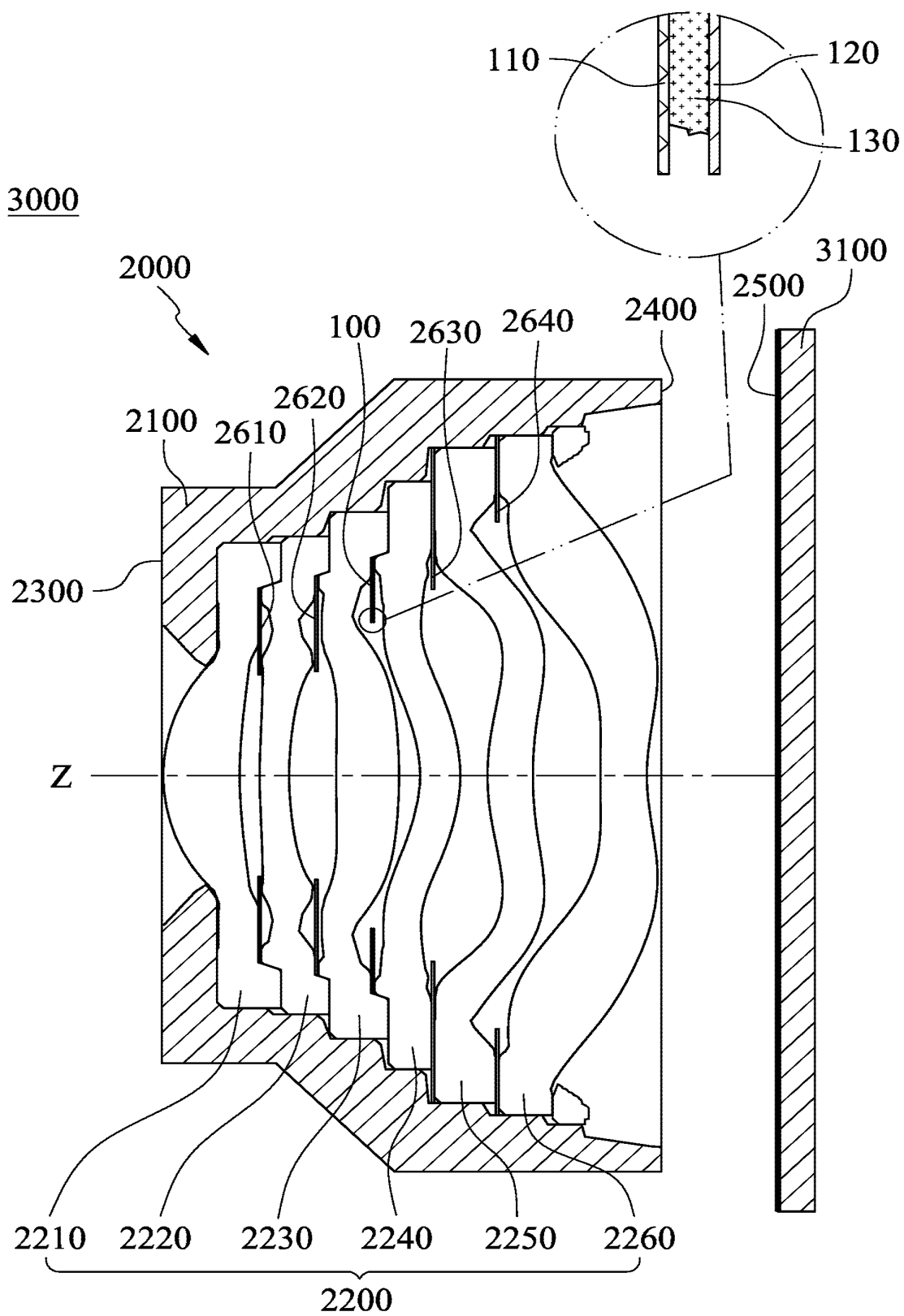


Fig. 14

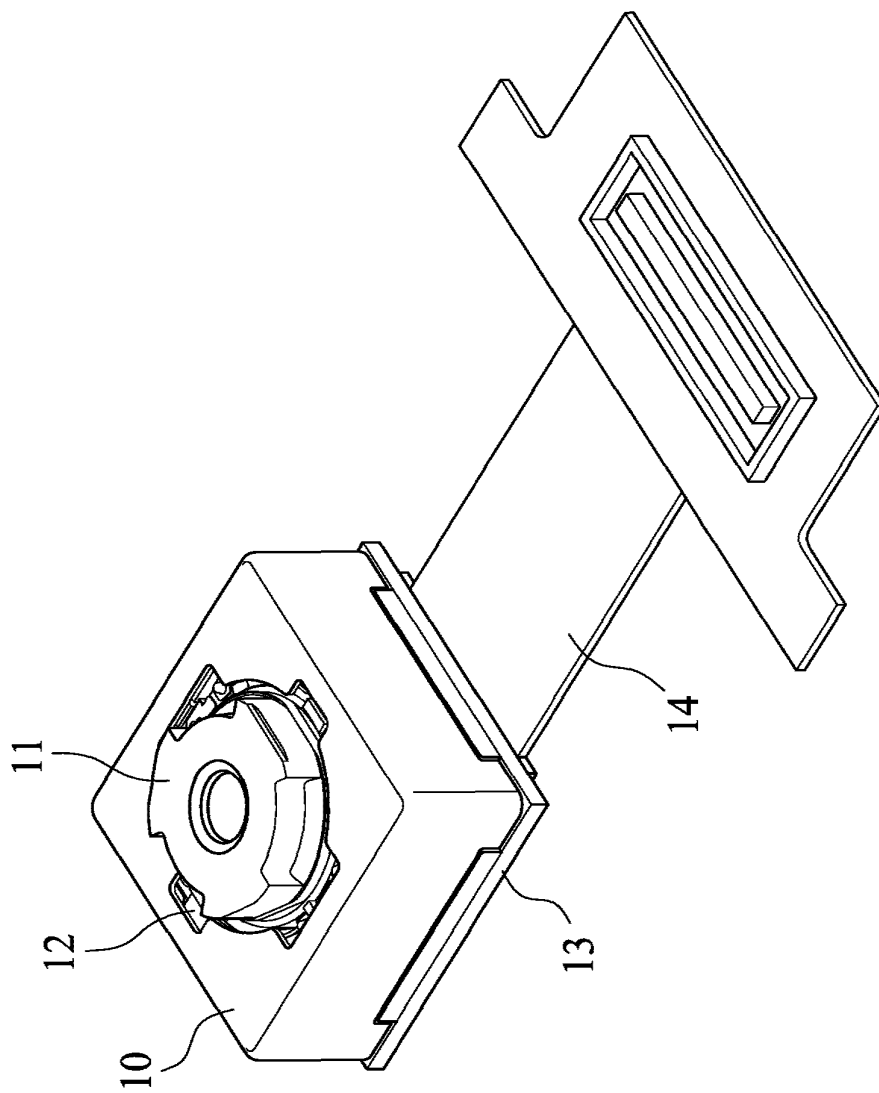


Fig. 15A

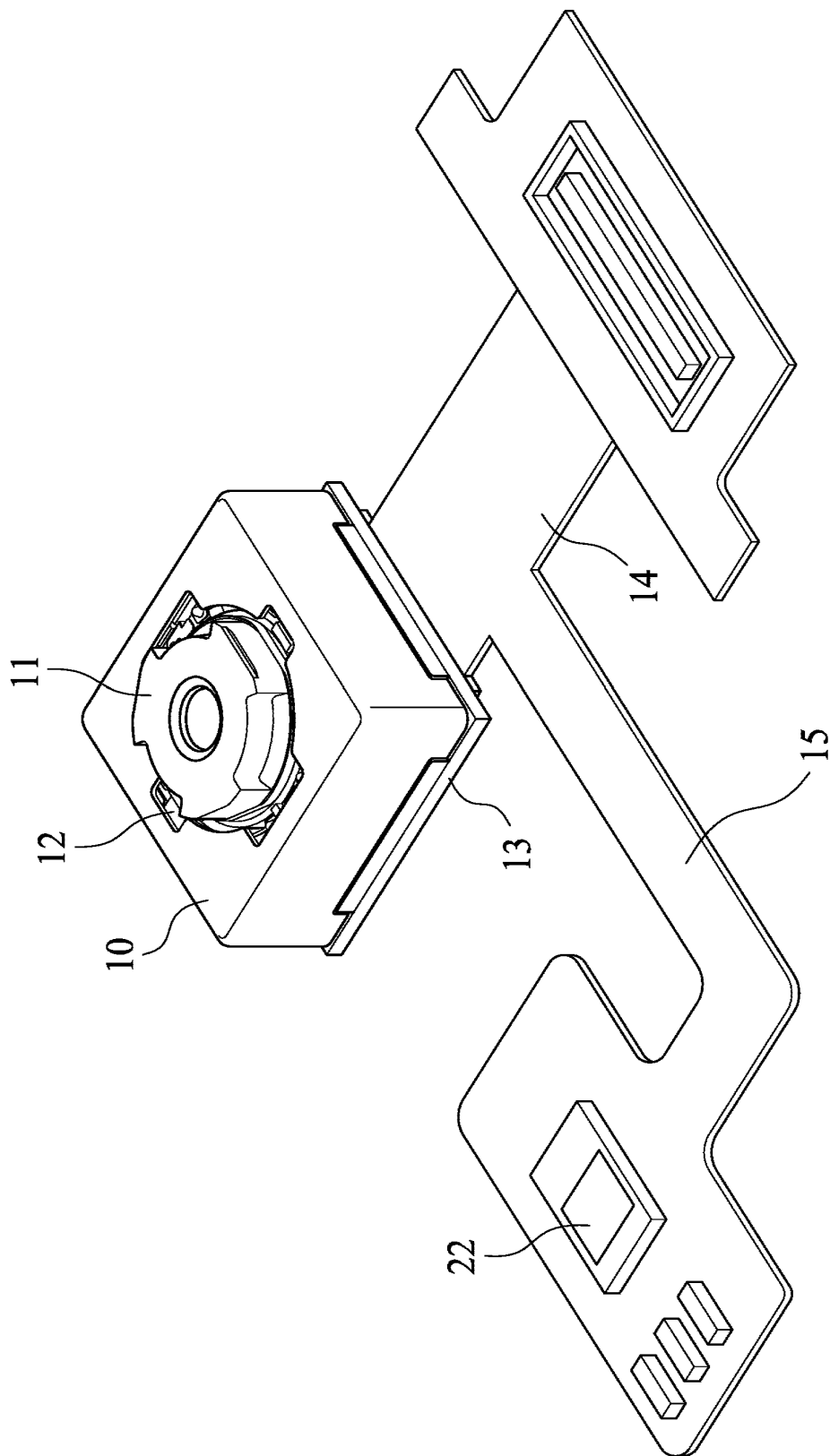


Fig. 15B

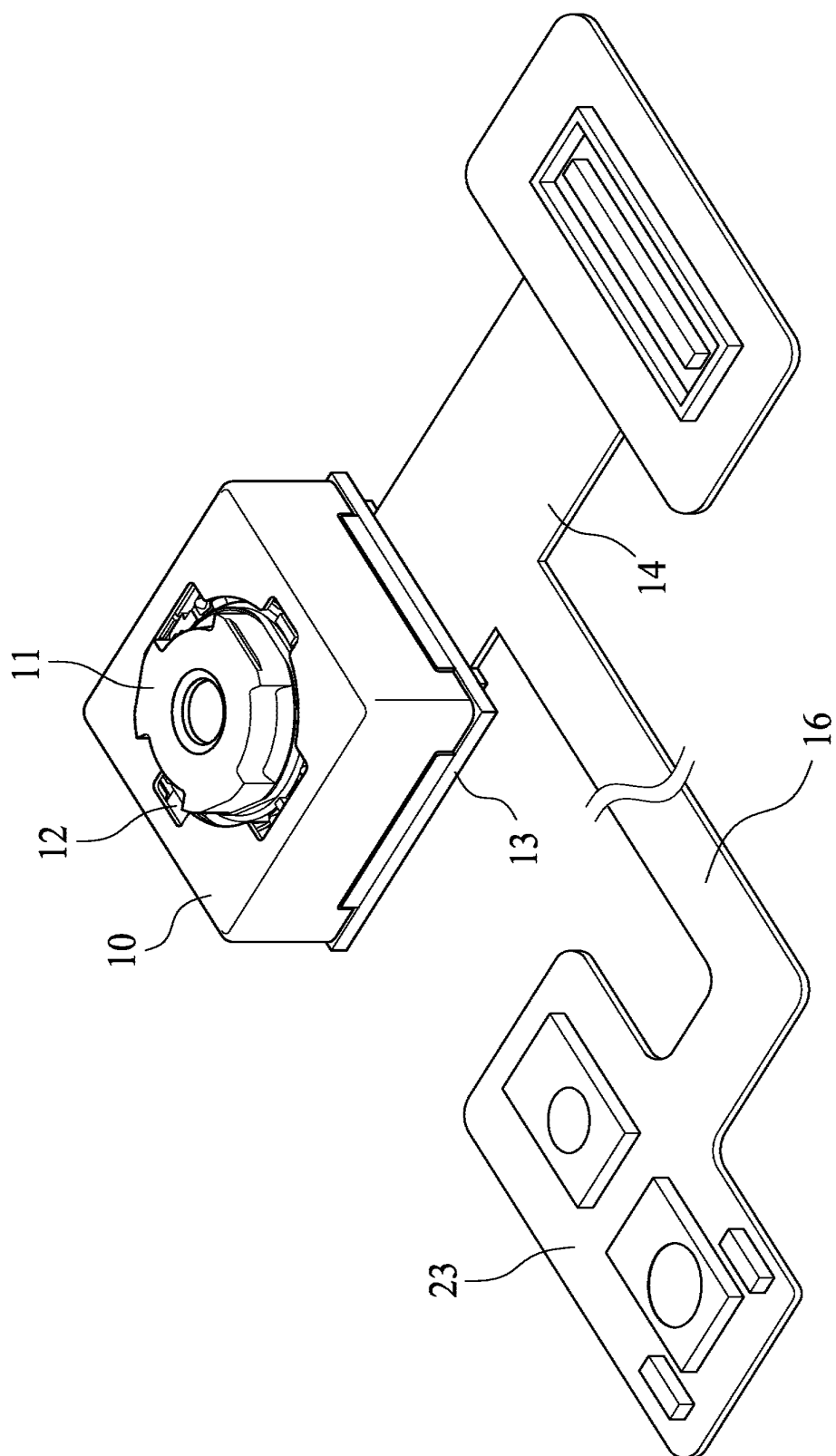


Fig. 15C

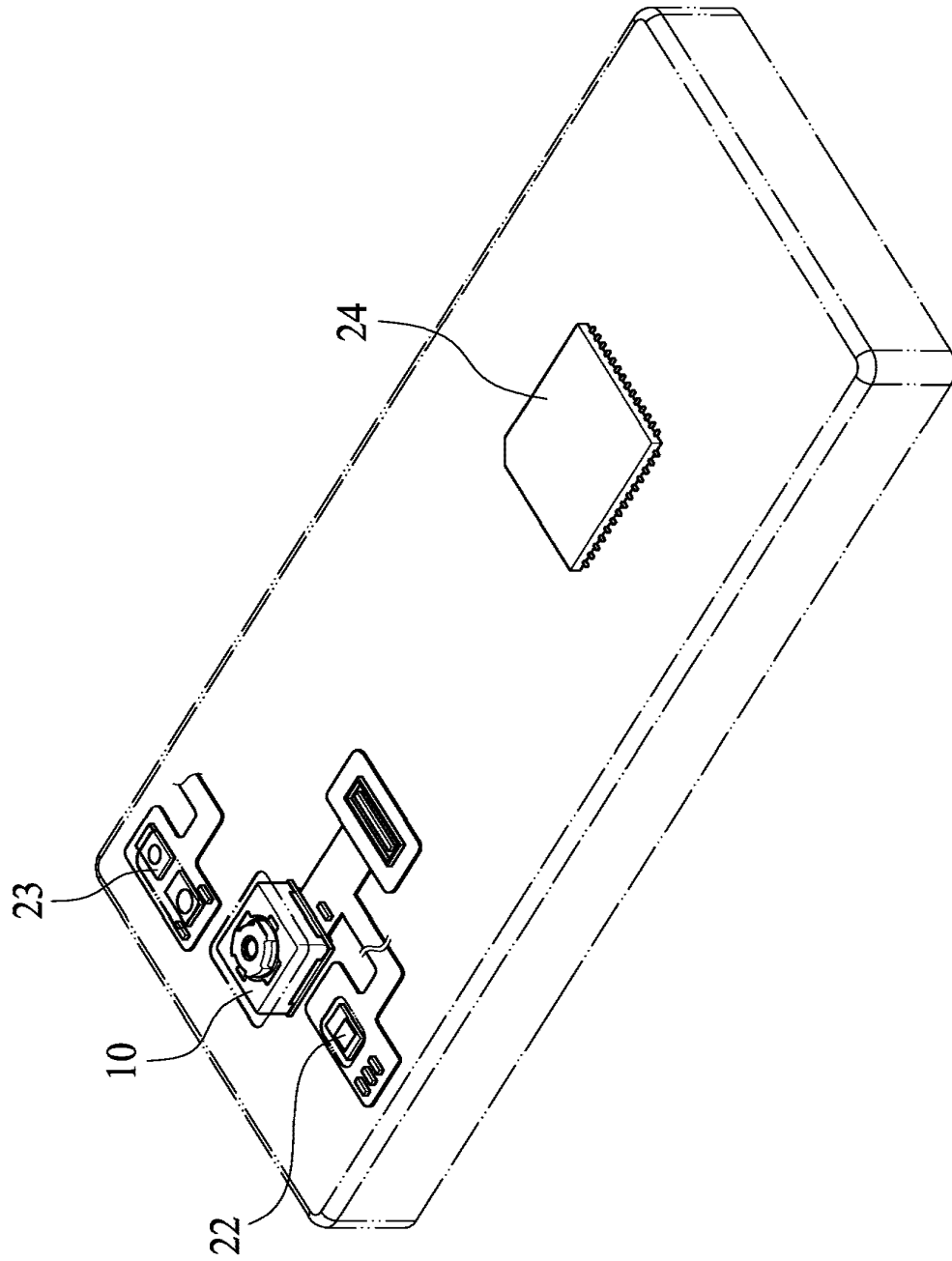


Fig. 16A

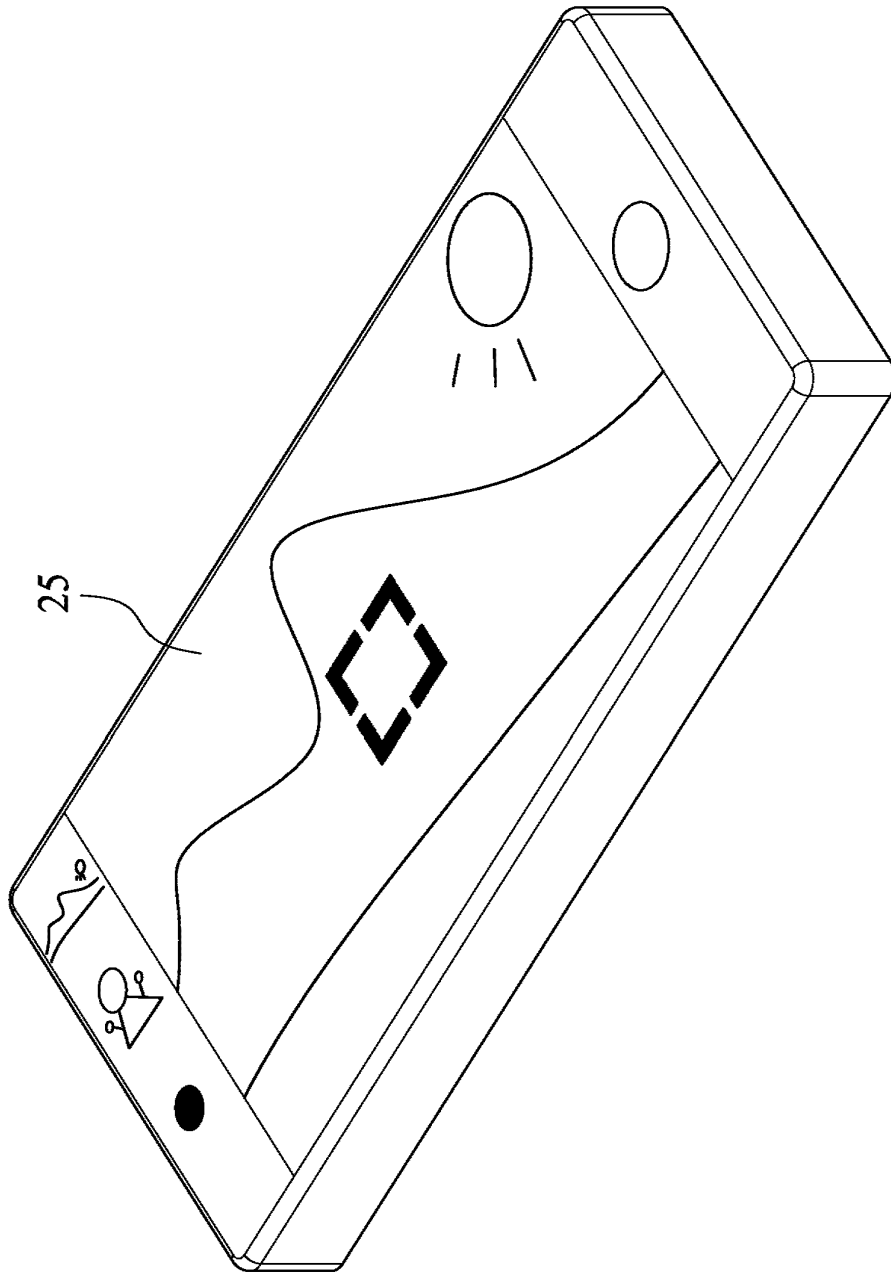


Fig. 16B

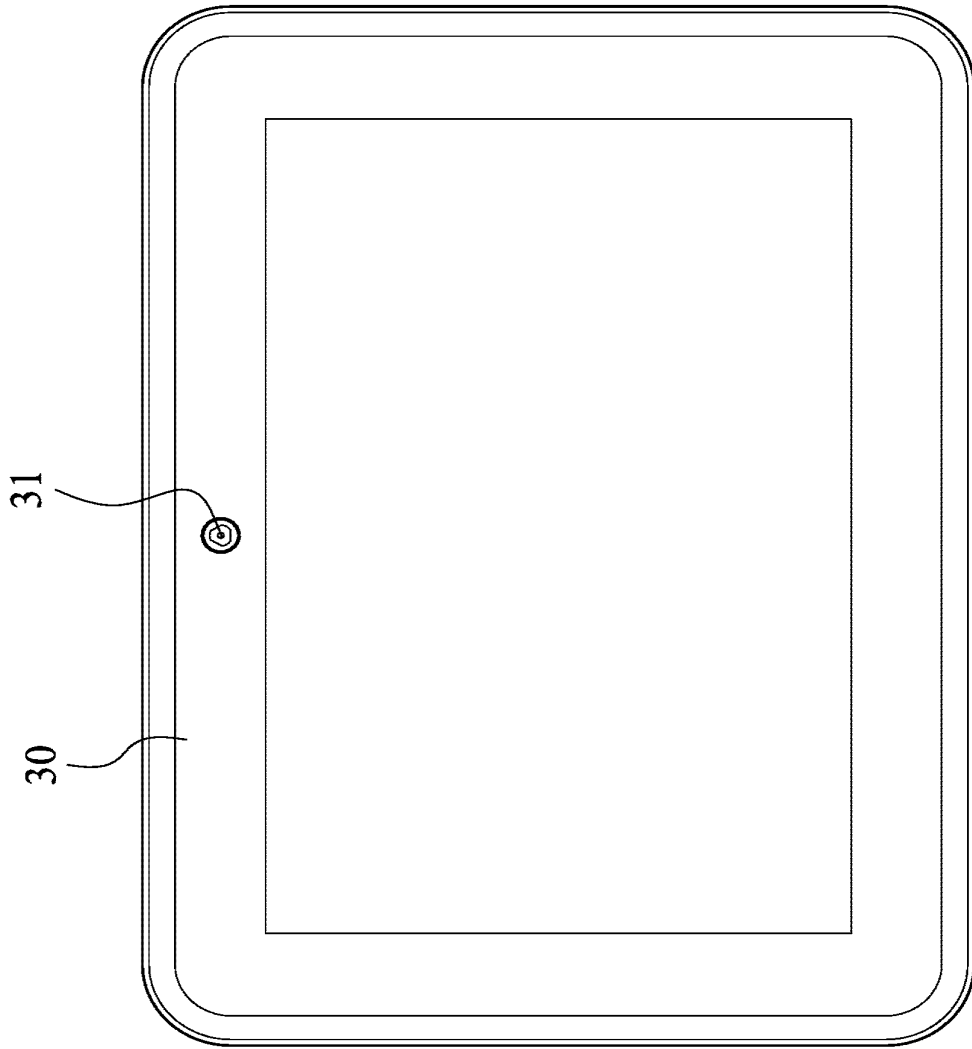


Fig. 17

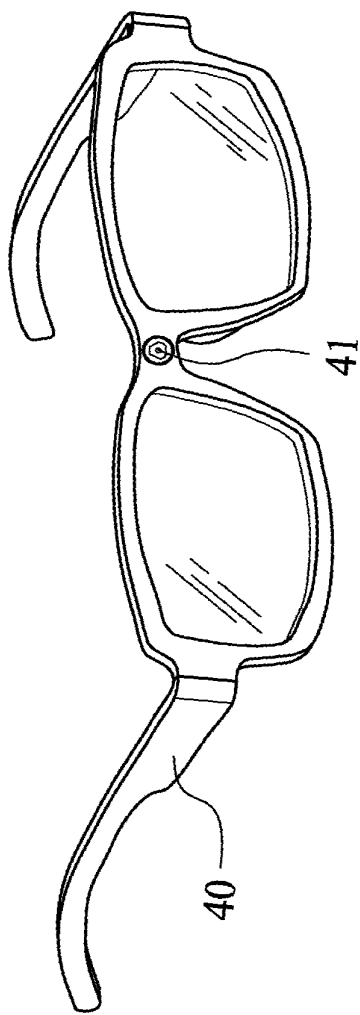


Fig. 18

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Hsu, et al.

Confirmation No.: Unassigned

Group Art Unit: Unassigned

Serial No.: Unassigned

Examiner: Unassigned

Filed: February 16, 2017

Docket No. 251236-1700

For: Light Blocking Sheet, Imaging Lens Module and Electronic Apparatus

INFORMATION DISCLOSURE STATEMENT

Mail Stop Amendment
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450

Sir:

This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97, and 1.98, and specifically:

- ☒ under 37 CFR 1.97(b), or
 (within Three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)
- ☐ under 37 CFR 1.97(c) together with either a:
☐ Statement Under 37 C.F.R. 1.97(e), or
☐ a \$180.00 fee under 37 CFR 1.17(p), or
 (After the CFR 1.97(b) time period, but before the final office action or notice of allowance, whichever occurs first)
- ☐ under 37 CFR 1.97(d) together with a:
☐ Statement under 37 CFR 1.97(e), and
☐ a \$180.00 petition fee set forth in 37 CFR 1.17(p).
 (Filed after final office action or notice of allowance, whichever occurs first, but before payment of the issue fee)
- ☐ Enclosed is a check in the amount of \$.
- ☐ Payment by credit card.
- ☐ Please charge \$ to deposit account .
- ☒ At any time during the pendency of this application, please charge any fees required to Deposit Account 50-5954 pursuant to 37 CFR 1.25. The Commissioner is hereby requested to credit any overpayment to Deposit Account No. 50-5954.

- ☒ Applicant(s) submit herewith *Form PTO SB/08A-08B-08a - Information Disclosure Statement by Applicant* together with copies (where required) of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may or may not be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56. As required by 37 C.F.R. §1.98(a), a legible copy of each document is provided.
- ☐ A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form SB/08A-08B-08a, as presently understood by the individual(s) designated in 37 CFR 1.56(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent is cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language version of the search report or action which indicates the degree of relevance found by the foreign office is listed on the form PTO SB/08A-08B-08a and is enclosed herewith.

The following rights are reserved by the Applicant(s): the right to establish the patentability of the claimed invention over any of the listed documents should they be applied as reference, and/or the right to prove that some of these documents may not be prior art, and/or the right to prove that some of these documents may not be enabling for the teachings they purport to offer.

This statement should not be construed as a representation that an exhaustive search has been made, or that information more material to the examination of the present application does not exist. Any statements or identifications regarding the relevance of any portion(s) of cited references should not be construed as a representation that the most relevant portion(s) have been identified, and the absence of such statements or identifications should not be construed as representations that there are no relevant portion(s). The Examiner is specifically requested not to rely solely on the materials submitted herewith. The Examiner is requested to conduct an independent and thorough review of the documents, and to form independent opinions as to their significance.

It is requested that the information disclosed herein be made of record in this application and that the Examiner initial and return a copy of the enclosed PTO SB/08A-08B-08a to indicate the documents have been considered.

Respectfully Submitted,

McClure, Qualey & Rodack, LLP

/Daniel R. McClure/

By:

Daniel R. McClure, Reg. No. 38,962

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/434,163			
APPLICATION AS FILED - PART I									
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY			
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)		
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280		
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	600		
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720		
TOTAL CLAIMS (37 CFR 1.16(j))	23	minus 20 = *	3			x 80 =	240		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *				x 420 =	0.00		
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00		
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00		
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL		TOTAL	1840		
APPLICATION AS AMENDED - PART II									
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	=			x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	=			x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
				TOTAL ADD'L FEE		TOTAL ADD'L FEE			
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)	
	Total (37 CFR 1.16(i))	*	Minus **	=			x	=	
	Independent (37 CFR 1.16(h))	*	Minus ***	=			x	=	
	Application Size Fee (37 CFR 1.16(s))								
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
				TOTAL ADD'L FEE		TOTAL ADD'L FEE			
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.									



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
15/434,163	02/16/2017	3754	1840	251236-1700	23	2

CONFIRMATION NO. 7080

FILING RECEIPT



0000000089433213

109673
McClure, Qualey & Rodack, LLP
3100 Interstate North Circle
Suite 150
Atlanta, GA 30339

Date Mailed: 02/27/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Chih-Wen HSU, Taichung City, TAIWAN;
Chih-Wei CHENG, Taichung City, TAIWAN;
Ming-Ta CHOU, Taichung City, TAIWAN;

Applicant(s)

LARGAN PRECISION CO., LTD., Taichung City, TAIWAN;

Power of Attorney: The patent practitioners associated with Customer Number 109673

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)
TAIWAN 105137120 11/14/2016

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/23/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/434,163**

Projected Publication Date: 05/17/2018

Non-Publication Request: No

Early Publication Request: No

Title

LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS

Preliminary Class

138

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

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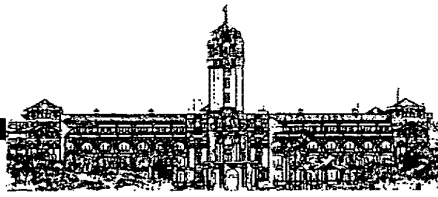
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中華民國經濟部智慧財產局

INTELLECTUAL PROPERTY OFFICE
MINISTRY OF ECONOMIC AFFAIRS
REPUBLIC OF CHINA

茲證明所附文件，係本局存檔中原申請案的副本，正確無訛，
其申請資料如下：

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：

申 請 日：西元 2016 年 11 月 14 日
Application Date Nov. 14, 2016

申 請 案 號：105137120
Application No.

申 請 人：大立光電股份有限公司
Applicant(s)

發 明 人：許誌文、鄭至偉、周明達
Inventor(s)

局 長
Director General

洪淑敏

西元 2016 年 11 月 24 日
Nov. 24, 2016

【發明摘要】

【中文發明名稱】遮光片、成像鏡頭與電子裝置

【英文發明名稱】Light Blocking Sheet, Imaging Lens
Module and Electronic Apparatus

【中文】

一種遮光片，包含一第一外表層、一第二外表層，一內部基材層以及一中心軸。第一外表層包含一第一開孔，第二外表層包含一第二開孔，內部基材層設置於第一外表層與第二外表層間且連接第一外表層與第二外表層，其中內部基材層包含一基材開孔，中心軸與第一開孔、第二開孔及基材開孔同軸，當滿足特定條件，有利於消減雜散光。

【英文】

A light blocking sheet includes a first outer layer, a second outer layer, an inner substrate layer and a central axis. The first outer layer includes a first opening. The second outer layer includes a second opening. The inner substrate layer disposed between the first outer layer and the second outer layer, and the inner substrate layer connects the first outer layer to the second outer layer. The inner substrate layer includes a substrate opening. The central axis, the first opening, the second opening

and the substrate opening are coaxial. When the certain condition is satisfied, it is favorable for effectively eliminating stray lights.

【指定代表圖】第2C圖

【代表圖之符號簡單說明】

100 : 遮光片	140 : 空氣夾層
110 : 第一外表層	d : 空氣夾層平行中心軸的長度
111 : 第一開孔	t : 遮光片的厚度
112 : 第一表面	Z : 中心軸
113 : 第二表面	$\Phi 1$: 第一開孔的直徑
120 : 第二外表層	$\Phi 2$: 第二開孔的直徑
121 : 第二開孔	Φ_{smin} : 基材開孔的最小直徑
122 : 第一表面	Φ : 遮光片的最大外徑
123 : 第二表面	M2 : 入射光線
130 : 內部基材層	M'2 : 入射光線
131 : 基材開孔	R2 : 反射光線
	R'2 : 反射光線

【發明說明書】

【中文發明名稱】遮光片、成像鏡頭與電子裝置

【英文發明名稱】Light Blocking Sheet, Imaging Lens
Module and Electronic Apparatus

【技術領域】

【0001】 本發明是有關於一種遮光片及成像鏡頭，且特別是有關於一種應用在可攜式電子裝置上的遮光片及成像鏡頭。

【先前技術】

【0002】 隨著手機、平板電腦等搭載有成像裝置的個人化電子產品及行動通訊產品的普及，連帶帶動小型化成像鏡頭的興起，對具有高解析度與優良成像品質的小型化成像鏡頭的需求也大幅攀升。

【0003】 遮光片通常用於遮蔽成像鏡頭內部不必要的光線，遮光片的表面性質攸關著對雜散光的抑制效果，因此，遮光片的表面性質連帶地影響成像鏡頭的成像品質。

【0004】 習用的遮光片材質通常使用外表含碳材質，內部夾層為聚對苯二甲酸乙二酯 (polyethylene terephthalate; PET) 之類塑膠材料的複合材料 (composite material)，習知且廣泛的複合材料常用於提高母材料的強度，而這裡所使用外表含碳材質的複合材料則還有取其表面是黑色可吸收光線的特性，這裡所述用於製造遮光片的複合

材料因製作方式的關係可為料帶的形式，可具有薄片化的優勢，利用控制內部夾層的製造過程可讓複合材料具有均勻厚度，容易做到不易翹曲且平整的極細薄片(thin film)。此外，習知的遮光片通常具有一內孔，通常使用沖壓的方法製造而成，然其沖壓而成的內孔表面光滑明亮而具有較高的反射率，因而無法有效消減雜散光，因而無法滿足高階成像裝置的需求。

【0005】 習用遮光片的結構可參考第1A圖和第1B圖，第1A圖係繪示習用的一種遮光片1的前視示意圖，第1B圖係第1A圖中遮光片1沿剖面線1b-1b的局部剖面示意圖，如第1A圖和第1B圖所示，遮光片1為環形，且可為三層結構，分別為外層L1、基材層L3以及外層L2，外層L1、基材層L3以及外層L2分別包含一個圓形內孔(未標號)，且外層L1、基材層L3以及外層L2的圓形內孔孔徑相等，也就是說，外層L1、基材層L3以及外層L2朝向圓形內孔的表面(以下簡稱內面，且未標號)彼此切齊，當入射光線M1、入射光線M'1入射到內面，會形成反射光線R1、反射光線R'1，當遮光片1應用於成像鏡頭，反射光線R1與反射光線R'1仍會進入成像鏡頭而干擾成像，因此，習用的遮光片1的結構無法有效消減雜散光。

【0006】 綜上所述，如何強化遮光片消減雜散光的能力以提升小型化成像鏡頭的成像品質，已成為當今最重要的議題之一。

【發明內容】

【0007】 本發明提供一種遮光片、成像鏡頭及電子裝置，藉由遮光片內部基材層的基材開孔最小直徑大於第一外表層與第二外表層的直徑，可有利於消減雜散光，進而改善成像鏡頭的成像品質，進而使電子產品滿足更高階的成像需求。

【0008】 根據本發明提供一種遮光片，包含第一外表層、第二外表層、內部基材層以及中心軸。第一外表層包含第一開孔。第二外表層包含第二開孔。內部基材層設置於第一外表層與第二外表層間且連接第一外表層與第二外表層，其中內部基材層包含基材開孔。中心軸與第一開孔、第二開孔及基材開孔同軸。基材開孔的最小直徑為 Φ_{smin} ，第一開孔的直徑為 Φ_1 ，第二開孔的直徑為 Φ_2 ，其滿足下列條件： $\Phi_{smin} > \Phi_1$ ；以及 $\Phi_{smin} > \Phi_2$ 。藉由本段所述特徵，有利於消減雜散光。

【0009】 依據上段所述的遮光片，其中內部基材層可為塑膠材質層，第一外表層與第二外表層可分別是黑色含碳材質層。基材開孔的最小直徑為 Φ_{smin} ，第一開孔的直徑為 Φ_1 ，第二開孔的直徑為 Φ_2 ，其可滿足下列條件： $2.0\ \mu\text{m} < (\Phi_{smin} - \Phi_1)/2 < 200\ \mu\text{m}$ ；以及 $2.0\ \mu\text{m} < (\Phi_{smin} - \Phi_2)/2 < 200\ \mu\text{m}$ 。或者，其可滿足下列條件： $3.0\ \mu\text{m} < (\Phi_{smin} - \Phi_1)/2 < 85\ \mu\text{m}$ ；以及 $3.0\ \mu\text{m} < (\Phi_{smin} - \Phi_2)/2 < 85\ \mu\text{m}$ 。遮光片可更包含空氣夾層，空氣夾層位於第一外表層與第二外表層間，且空氣夾層靠近第一開孔與第二開孔。

空氣夾層平行中心軸的長度為 d ，其可滿足下列條件： $5\text{ }\mu\text{m} < d < 49\text{ }\mu\text{m}$ 。遮光片的厚度為 t ，其可滿足下列條件： $5\text{ }\mu\text{m} < t < 49\text{ }\mu\text{m}$ 。空氣夾層平行中心軸的長度為 d ，遮光片的厚度為 t ，其可滿足下列條件： $0.12 < d/t < 0.67$ 。第一開孔的直徑為 $\Phi 1$ ，第二開孔的直徑為 $\Phi 2$ ，其可滿足下列條件： $0.93 < \Phi 1/\Phi 2 < 1.07$ 。遮光片的最大外徑為 Φ ，遮光片的厚度為 t ，其可滿足下列條件： $1 < 1000t/\Phi < 50$ 。藉由上述提及的各點技術特徵，有利於遮光片的薄型化並兼顧減少漫射光的反射。

【0010】 根據本發明另提供一種成像鏡頭，包含鏡筒、光學鏡組以及上述的遮光片，光學鏡組設置於鏡筒內，遮光片也設置於鏡筒內。藉由本段所述特徵，可有效遮光，減少雜散光入射至成像鏡頭反射光強度，進而改善成像鏡頭的成像品質。

【0011】 依據前述的成像鏡頭，其中遮光片的第一外表層更包含第一表面與成像鏡頭的物側面對應，遮光片的第二外表層更包含第二表面與成像鏡頭的像側面對應，且第一表面與第二表面中至少一表面鍍有一抗反射膜層。抗反射膜層可包含二氧化矽材質層。第一表面與第二表面中可僅一表面鍍有抗反射膜層。藉由上述提及的各點技術特徵，有利於進一步減少光線的反射，而可更進一步提升成像鏡頭的成像品質。

【0012】 根據本發明再提供一種電子裝置，包含前述的成像鏡頭以及電子感光元件，電子感光元件設置於成像鏡頭

的成像面。藉由本段所述特徵，可有效降低雜散光的反射光，以具有良好的成像品質，故能滿足現今對電子裝置的高規格的成像需求。

【0013】 根據本發明又提供一種遮光片，包含第一外表層、第二外表層、內部基材層、空氣夾層以及中心軸。第一外表層包含第一開孔。第二外表層包含第二開孔。內部基材層設置於第一外表層與第二外表層間且連接第一外表層與第二外表層，其中內部基材層包含基材開孔。空氣夾層位於第一外表層與第二外表層間，且空氣夾層靠近第一開孔與第二開孔。中心軸與第一開孔、第二開孔及基材開孔同軸。空氣夾層平行中心軸的長度為 d ，其滿足下列條件： $5\ \mu\text{m} < d < 50\ \mu\text{m}$ 。藉由本段所述特徵，有利於減少漫射光的反射，從而有效消滅雜散光。

【0014】 依據上段所述的遮光片，其中內部基材層可為塑膠材質層，第一外表層與第二外表層可分別為黑色含碳材質層。各內部基材層、第一外表層與第二外表層的厚度可為均勻。基材開孔的最小直徑為 Φ_{smin} ，第一開孔的直徑為 Φ_1 ，第二開孔的直徑為 Φ_2 ，其可滿足下列條件： $3.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_1)/2 < 85\ \mu\text{m}$ ；以及 $3.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_2)/2 < 85\ \mu\text{m}$ 。空氣夾層平行中心軸的長度為 d ，遮光片的厚度為 t ，其可滿足下列條件： $0.12 < d/t < 0.67$ 。藉由上述提及的各點技術特徵，可有利於縮短製造空氣夾層的時間，並兼顧減少反射光的功效。

【0015】 根據本發明更提供一種成像鏡頭，包含鏡筒、

光學鏡組以及上述的遮光片，光學鏡組設置於鏡筒內，遮光片也設置於鏡筒內。藉由本段所述特徵，可有效遮光，減少雜散光入射至成像鏡頭反射光強度，進而改善成像鏡頭的成像品質。

【0016】 依據上段所述的成像鏡頭，其中遮光片的第一外表層更包含第一表面與成像鏡頭的物側面對應，遮光片的第二外表層更包含第二表面與成像鏡頭的像側面對應，且第一表面與第二表面中至少一表面鍍有抗反射膜層。藉由本段所述特徵，有利於進一步減少光線的反射，而可更進一步提升成像鏡頭的成像品質。

【0017】 根據本發明再提供一種電子裝置，包含前述的成像鏡頭以及電子感光元件，電子感光元件設置於成像鏡頭的成像面。藉由本段所述特徵，可有效降低雜散光的反射光，以具有良好的成像品質，故能滿足現今對電子裝置的高規格的成像需求。

【圖式簡單說明】

【0018】 為讓本發明之上述和其他目的、特徵、優點與實施例能更明顯易懂，所附圖式之說明如下：

第1A圖係繪示習用的一種遮光片的前視示意圖；

第1B圖係第1A圖中遮光片沿剖面線1b-1b的局部剖面示意圖；

第2A圖繪示依照本發明一實施方式的一種遮光片的前視示意圖；

第2B圖係第2A圖中遮光片的夾層結構分離示意圖；

第2C圖係第2A圖中遮光片沿剖面線2c-2c的剖面示意圖；

第2D圖是第2A圖中遮光片的複合材料示意圖；

第2E圖是第2D圖中複合材料的結構分離示意圖；

第3圖係繪示依照本發明另一實施方式的一種遮光片的剖面示意圖；

第4圖係繪示依照本發明第一實施例的遮光片的局部剖面示意圖；

第5圖係繪示依照本發明第二實施例的遮光片的局部剖面示意圖；

第6圖係繪示依照本發明第三實施例的遮光片的局部剖面示意圖；

第7圖係繪示依照本發明第四實施例的遮光片的局部剖面示意圖；

第8圖係繪示依照本發明第五實施例的遮光片的局部剖面示意圖；

第9圖係繪示依照本發明第六實施例的遮光片的局部剖面示意圖；

第10圖係繪示依照本發明第七實施例的遮光片的局部剖面示意圖；

第11圖係繪示依照本發明第八實施例的遮光片的局部剖面示意圖；

第12圖係繪示依照本發明第九實施例的遮光片的局部剖面示意圖；

第13圖係繪示依照本發明又一實施方式的成像鏡頭示意圖；

第14圖係繪示依照本發明再一實施方式的電子裝置示意圖；

第15A圖係繪示依照本發明第十實施例的一種取像裝置的示意圖；

第15B圖係繪示第15A圖中取像裝置與其他模組的連接示意圖；

第15C圖係繪示第15A圖中取像裝置與其他模組的另一連接示意圖；

第16A圖係繪示依照本發明第十一實施例的電子裝置透視示意圖；

第16B圖係繪示第16A圖中電子裝置另一視角的示意圖；

第17圖係繪示依照本發明第十二實施例的電子裝置示意圖；以及

第18圖係繪示依照本發明第十三實施例的電子裝置示意圖。

【實施方式】

<遮光片>

【0019】 第2A圖繪示依照本發明一實施方式的一種遮

光片100的前視示意圖，第2B圖係第2A圖中遮光片100的夾層結構分離示意圖，第2C圖係第2A圖中遮光片100沿剖面線2c-2c的剖面示意圖。第2A圖至第2C圖中，遮光片100包含第一外表層110、第二外表層120、內部基材層130以及中心軸Z。

【0020】 請同時參照第2D圖和第2E圖，第2D圖是第2A圖中遮光片100的複合材料示意圖，第2E圖是第2D圖中複合材料的結構分離示意圖。由第2D圖和第2E圖可知，複合材料包含第一外表材料層110A、第二外表材料層120A以及內部基材材料層130A，其中，第2E圖為更清楚呈現第一外表材料層110A、第二外表材料層120A以及內部基材材料層130A的關係，其乃繪示第一外表材料層110A與第二外表材料層120A受外力拉扯撕開後材質因非均勻延展而呈現扭曲的情形，然而，在正常情況下，第一外表材料層110A、第二外表材料層120A以及內部基材材料層130A為緊密貼合，如第2D圖所示。藉此，複合材料因製作方式的關係可為料帶的形式，具有薄片化的優勢，利用控制內部夾層的製造過程可讓複合材料具有均勻厚度，容易做到不易翹曲且平整的極細薄片(thin film)複合材，而有利於遮光片100的薄型化。

【0021】 請復參照第2A圖至第2C圖，第一外表層110包含第一開孔111。第二外表層120包含第二開孔121。內部基材層130設置於第一外表層110與第二外表層120間且連接第一外表層110與第二外表層120，其中內部基材層130

包含基材開孔131。中心軸Z與第一開孔111、第二開孔121及基材開孔131同軸。

【0022】 具體來說，第一外表層110包含朝向外側的第一表面112以及朝向內側的第二表面113，第二外表層120包含朝向內側的第一表面122以及朝向外側的第二表面123。第一外表層110以第二表面113與內部基材層130連接，第二外表層120以第一表面122與內部基材層130連接，此外，第一開孔111、第二開孔121與基材開孔131彼此對應。

【0023】 基材開孔131的最小直徑為 Φ_{smin} ，第一開孔111的直徑為 $\Phi 1$ ，第二開孔121的直徑為 $\Phi 2$ ，其滿足下列條件： $\Phi_{smin} > \Phi 1$ ；以及 $\Phi_{smin} > \Phi 2$ 。藉此，第一外表層110、第二外表層120與內部基材層130形成一與基材開孔131連通的內部空間(請見第2C圖)，所述內部空間在不填充其他材料時，可形成空氣夾層140，換言之，空氣夾層140位於第一外表層110與第二外表層120間，且空氣夾層140靠近第一開孔111與第二開孔121，並和基材開孔131連通。前述“空氣夾層140靠近第一開孔111與第二開孔121”是指空氣夾層140相較於內部基材層130更靠近第一開孔111與第二開孔121。

【0024】 如第2C圖所示，當入射光線M2與入射光線M'2入射到內部空間(空氣夾層140)中的表面，即內部基材層130朝向基材開孔131的表面(未另標號)或第一外表層110的第二表面113或第二外表層120的第一表面122時，所產

生的反射光線R2與反射光線R'2易於內部空間(空氣夾層140)中再次反射，因此，遮光片100可有效衰減由其反射而出的反射光強度，當遮光片100應用於成像鏡組，可有利於消滅雜散光，而提升成像品質。

【0025】 在本實施方式中，內部空間為空氣夾層140，藉由空氣夾層140可減少漫射光的反射。然而，在其他實施方式中，內部空間可填充其他容易吸收或降低反射光線的材料，例如：含碳材料的黑色粉體或黑色膠體或是抗反射塗層材料，其中抗反射塗層材料可包含 TiO_2 與 SiO_2 。所填充吸光或降反射的材料以不突出於內部空間為佳。此外，如第2C圖所示，內部基材層130朝向基材開孔131的表面可設置為傾斜的粗糙面，藉此可進一步衰減由空氣夾層140反射而出的反射光強度。在其他實施方式中，內部基材層130朝向基材開孔131的表面可設置為具有弧度且傾斜的平滑面(例如第5圖、第6圖)，或者，內部基材層130朝向基材開孔131的表面可為凹面(例如第7圖)或凸面(例如第8圖)。

【0026】 內部基材層130可為塑膠材質層，第一外表層110與第二外表層120可為黑色碳纖維層。藉此，遮光片100為複合材質，有利於薄型化。此外，使用黑色碳纖維可兼顧強度與消光的需求。具體來說，塑膠材質層的塑膠材質可為黑色或透明的聚碳酸酯(polycarbonate; PC)、黑色或透明的聚對苯二甲酸乙二酯(polyethylene terephthalate; PET)、聚甲基丙烯酸甲酯(polymethylmethacrylate; PMMA)或其組合。

【0027】 基材開孔131的最小直徑為 Φ_{smin} ，第一開孔111的直徑為 $\Phi 1$ ，第二開孔121的直徑為 $\Phi 2$ ，其可滿足下列條件： $2.0\ \mu m < (\Phi_{smin}-\Phi 1)/2 < 200\ \mu m$ ；以及 $2.0\ \mu m < (\Phi_{smin}-\Phi 2)/2 < 200\ \mu m$ 。藉此，特定範圍內的尺寸差異可兼顧減少反射光的功效與製造空氣夾層140的時間。較佳地，其可滿足下列條件： $3.0\ \mu m < (\Phi_{smin}-\Phi 1)/2 < 85\ \mu m$ ；以及 $3.0\ \mu m < (\Phi_{smin}-\Phi 2)/2 < 85\ \mu m$ 。

【0028】 空氣夾層140平行中心軸Z的長度為d，其可滿足下列條件：藉此， $5\ \mu m < d < 50\ \mu m$ 。可減少漫射光的行走路徑。較佳地，其可滿足下列條件： $5\ \mu m < d < 49\ \mu m$ 。

【0029】 遮光片100的厚度為t，其可滿足下列條件： $5\ \mu m < t < 49\ \mu m$ 。藉此，遮光片100的厚度適當，可減少施作空氣夾層140的時間與成本。

【0030】 空氣夾層140平行中心軸Z的長度為d，遮光片100的厚度為t，其可滿足下列條件： $0.12 < d/t < 0.67$ 。藉此，有利於減少製程的物料耗費與生產成本。

【0031】 第一開孔111的直徑為 $\Phi 1$ ，第二開孔121的直徑為 $\Phi 2$ ，其可滿足下列條件： $0.93 < \Phi 1/\Phi 2 < 1.07$ 。藉此，有利於使用沖壓或雷射切割方式製造第一開孔111與第二開孔121，而可提高生產效率。

【0032】 遮光片100的最大外徑為 Φ ，遮光片100的厚度為t，其可滿足下列條件： $1 < 1000t/\Phi < 50$ 。藉此，可兼具較大的遮光範圍與較小的體積。

【0033】 內部基材層130、第一外表層110與第二外表層

120的厚度可為均勻。藉此，可快速且大量生產，使原料容易以料帶的形式供應，便於後續的製程加工。前述厚度可為均勻，是指厚度均一，也就是內部基材層130除了基材開孔131以外的區域，內部基材層130平行中心軸Z的厚度皆相同。第一外表層110除了第一開孔111以外的區域，第一外表層110平行中心軸Z的厚度皆相同。第二外表層120除了第二開孔121以外的區域，第二外表層120平行中心軸Z的厚度皆相同。

【0034】 第3圖係繪示依照本發明另一實施方式的一種遮光片200的剖面示意圖。第3圖中，遮光片200包含第一外表層210、第二外表層220、內部基材層230以及中心軸Z。第一外表層210包含第一開孔211。第二外表層220包含第二開孔221。內部基材層230設置於第一外表層210與第二外表層220間且連接第一外表層210與第二外表層220，其中內部基材層230包含基材開孔231。中心軸Z與第一開孔211、第二開孔221及基材開孔231同軸。

【0035】 具體來說，第一外表層210包含朝向外側的第一表面212以及朝向內側的第二表面213，第二外表層220包含朝向內側的第一表面222以及朝向外側的第二表面223。第一外表層210以第二表面213與內部基材層230連接，第二外表層220以第一表面222與內部基材層230連接，此外，第一開孔211、第二開孔221與基材開孔231彼此對應。第一外表層210、第二外表層220與內部基材層230形成一與基材開孔231連通的內部空間，在本實施方式中，

內部空間沒有填充其他材料而形成空氣夾層240。

【0036】 第一外表層210的第一表面212與第二外表層220的第二表面223其中至少一表面鍍有抗反射膜層250。藉此，可提升遮光片200衰減反射光的效果，並使遮光片200可適用的材質更為寬廣。

【0037】 在本實施方式中，僅有第一外表層210的第一表面212鍍有抗反射膜層250，在其他實施方式中，可僅有第二外表層220的第二表面223鍍有抗反射膜層250。藉此，可增加正、反面辨識的功效。

【0038】 在其他實施方式中，可第一外表層210的第一表面212與第二外表層220的第二表面223同時鍍有抗反射膜層250，藉此，可進一步提升遮光片200衰減反射光的效果，並使遮光片200可適用的材質更為寬廣。

【0039】 抗反射膜層250可包含二氧化矽材質層。藉此，可增加遮光片200抗氧化的化學功效，減少因製程所需的流程而引起額外的影響。具體來說，抗反射膜層250可為複數膜層結構，且所述複數膜層結構中包含至少一二氧化矽材質層。

【0040】 關於遮光片200的其他細節可與第2A圖至第2C圖中的遮光片100相同，在此不再予以贅述。

<成像鏡頭>

【0041】 第13圖係繪示依照本發明又一實施方式的成像鏡頭2000示意圖。第13圖中，成像鏡頭2000包含鏡筒

2100、光學鏡組2200以及遮光片100。光學鏡組2200設置於鏡筒2100內，遮光片100也設置於鏡筒2100內。藉此，可有效遮光，減少雜散光入射至成像鏡頭2000的反射光強度，進而改善成像鏡頭2000的成像品質。

【0042】 具體來說，成像鏡頭2000還包含一物側面2300、一像側面2400與一成像面2500，物側面2300朝向被攝物(圖未揭示)，而像側面2400朝向成像面2500。光學鏡組2200可包含至少二透鏡(2210、2220、2230、2240、2250、2260)，而遮光片100與所述至少一透鏡(2210、2220、2230、2240、2250、2260)鄰接，不同透鏡(2210、2220、2230、2240、2250、2260)間還可包含其他間隔元件(2610、2620、2630、2640)。

【0043】 更具體來說，在本實施方式中，光學鏡組2200包含第一透鏡2210、第二透鏡2220、第三透鏡2230、第四透鏡2240、第五透鏡2250與第六透鏡2260。遮光片100設置於第三透鏡2230與第四透鏡2240之間，遮光片100的第一外表層110的第一表面112(標號請參見第2C圖)與成像鏡頭2000的物側面2300對應，遮光片100的第二外表層120的第二表面123(標號請參見第2C圖)與成像鏡頭2000的像側面2400對應，而間隔元件2610設置於第一透鏡2210與第二透鏡2220之間，間隔元件2620設置於第二透鏡2220與第三透鏡2230之間，間隔元件2630設置於第四透鏡2240與第五透鏡2250之間，間隔元件2640設置於第五透鏡2250與第六透鏡2260之間。在本實施方式中，遮光片100設置的位置

以及使用的數量僅為例示，在實際應用時，遮光片100可設置於第一透鏡2210至第六透鏡2260中任意兩透鏡之間，且間隔元件2610、間隔元件2620、間隔元件2630及/或間隔元件2640可替換為遮光片100。

【0044】此外，遮光片100的第一外表層110的第一表面112面與第二外表層120的第二表面123中至少一表面可鍍有一抗反射膜層，關於抗反射膜層的有關細節可參考第3圖，在此不予贅述。藉此，有利於進一步減少光線的反射，而可更進一步提升成像鏡頭2000的成像品質。

<電子裝置>

【0045】第14圖係繪示依照本發明再一實施方式的電子裝置3000示意圖。第14圖中，電子裝置3000包含第13圖中的成像鏡頭2000以及電子感光元件3100，電子感光元件3100設置於成像鏡頭2000的成像面2500。藉此，可有效降低雜散光的反射光，以具有良好的成像品質，故能滿足現今對電子裝置3000的高規格的成像需求。電子裝置3000可進一步包含但不限於顯示單元(Display)、控制單元(Control Unit)、儲存單元(Storage Unit)、暫儲存單元(RAM)、唯讀儲存單元(ROM)或其組合。此外，電子裝置3000可為但不限於三維(3D)影像擷取裝置、數位相機、行動產品、數位平板、智慧型電視、網路監控設備、體感遊戲機、車用鏡頭如行車紀錄器與倒車顯影裝置、空拍機、運動攝影器材、各式智慧型電子產品與可穿戴式產品。

<第一實施例>

【0046】 第4圖係繪示依照本發明第一實施例的遮光片300的局部剖面示意圖。第4圖的視角與第2C圖相同，且僅呈現遮光片300剖面的一半。遮光片300包含第一外表層310、第二外表層320、內部基材層330、空氣夾層340以及中心軸Z。第一外表層310包含第一開孔311。第二外表層320包含第二開孔321。內部基材層330設置於第一外表層310與第二外表層320間且連接第一外表層310與第二外表層320，其中內部基材層330包含基材開孔331。空氣夾層340位於第一外表層310與第二外表層320間，且空氣夾層340靠近第一開孔311與第二開孔321。中心軸Z與第一開孔311、第二開孔321及基材開孔331同軸。

【0047】 具體來說，第一外表層310包含朝向外側的第一表面312以及朝向內側的第二表面313，第二外表層320包含朝向內側的第一表面322以及朝向外側的第二表面323。第一外表層310以第二表面313與內部基材層330連接，第二外表層320以第一表面322與內部基材層330連接。此外，第一外表層310、第二外表層320、內部基材層330的厚度均勻。

【0048】 第一外表層310與第二外表層320可皆為黑色含碳材質層，內部基材層330可為塑膠材質層。第一外表層310的第一表面312以及第二外表層320的第二表面323可鍍有抗反射膜層(參見第3圖)。抗反射膜層可包含二氧化矽

材質層。

【0049】 第一實施例的遮光片300中，空氣夾層340平行中心軸Z的長度為d，遮光片300的厚度為t，第一開孔311的直徑為 $\Phi 1$ ，第二開孔321的直徑為 $\Phi 2$ ，基材開孔331的最小直徑為 $\Phi smin$ ，遮光片300的最大外徑為 Φ ，關於第一實施例中d、t、d/t、 $\Phi 1$ 、 $\Phi 2$ 、 $\Phi smin$ 、 Φ 、 $(\Phi smin-\Phi 1)/2$ 、 $(\Phi smin-\Phi 2)/2$ 、 $\Phi 1/\Phi 2$ 、 $1000t/\Phi$ 的數值紀錄於表一。

表一、第一實施例			
d (μm)	17.5	Φ (mm)	3.25
t (μm)	29.5	$(\Phi smin-\Phi 1)/2$ (μm)	6
d/t	0.59	$(\Phi smin-\Phi 2)/2$ (μm)	6
$\Phi 1$ (mm)	2.5	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	2.5	$1000t/\Phi$	9.08
$\Phi smin$ (mm)	2.5120		

<第二實施例>

【0050】 第5圖係繪示依照本發明第二實施例的遮光片400的局部剖面示意圖。第5圖的視角與第2C圖相同，且僅呈現遮光片400剖面的一半。遮光片400包含第一外表層410、第二外表層420、內部基材層430、空氣夾層440以及中心軸Z。第一外表層410包含第一開孔411。第二外表層420包含第二開孔421。內部基材層430設置於第一外表層410與第二外表層420間且連接第一外表層410與第二外表層420，其中內部基材層430包含基材開孔431。空氣夾層440位於第一外表層410與第二外表層420間，且空氣夾層440靠近第一開孔411與第二開孔421。中心軸Z與第一開孔411、第二開孔421及基材開孔431同軸。

【0051】 具體來說，第一外表層410包含朝向外側的第一表面412以及朝向內側的第二表面413，第二外表層420包含朝向內側的第一表面422以及朝向外側的第二表面423。第一外表層410以第二表面413與內部基材層430連接，第二外表層420以第一表面422與內部基材層430連接。此外，第一外表層410、第二外表層420、內部基材層430的厚度均勻。

【0052】 第一外表層410與第二外表層420可皆為黑色含碳材質層，內部基材層430可為塑膠材質層。第一外表層410的第一表面412以及第二外表層420的第二表面423可鍍有抗反射膜層(參見第3圖)。抗反射膜層可包含二氧化矽材質層。

【0053】 第二實施例的遮光片400中，空氣夾層440平行中心軸Z的長度為d，遮光片400的厚度為t，第一開孔411的直徑為 $\Phi 1$ ，第二開孔421的直徑為 $\Phi 2$ ，基材開孔431的最小直徑為 Φ_{smin} ，遮光片400的最大外徑為 Φ ，關於參數d、t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 可參照第2C圖。關於第二實施例中d、t、d/t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 、 $(\Phi_{smin}-\Phi 1)/2$ 、 $(\Phi_{smin}-\Phi 2)/2$ 、 $\Phi 1/\Phi 2$ 、 $1000t/\Phi$ 的數值紀錄於表二。

表二、第二實施例			
d (μm)	29.5	Φ (mm)	3.05
t (μm)	37.5	$(\Phi_{smin}-\Phi 1)/2$ (μm)	15.95
d/t	0.79	$(\Phi_{smin}-\Phi 2)/2$ (μm)	15.95
$\Phi 1$ (mm)	1.65	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	1.65	$1000t/\Phi$	12.30
Φ_{smin} (mm)	1.6819		

<第三實施例>

【0054】第6圖係繪示依照本發明第三實施例的遮光片500的局部剖面示意圖。第6圖的視角與第2C圖相同，且僅呈現遮光片500剖面的一半。遮光片500包含第一外表層510、第二外表層520、內部基材層530、空氣夾層540以及中心軸Z。第一外表層510包含第一開孔511。第二外表層520包含第二開孔521。內部基材層530設置於第一外表層510與第二外表層520間且連接第一外表層510與第二外表層520，其中內部基材層530包含基材開孔531。空氣夾層540位於第一外表層510與第二外表層520間，且空氣夾層540靠近第一開孔511與第二開孔521。中心軸Z與第一開孔511、第二開孔521及基材開孔531同軸。

【0055】具體來說，第一外表層510包含朝向外側的第一表面512以及朝向內側的第二表面513，第二外表層520包含朝向內側的第一表面522以及朝向外側的第二表面523。第一外表層510以第二表面513與內部基材層530連接，第二外表層520以第一表面522與內部基材層530連接。此外，第一外表層510、第二外表層520、內部基材層530的厚度均勻。

【0056】第一外表層510與第二外表層520可皆為黑色碳纖維層，內部基材層530可為黑色塑膠PET材質層。第一外表層510的第一表面512以及第二外表層520的第二表面523可鍍有抗反射膜層(參見第3圖)。抗反射膜層可包含二氧化矽材質層。

【0057】 第三實施例的遮光片500中，空氣夾層540平行中心軸Z的長度為d，遮光片500的厚度為t，第一開孔511的直徑為 $\Phi 1$ ，第二開孔521的直徑為 $\Phi 2$ ，基材開孔531的最小直徑為 Φ_{smin} ，遮光片500的最大外徑為 Φ ，關於參數d、t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 可參照第2C圖。關於第三實施例中d、t、d/t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 、 $(\Phi_{smin}-\Phi 1)/2$ 、 $(\Phi_{smin}-\Phi 2)/2$ 、 $\Phi 1/\Phi 2$ 、 $1000t/\Phi$ 的數值紀錄於表三。

表三、第三實施例			
d (μm)	9	Φ (mm)	3.55
t (μm)	17	$(\Phi_{smin}-\Phi 1)/2$ (μm)	15.95
d/t	0.53	$(\Phi_{smin}-\Phi 2)/2$ (μm)	15.95
$\Phi 1$ (mm)	3.04	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	3.04	$1000t/\Phi$	4.79
Φ_{smin} (mm)	3.0719		

<第四實施例>

【0058】 第7圖係繪示依照本發明第四實施例的遮光片600的局部剖面示意圖。第7圖的視角與第2C圖相同，且僅呈現遮光片600剖面的一半。遮光片600包含第一外表層610、第二外表層620、內部基材層630、空氣夾層640以及中心軸Z。第一外表層610包含第一開孔611。第二外表層620包含第二開孔621。內部基材層630設置於第一外表層610與第二外表層620間且連接第一外表層610與第二外表層620，其中內部基材層630包含基材開孔631。空氣夾層640位於第一外表層610與第二外表層620間，且空氣夾層640靠近第一開孔611與第二開孔621。中心軸Z與第一開孔611、第二開孔621及基材開孔631同軸。

【0059】 具體來說，第一外表層610包含朝向外側的第一表面612以及朝向內側的第二表面613，第二外表層620包含朝向內側的第一表面622以及朝向外側的第二表面623。第一外表層610以第二表面613與內部基材層630連接，第二外表層620以第一表面622與內部基材層630連接。此外，第一外表層610、第二外表層620、內部基材層630的厚度均勻。

【0060】 第一外表層610與第二外表層620可皆為黑色碳纖維層，內部基材層630可為透明塑膠PET材質層。第一外表層610的第一表面612以及第二外表層620的第二表面623可鍍有抗反射膜層(參見第3圖)。抗反射膜層可包含二氧化矽材質層。

【0061】 第四實施例的遮光片600中，空氣夾層640平行中心軸Z的長度為 d ，遮光片600的厚度為 t ，第一開孔611的直徑為 $\Phi 1$ ，第二開孔621的直徑為 $\Phi 2$ ，基材開孔631的最小直徑為 Φ_{smin} ，遮光片600的最大外徑為 Φ ，關於參數 d 、 t 、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 可參照第2C圖。關於第四實施例中 d 、 t 、 d/t 、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 、 $(\Phi_{smin}-\Phi 1)/2$ 、 $(\Phi_{smin}-\Phi 2)/2$ 、 $\Phi 1/\Phi 2$ 、 $1000t/\Phi$ 的數值紀錄於表四。

表四、第四實施例			
$d(\mu m)$	40	$\Phi(mm)$	5.35
$t(\mu m)$	48	$(\Phi_{smin}-\Phi 1)/2(\mu m)$	36.64
d/t	0.83	$(\Phi_{smin}-\Phi 2)/2(\mu m)$	36.64
$\Phi 1(mm)$	4.14	$\Phi 1/\Phi 2$	1
$\Phi 2(mm)$	4.14	$1000t/\Phi$	8.97
$\Phi_{smin}(mm)$	4.2133		

<第五實施例>

【0062】 第8圖係繪示依照本發明第五實施例的遮光片700的局部剖面示意圖。第8圖的視角與第2C圖相同，且僅呈現遮光片700剖面的一半。遮光片700包含第一外表層710、第二外表層720、內部基材層730、空氣夾層740以及中心軸Z。第一外表層710包含第一開孔711。第二外表層720包含第二開孔721。內部基材層730設置於第一外表層710與第二外表層720間且連接第一外表層710與第二外表層720，其中內部基材層730包含基材開孔731。空氣夾層740位於第一外表層710與第二外表層720間，且空氣夾層740靠近第一開孔711與第二開孔721。中心軸Z與第一開孔711、第二開孔721及基材開孔731同軸。

【0063】 具體來說，第一外表層710包含朝向外側的第一表面712以及朝向內側的第二表面713，第二外表層720包含朝向內側的第一表面722以及朝向外側的第二表面723。第一外表層710以第二表面713與內部基材層730連接，第二外表層720以第一表面722與內部基材層730連接。此外，第一外表層710、第二外表層720、內部基材層730的厚度均勻。

【0064】 第一外表層710與第二外表層720可皆為黑色含碳材質層，內部基材層730可為塑膠材質層。第一外表層710的第一表面712以及第二外表層720的第二表面723可鍍有抗反射膜層(參見第3圖)。抗反射膜層可包含二氧化矽材質層。

【0065】 第五實施例的遮光片700中，空氣夾層740平行中心軸Z的長度為d，遮光片700的厚度為t，第一開孔711的直徑為 $\Phi 1$ ，第二開孔721的直徑為 $\Phi 2$ ，基材開孔731的最小直徑為 Φ_{smin} ，遮光片700的最大外徑為 Φ ，關於參數d、t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 可參照第2C圖。關於第五實施例中d、t、d/t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 、 $(\Phi_{smin}-\Phi 1)/2$ 、 $(\Phi_{smin}-\Phi 2)/2$ 、 $\Phi 1/\Phi 2$ 、 $1000t/\Phi$ 的數值紀錄於表五。

表五、第五實施例			
d (μm)	20	Φ (mm)	5.55
t (μm)	28	$(\Phi_{smin}-\Phi 1)/2$ (μm)	92
d/t	0.71	$(\Phi_{smin}-\Phi 2)/2$ (μm)	92
$\Phi 1$ (mm)	4.14	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	4.14	$1000t/\Phi$	5.05
Φ_{smin} (mm)	4.3240		

<第六實施例>

【0066】 第9圖係繪示依照本發明第六實施例的遮光片800的局部剖面示意圖。第9圖的視角與第2C圖相同，且僅呈現遮光片800剖面的一半。遮光片800包含第一外表層810、第二外表層820、內部基材層830、空氣夾層840以及中心軸Z。第一外表層810包含第一開孔811。第二外表層820包含第二開孔821。內部基材層830設置於第一外表層810與第二外表層820間且連接第一外表層810與第二外表層820，其中內部基材層830包含基材開孔831。空氣夾層840位於第一外表層810與第二外表層820間，且空氣夾層840靠近第一開孔811與第二開孔821。中心軸Z與第一開孔811、第二開孔821及基材開孔831同軸。

【0067】 具體來說，第一外表層810包含朝向外側的第一表面812以及朝向內側的第二表面813，第二外表層820包含朝向內側的第一表面822以及朝向外側的第二表面823。第一外表層810以第二表面813與內部基材層830連接，第二外表層820以第一表面822與內部基材層830連接。此外，第一外表層810、第二外表層820、內部基材層830的厚度均勻。

【0068】 第一外表層810與第二外表層820可皆為黑色含碳材質層，內部基材層830可為塑膠材質層。第一外表層810的第一表面812以及第二外表層820的第二表面823可鍍有抗反射膜層(參見第3圖)。抗反射膜層可包含二氧化矽材質層。

【0069】 第六實施例的遮光片800中，空氣夾層840平行中心軸Z的長度為d，遮光片800的厚度為t，第一開孔811的直徑為 $\Phi 1$ ，第二開孔821的直徑為 $\Phi 2$ ，基材開孔831的最小直徑為 Φ_{smin} ，遮光片800的最大外徑為 Φ ，關於參數d、t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 可參照第2C圖。關於第六實施例中d、t、d/t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 、 $(\Phi_{smin}-\Phi 1)/2$ 、 $(\Phi_{smin}-\Phi 2)/2$ 、 $\Phi 1/\Phi 2$ 、 $1000t/\Phi$ 的數值紀錄於表六。在第六實施例中，由於空氣夾層840於平行中心軸Z具有不同的長度(即d不同)，表六中記載的是最小長度(即所有d中的最小值)。

表六、第六實施例			
d (μm)	7.15	Φ (mm)	5.55
t (μm)	28	$(\Phi_{smin}-\Phi 1)/2$ (μm)	91.8
d/t	0.26	$(\Phi_{smin}-\Phi 2)/2$ (μm)	91.8

$\Phi 1$ (mm)	4.14	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	4.14	$1000t/\Phi$	5.05
Φ_{smin} (mm)	4.3236		

<第七實施例>

【0070】第10圖係繪示依照本發明第七實施例的遮光片900的局部剖面示意圖。第10圖的視角與第2C圖相同，且僅呈現遮光片900剖面的一半。遮光片900包含第一外表層910、第二外表層920、內部基材層930、空氣夾層940以及中心軸Z。第一外表層910包含第一開孔911。第二外表層920包含第二開孔921。內部基材層930設置於第一外表層910與第二外表層920間且連接第一外表層910與第二外表層920，其中內部基材層930包含基材開孔931。空氣夾層940位於第一外表層910與第二外表層920間，且空氣夾層940靠近第一開孔911與第二開孔921。中心軸Z與第一開孔911、第二開孔921及基材開孔931同軸。

【0071】具體來說，第一外表層910包含朝向外側的第一表面912以及朝向內側的第二表面913，第二外表層920包含朝向內側的第一表面922以及朝向外側的第二表面923。第一外表層910以第二表面913與內部基材層930連接，第二外表層920以第一表面922與內部基材層930連接。此外，第一外表層910、第二外表層920、內部基材層930的厚度均勻。

【0072】第一外表層910與第二外表層920可皆為黑色含碳材質層，內部基材層930可為塑膠材質層。第一外表層910的第一表面912以及第二外表層920的第二表面923可

鍍有抗反射膜層(參見第3圖)。抗反射膜層可包含二氧化矽材質層。

【0073】 第七實施例的遮光片900中，空氣夾層940平行中心軸Z的長度為d，遮光片900的厚度為t，第一開孔911的直徑為 $\Phi 1$ ，第二開孔921的直徑為 $\Phi 2$ ，基材開孔931的最小直徑為 Φ_{smin} ，遮光片900的最大外徑為 Φ ，關於參數d、t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 可參照第2C圖。關於第七實施例中d、t、d/t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 、 $(\Phi_{smin}-\Phi 1)/2$ 、 $(\Phi_{smin}-\Phi 2)/2$ 、 $\Phi 1/\Phi 2$ 、 $1000t/\Phi$ 的數值紀錄於表七。

表七、第七實施例			
d (μm)	17.68	Φ (mm)	3.25
t (μm)	29.5	$(\Phi_{smin}-\Phi 1)/2$ (μm)	36
d/t	0.60	$(\Phi_{smin}-\Phi 2)/2$ (μm)	36
$\Phi 1$ (mm)	2.5	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	2.5	$1000t/\Phi$	9.08
Φ_{smin} (mm)	2.5720		

<第八實施例>

【0074】 第11圖係繪示依照本發明第八實施例的遮光片1000的局部剖面示意圖。第11圖的視角與第2C圖相同，且僅呈現遮光片1000剖面的一半。遮光片1000包含第一外表層1010、第二外表層1020、內部基材層1030、空氣夾層1040以及中心軸Z。第一外表層1010包含第一開孔1011。第二外表層1020包含第二開孔1021。內部基材層1030設置於第一外表層1010與第二外表層1020間且連接第一外表層1010與第二外表層1020，其中內部基材層1030包含基材開孔1031。空氣夾層1040位於第一外表層1010與第二外表

層1020間，且空氣夾層1040靠近第一開孔1011與第二開孔1021。中心軸Z與第一開孔1011、第二開孔1021及基材開孔1031同軸。

【0075】 具體來說，第一外表層1010包含朝向外側的第一表面1012以及朝向內側的第二表面1013，第二外表層1020包含朝向內側的第一表面1022以及朝向外側的第二表面1023。第一外表層1010以第二表面1013與內部基材層1030連接，第二外表層1020以第一表面1022與內部基材層1030連接。此外，第一外表層1010、第二外表層1020、內部基材層1030的厚度均勻。

【0076】 第一外表層1010與第二外表層1020可皆為黑色含碳材質層，內部基材層1030可為塑膠材質層。第一外表層1010的第一表面1012以及第二外表層1020的第二表面1023可鍍有抗反射膜層(參見第3圖)。抗反射膜層可包含二氧化矽材質層。

【0077】 第八實施例的遮光片1000中，空氣夾層1040平行中心軸Z的長度為d，遮光片1000的厚度為t，第一開孔1011的直徑為 $\Phi 1$ ，第二開孔1021的直徑為 $\Phi 2$ ，基材開孔1031的最小直徑為 Φ_{smin} ，遮光片1000的最大外徑為 Φ ，關於參數d、t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 可參照第2C圖。關於第八實施例中d、t、d/t、 $\Phi 1$ 、 $\Phi 2$ 、 Φ_{smin} 、 Φ 、 $(\Phi_{smin}-\Phi 1)/2$ 、 $(\Phi_{smin}-\Phi 2)/2$ 、 $\Phi 1/\Phi 2$ 、 $1000t/\Phi$ 的數值紀錄於表八。

表八、第八實施例			
d (μm)	29.5	Φ (mm)	3.05

t (μm)	37.5	$(\Phi_{\text{min}} - \Phi 1)/2$ (μm)	30.95
d/t	0.79	$(\Phi_{\text{min}} - \Phi 2)/2$ (μm)	15.95
Φ 1 (mm)	1.62	Φ 1 / Φ 2	0.98
Φ 2 (mm)	1.65	1000t/Φ	12.30
Φ _{min} (mm)	1.6819		

<第九實施例>

【0078】 第12圖係繪示依照本發明第九實施例的遮光片1100的局部剖面示意圖。第12圖的視角與第2C圖相同，且僅呈現遮光片1100剖面的一半。遮光片1100包含第一外表層1110、第二外表層1120、內部基材層1130、空氣夾層1140以及中心軸Z。第一外表層1110包含第一開孔1111。第二外表層1120包含第二開孔1121。內部基材層1130設置於第一外表層1110與第二外表層1120間且連接第一外表層1110與第二外表層1120，其中內部基材層1130包含基材開孔1131。空氣夾層1140位於第一外表層1110與第二外表層1120間，且空氣夾層1140靠近第一開孔1111與第二開孔1121。中心軸Z與第一開孔1111、第二開孔1121及基材開孔1131同軸。

【0079】 具體來說，第一外表層1110包含朝向外側的第一表面1112以及朝向內側的第二表面1113，第二外表層1120包含朝向內側的第一表面1122以及朝向外側的第二表面1123。第一外表層1110以第二表面1113與內部基材層1130連接，第二外表層1120以第一表面1122與內部基材層1130連接。此外，第一外表層1110、第二外表層1120、內部基材層1130的厚度均勻。

【0080】 第一外表層1110與第二外表層1120可皆為黑

色含碳材質層，內部基材層1130可為塑膠材質層。第一外表層1110的第一表面1112以及第二外表層1120的第二表面1123可鍍有抗反射膜層(參見第3圖)。抗反射膜層可包含二氧化矽材質層。

【0081】 第九實施例的遮光片1100中，空氣夾層1140平行中心軸Z的長度為d，遮光片1100的厚度為t，第一開孔1111的直徑為 $\Phi 1$ ，第二開孔1121的直徑為 $\Phi 2$ ，基材開孔1131的最小直徑為 $\Phi smin$ ，遮光片1100的最大外徑為 Φ ，關於參數d、t、 $\Phi 1$ 、 $\Phi 2$ 、 $\Phi smin$ 、 Φ 可參照第2C圖。關於第九實施例中d、t、d/t、 $\Phi 1$ 、 $\Phi 2$ 、 $\Phi smin$ 、 Φ 、 $(\Phi smin-\Phi 1)/2$ 、 $(\Phi smin-\Phi 2)/2$ 、 $\Phi 1/\Phi 2$ 、 $1000t/\Phi$ 的數值紀錄於表九。

表九、第九實施例			
d (μm)	4.5	Φ (mm)	3.55
t (μm)	11.5	$(\Phi smin-\Phi 1)/2$ (μm)	15.95
d/t	0.39	$(\Phi smin-\Phi 2)/2$ (μm)	15.95
$\Phi 1$ (mm)	3.04	$\Phi 1/\Phi 2$	1
$\Phi 2$ (mm)	3.04	$1000t/\Phi$	3.24
$\Phi smin$ (mm)	3.0719		

<第十實施例>

【0082】 請參照第15A圖，係繪示依照本發明第十實施例的一種取像裝置10的示意圖。第十實施例的取像裝置10係一相機模組，取像裝置10包含成像鏡頭11、驅動裝置組12、電子感光元件13以及導線電路14，其中成像鏡頭11包含本發明第一實施例的光學鏡組(圖未揭示)以及一承載光學鏡組的鏡筒(未另標號)。取像裝置10利用成像鏡頭11

聚光產生影像並配合驅動裝置組12進行影像對焦，最後成像於電子感光元件13，並透過導線電路14將影像資料輸出。

【0083】 驅動裝置組12可為自動對焦(Auto-Focus)模組，其驅動方式可使用如音圈馬達(Voice Coil Motor；VCM)、微機電系統(Micro Electro-Mechanical Systems；MEMS)、壓電系統(Piezoelectric)以及記憶金屬(Shape Memory Alloy)等驅動系統。驅動裝置組12可讓光學鏡組取得較佳的成像位置，可提供被攝物於不同物距的狀態下，皆能拍攝清晰影像；此外，驅動裝置組12亦可搭配加速計、陀螺儀或霍爾元件(Hall Effect Sensor)等動能感測元件，藉由調整光學鏡組不同軸向的變化以補償拍攝瞬間因晃動而產生的模糊影像，進一步提升動態以及低照度場景拍攝的成像品質，例如：光學防手震(Optical Image Stabilization；OIS)、電子防手震(Electronic Image Stabilization；EIS)等；此外，取像裝置10搭載一感光度佳及低雜訊的電子感光元件13(如CMOS、CCD)設置於光學鏡組的成像面，可真實呈現光學鏡組的良好成像品質。

【0084】 在實際應用中，取像裝置10可以其他模組連接，以賦予取像裝置10所需的功能。請參照第15B圖，其係繪示第15A圖中取像裝置10與其他模組的連接示意圖，第15B圖中，取像裝置10是透過導線電路15與閃光燈模組22連接，藉此，閃光燈模組22可提供補光的功能，有利於優化成像品質。另請參照第15C圖，其係繪示第15A圖中取像裝置10與其他模組的另一連接示意圖。第15C圖中，取像裝

置10是透過導線電路16與對焦輔助模組23連接，藉此，對焦輔助模組23可提供的被攝物物距資訊而有利於取像裝置10快速對焦。第15B圖與第15C圖中，閃光燈模組22與對焦輔助模組23僅為例示，可視實際需求更換為其他模組，此外，取像裝置10可僅與一個其他模組或同時與多個其他模組連接。而導線電路14、導線電路15與導線電路16可為但不限於軟式電路板(Flexible Printing Circuit；FPC)。

<第十一實施例>

【0085】請參照第16A圖與第16B圖，第16A圖係繪示依照本發明第十一實施例的電子裝置20的透視示意圖，第16B圖係繪示第16A圖中電子裝置20另一視角的示意圖。第十一實施例的電子裝置20係一智慧型手機，電子裝置20包含第十實施例取像裝置10、閃光燈模組22、對焦輔助模組23、成像訊號處理元件24(Image Signal Processor)、使用者介面25，其中取像裝置10與閃光燈模組22、對焦輔助模組23、成像訊號處理元件24(Image Signal Processor)、使用者介面25電性連接(圖未繪示)。當使用者透過使用者介面25進行拍攝，電子裝置20利用取像裝置10聚光取像，啟動閃光燈模組22進行補光，並使用對焦輔助模組23提供的被攝物物距資訊進行快速對焦，再加上成像訊號處理元件24進行影像最佳化處理，來進一步提升光學鏡組所產生的影像品質。其中對焦輔助模組23可採用紅外線或雷射對焦輔助系統來達到快速對焦。其中使用者介面

25可採用觸控螢幕或實體拍攝按鈕，配合影像處理軟體的多樣化功能進行影像拍攝以及影像處理。

<第十二實施例>

【0086】第17圖係繪示依照本發明第十二實施例的電子裝置30示意圖。第17圖中，第十二實施例的電子裝置30係一平板電腦，電子裝置30包含取像裝置31，取像裝置31可與前述第十實施例相同，在此不另贅述。

<第十三實施例>

【0087】第18圖係繪示依照本發明第十三實施例的電子裝置40示意圖。第18圖中，第十三實施例的電子裝置40係一頭戴式顯示器（Head-mounted display，HMD），電子裝置40包含取像裝置41，取像裝置41可與前述第十實施例相同，在此不另贅述。

【0088】雖然本發明已以實施方式揭露如上，然其並非用以限定本發明，任何熟習此技藝者，在不脫離本發明的精神和範圍內，當可作各種的更動與潤飾，因此本發明的保護範圍當視後附的申請專利範圍所界定者為準。

【符號說明】

【0089】

遮光片：1

外層：L1、L2

基材層：L3

入射光線：M1、M'1、M2、M'2

反射光線：R1、R'1、R2、R'2

電子裝置：20、30、40

取像裝置：10、31、41

成像鏡頭：11

驅動裝置組：12

電子感光元件：13

導線電路：14、15、16

閃光燈模組：22

對焦輔助模組：23

成像訊號處理元件：24

使用者介面：25

第一外表材料層：110A

第二外表材料層：120A

內部基材材料層：130A

遮光片：100、200、300、400、500、600、700、800、
900、1000、1100

第一外表層：110、210、310、410、510、610、710、
810、910、1010、1110

第一開孔：111、211、311、411、511、611、711、811、
911、1011、1111

第一表面：112、212、312、412、512、612、712、812、
912、1012、1112

第二表面：113、213、313、413、513、613、713、813、
913、1013、1113

第二外表層：120、220、320、420、520、620、720、
820、920、1020、1120

第二開孔：121、221、321、421、521、621、721、821、
921、1021、1121

第一表面：122、222、322、422、522、622、722、822、
922、1022、1122

第二表面：123、223、323、423、523、623、723、823、
923、1023、1123

內部基材層：130、230、330、430、530、630、730、
830、930、1030、1130

基材開孔：131、231、331、431、531、631、731、831、
931、1031、1131

空氣夾層：140、240、340、440、540、640、740、840、
940、1040、1140

抗反射膜層：250

成像鏡頭：2000

鏡筒：2100

光學鏡組：2200

物側面：2300

像側面：2400

成像面：2500

第一透鏡：2210

第二透鏡：2220

第三透鏡：2230

第四透鏡：2240

第五透鏡：2250

第六透鏡：2260

間隔元件：2610、2620、2630、2640

電子裝置：3000

電子感光元件：3100

Z：中心軸

d：空氣夾層平行中心軸的長度

t：遮光片的厚度

$\Phi 1$ ：第一開孔的直徑

$\Phi 2$ ：第二開孔的直徑

Φ_{smin} ：基材開孔的最小直徑

Φ ：遮光片的最大外徑

【發明申請專利範圍】

【第 1 項】一種遮光片，包含：

一第一外表層，包含一第一開孔；

一第二外表層，包含一第二開孔；

一內部基材層，設置於該第一外表層與該第二外表層間且連接該第一外表層與該第二外表層，其中該內部基材層包含一基材開孔；以及

一中心軸，與該第一開孔、該第二開孔及該基材開孔同軸；

其中，該基材開孔的最小直徑為 Φ_{smin} ，該第一開孔的直徑為 $\Phi 1$ ，該第二開孔的直徑為 $\Phi 2$ ，其滿足下列條件：

$\Phi_{smin} > \Phi 1$ ；以及

$\Phi_{smin} > \Phi 2$ 。

【第 2 項】如申請專利範圍第 1 項所述的遮光片，其中該內部基材層是一塑膠材質層，該第一外表層與該第二外表層分別是一黑色含碳材質層。

【第 3 項】如申請專利範圍第 2 項所述的遮光片，其中該基材開孔的最小直徑為 Φ_{smin} ，該第一開孔的直徑為 $\Phi 1$ ，該第二開孔的直徑為 $\Phi 2$ ，其滿足下列條件：

$2.0 \mu m < (\Phi_{smin} - \Phi 1) / 2 < 200 \mu m$ ；以及

$2.0 \mu m < (\Phi_{smin} - \Phi 2) / 2 < 200 \mu m$ 。

【第 4 項】如申請專利範圍第 1 項所述的遮光片，其中該基材開孔的最小直徑為 Φ_{smin} ，該第一開孔的直徑為 $\Phi 1$ ，該第二開孔的直徑為 $\Phi 2$ ，其滿足下列條件：

$3.0 \mu m < (\Phi_{smin} - \Phi 1) / 2 < 85 \mu m$ ；以及

$$3.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi 2)/2 < 85 \mu\text{m}。$$

【第 5 項】如申請專利範圍第 1 項所述的遮光片，更包含：

一空氣夾層，位於該第一外表層與該第二外表層間，且該空氣夾層靠近該第一開孔與該第二開孔。

【第 6 項】如申請專利範圍第 5 項所述的遮光片，其中該空氣夾層平行該中心軸的長度為 d ，其滿足下列條件：

$$5 \mu\text{m} < d < 49 \mu\text{m}。$$

【第 7 項】如申請專利範圍第 5 項所述的遮光片，其中該遮光片的厚度為 t ，其滿足下列條件：

$$5 \mu\text{m} < t < 49 \mu\text{m}。$$

【第 8 項】如申請專利範圍第 5 項所述的遮光片，其中該空氣夾層平行該中心軸的長度為 d ，該遮光片的厚度為 t ，其滿足下列條件：

$$0.12 < d/t < 0.67。$$

【第 9 項】如申請專利範圍第 3 項所述的遮光片，其中該第一開孔的直徑為 $\Phi 1$ ，該第二開孔的直徑為 $\Phi 2$ ，其滿足下列條件：

$$0.93 < \Phi 1/\Phi 2 < 1.07。$$

【第 10 項】如申請專利範圍第 3 項所述的遮光片，其中該遮光片的最大外徑為 Φ ，該遮光片的厚度為 t ，其滿足下列條件：

$$1 < 1000t/\Phi < 50。$$

【第 11 項】一種成像鏡頭，包含：

一鏡筒；

一光學鏡組，設置於該鏡筒內；以及
如申請專利範圍第 1 項所述的遮光片，設置於該鏡筒內。

【第 12 項】如申請專利範圍第 11 項所述的成像鏡頭，其中該遮光片的該第一外表層更包含一第一表面與該成像鏡頭的一物側面對應，該遮光片的該第二外表層更包含一第二表面與該成像鏡頭的一像側面對應，且該第一表面與該第二表面中至少一表面鍍有一抗反射膜層。

【第 13 項】如申請專利範圍第 12 項所述的成像鏡頭，其中該抗反射膜層包含二氧化矽材質層。

【第 14 項】如申請專利範圍第 12 項所述的成像鏡頭，其中該第一表面與該第二表面中僅一表面鍍有該抗反射膜層。

【第 15 項】一種電子裝置，包含：

如申請專利範圍第 11 項所述的成像鏡頭；以及
一電子感光元件，設置於該成像鏡頭的一成像面。

【第 16 項】一種遮光片，包含：

一第一外表層，包含一第一開孔；

一第二外表層，包含一第二開孔；

一內部基材層，設置於該第一外表層與該第二外表層間且連接該第一外表層與該第二外表層，其中該內部基材層包含一基材開孔；

一空氣夾層，位於該第一外表層與該第二外表層間，且該空氣夾層靠近該第一開孔與該第二開孔；以及

一中心軸，與該第一開孔、該第二開孔及該基材開孔

同軸；

其中，該空氣夾層平行該中心軸的長度為 d ，其滿足下列條件：

$$5\ \mu\text{m} < d < 50\ \mu\text{m}。$$

【第 17 項】如申請專利範圍第 16 項所述的遮光片，其中該內部基材層是一塑膠材質層，該第一外表層與該第二外表層是一黑色含碳材質層。

【第 18 項】如申請專利範圍第 17 項所述的遮光片，其中各該內部基材層、該第一外表層與該第二外表層的厚度均勻。

【第 19 項】如申請專利範圍第 17 項所述的遮光片，其中該基材開孔的最小直徑為 Φ_{smin} ，該第一開孔的直徑為 $\Phi 1$ ，該第二開孔的直徑為 $\Phi 2$ ，其滿足下列條件：

$$3.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi 1)/2 < 85\ \mu\text{m}；以及$$

$$3.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi 2)/2 < 85\ \mu\text{m}。$$

【第 20 項】如申請專利範圍第 17 項所述的遮光片，其中該空氣夾層平行該中心軸的長度為 d ，該遮光片的厚度為 t ，其滿足下列條件：

$$0.12 < d/t < 0.67。$$

【第 21 項】一種成像鏡頭，包含：

一鏡筒；

一光學鏡組，設置於該鏡筒內；以及

如申請專利範圍第 16 項所述的遮光片，設置於該鏡筒內。

【第 22 項】如申請專利範圍第 21 項所述的成像鏡

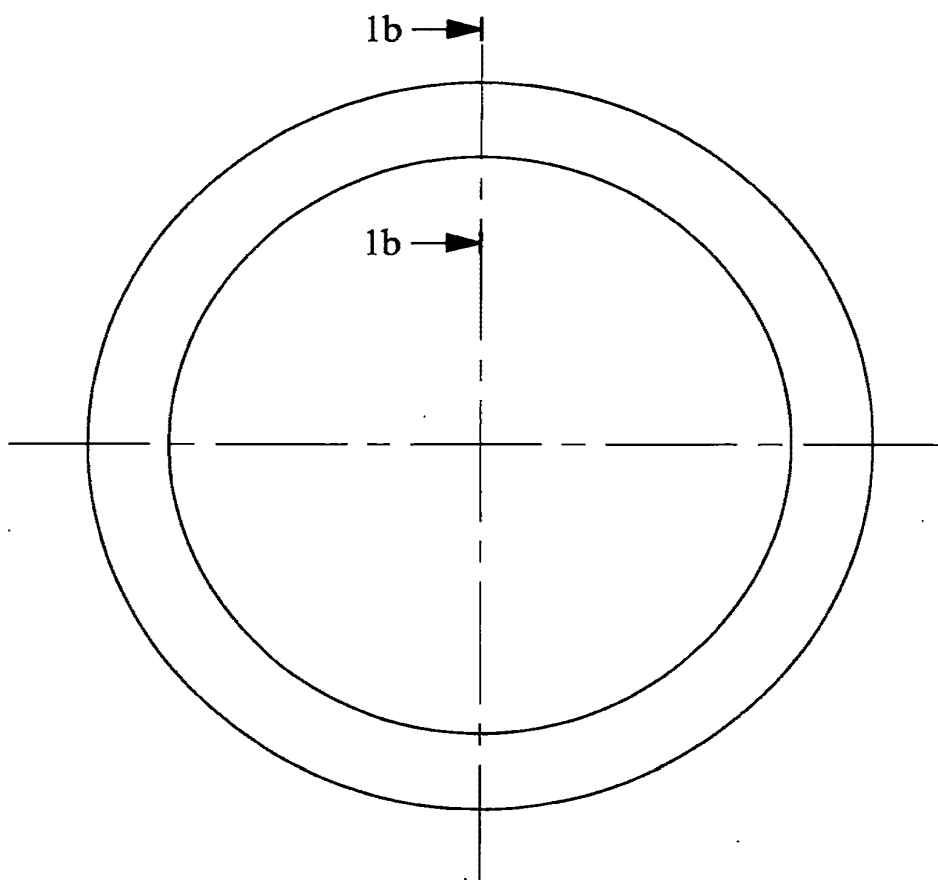
頭，其中該遮光片的該第一外表層更包含一第一表面與該成像鏡頭的一物側面對應，該遮光片的該第二外表層更包含一第二表面與該成像鏡頭的一像側面對應，且該第一表面與該第二表面中至少一表面鍍有一抗反射膜層。

【第 23 項】一種電子裝置，包含：

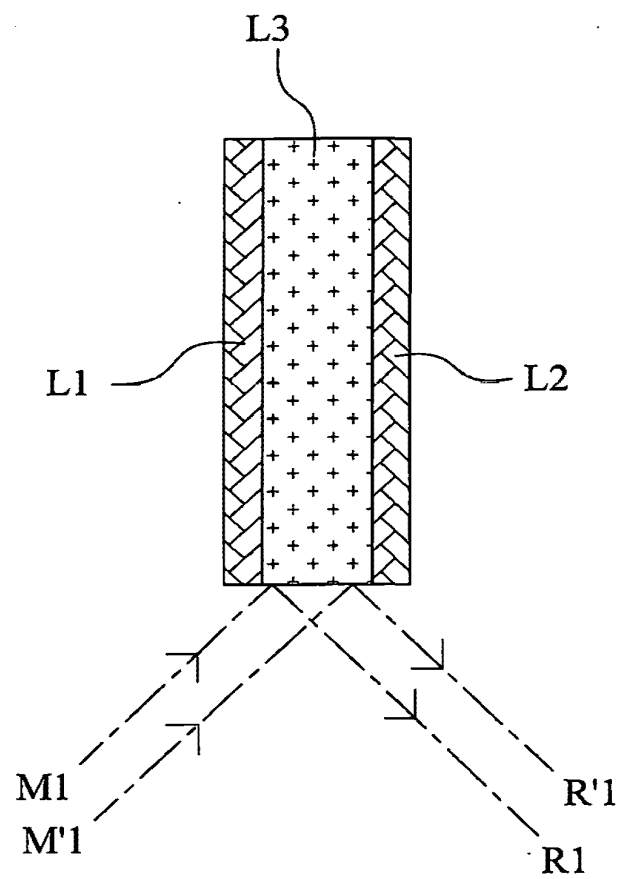
如申請專利範圍第 21 項所述的成像鏡頭；以及
一電子感光元件，設置於該成像鏡頭的一成像面。

圖式

1

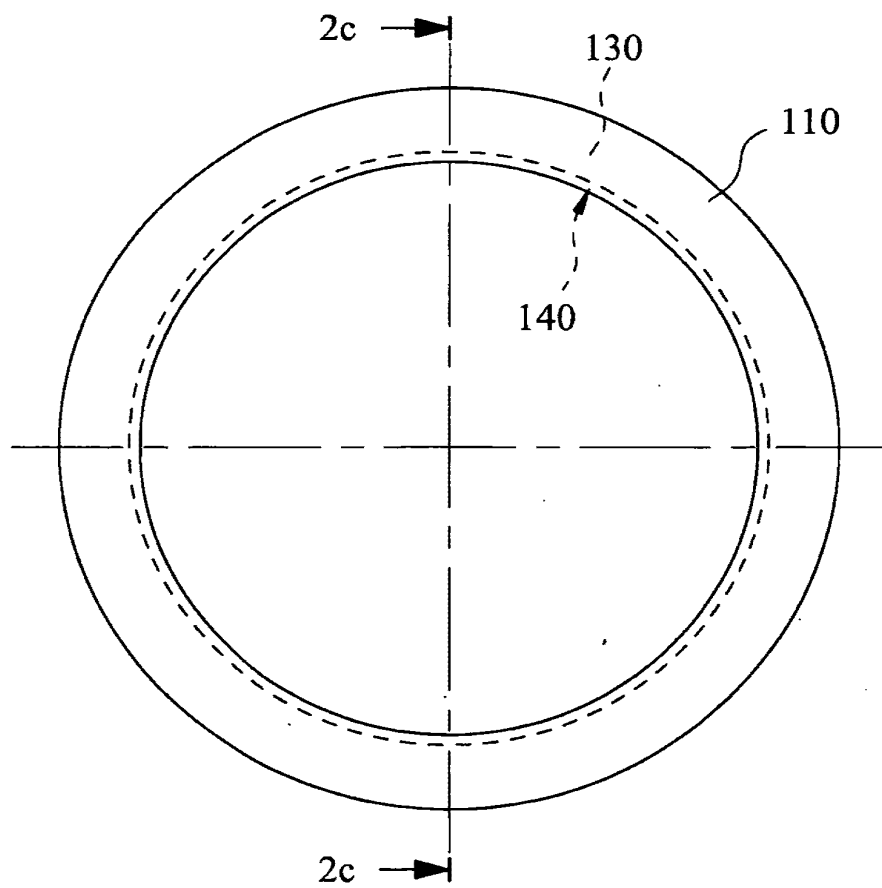


第 1A 圖



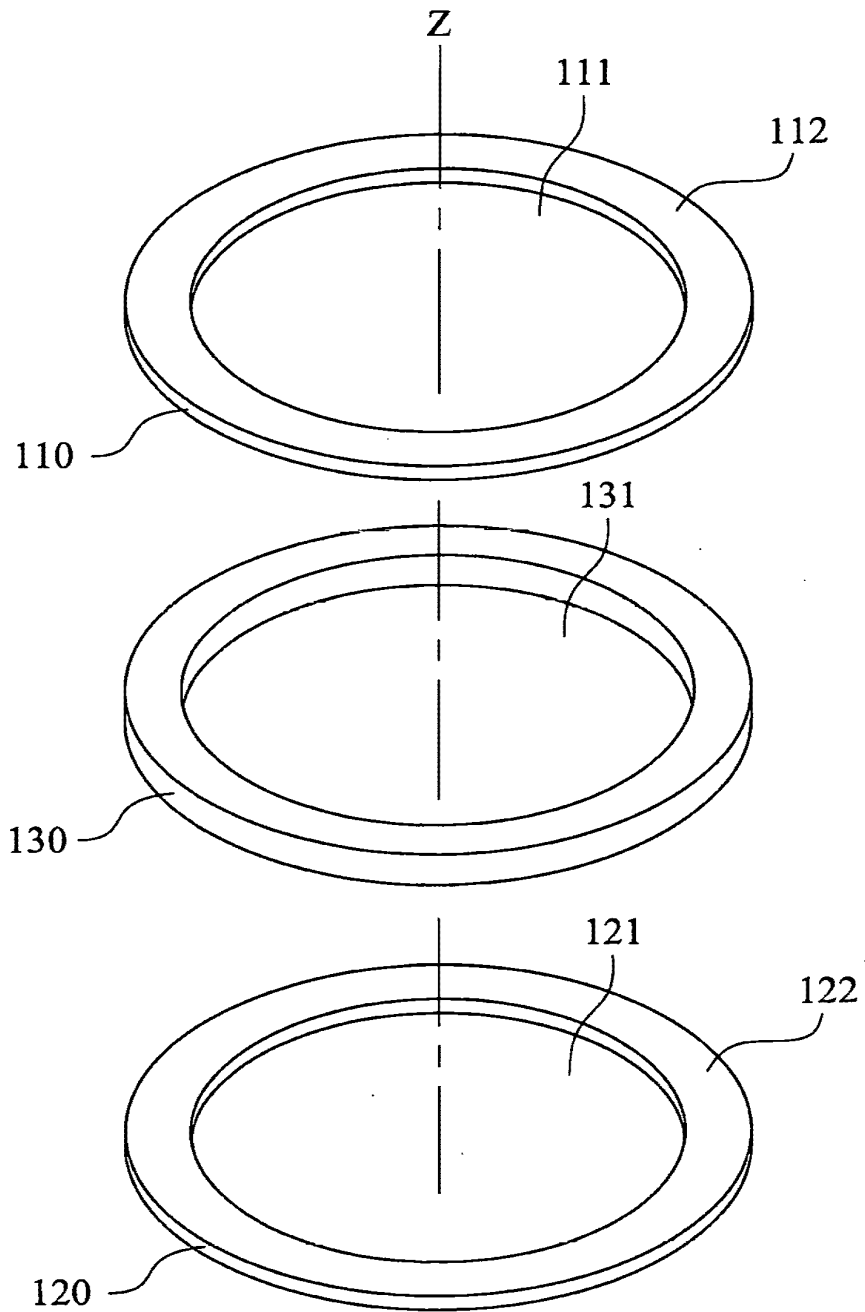
第 1B 圖

100

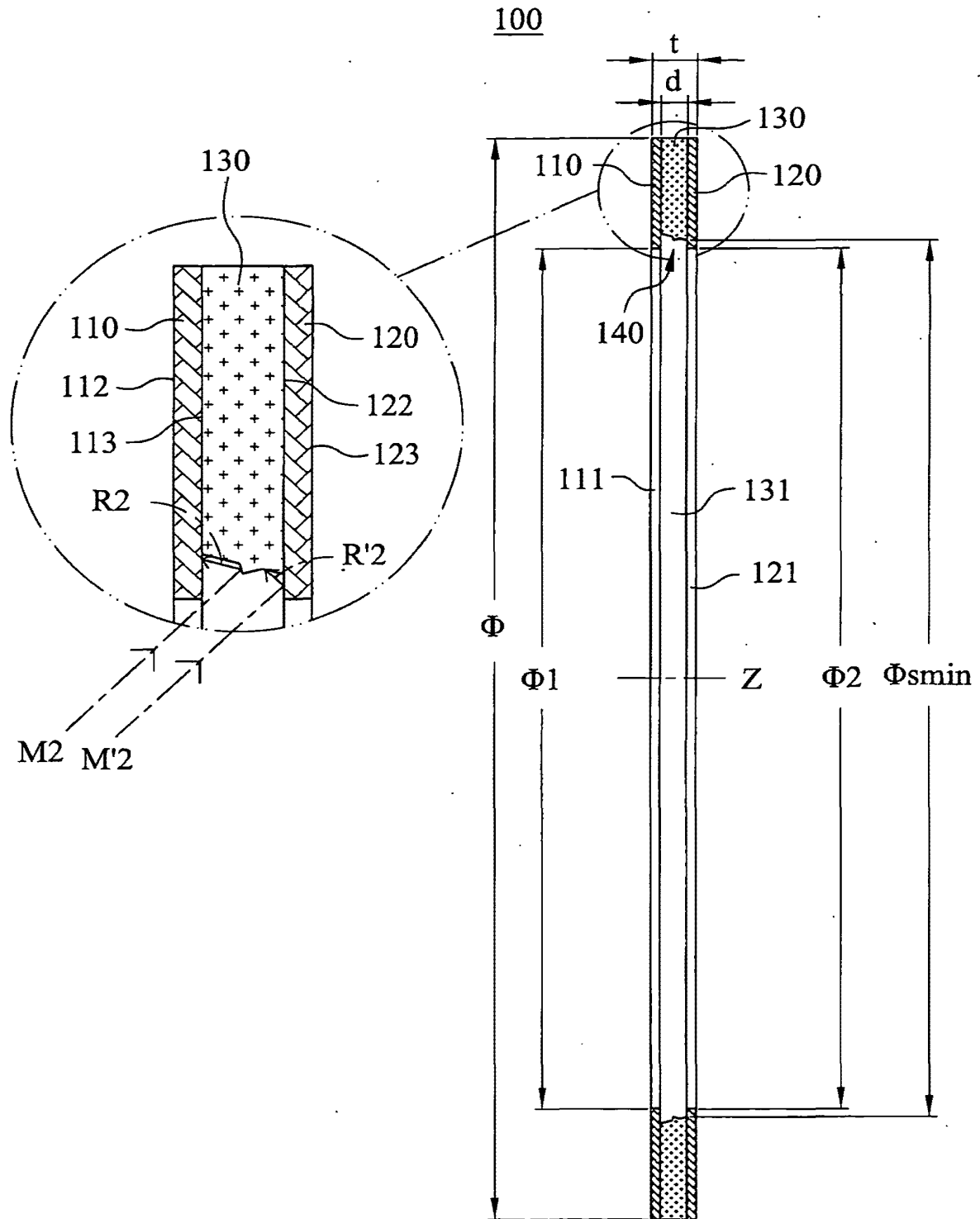


第 2A 圖

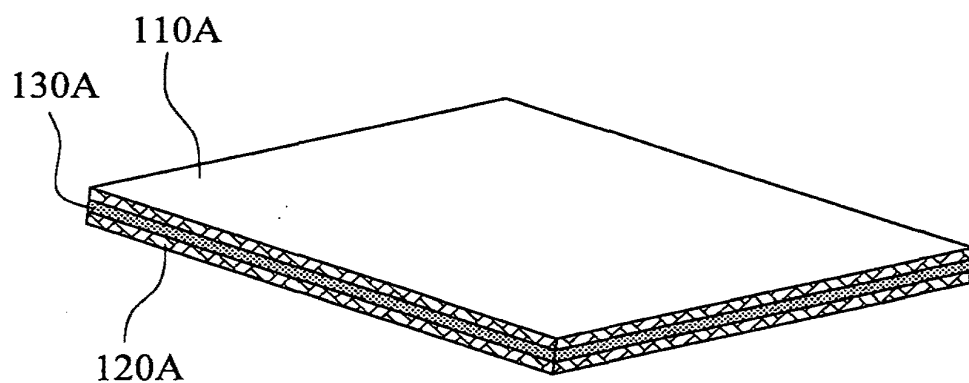
100



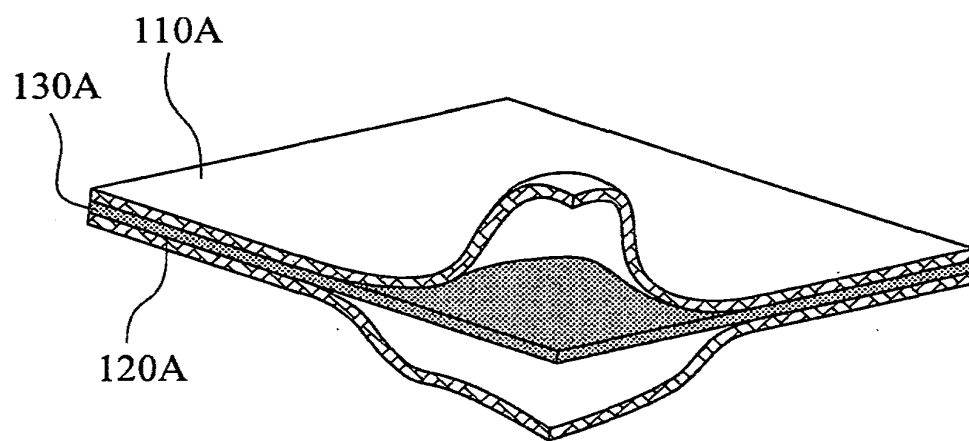
第 2B 圖



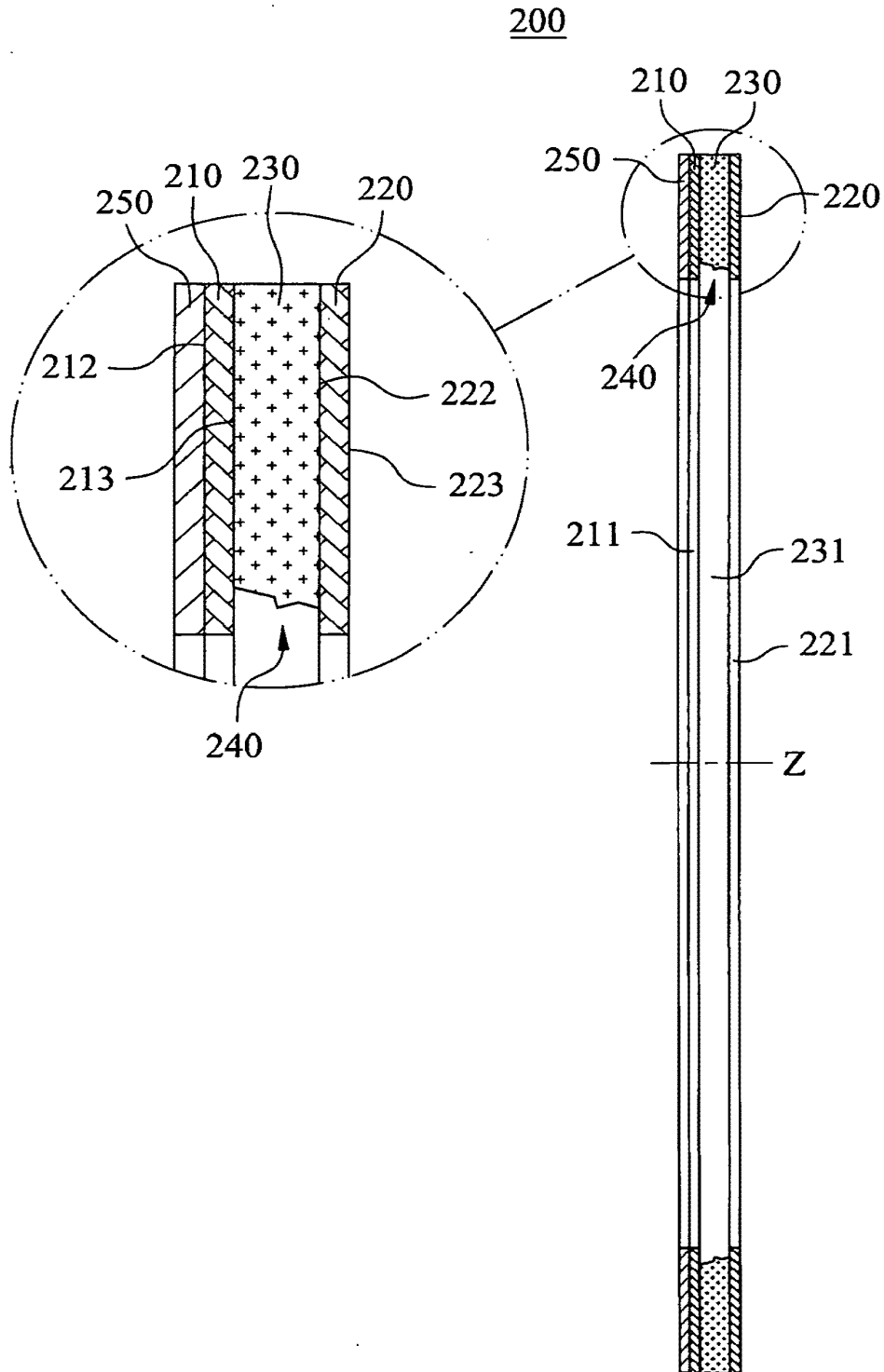
第 2C 圖



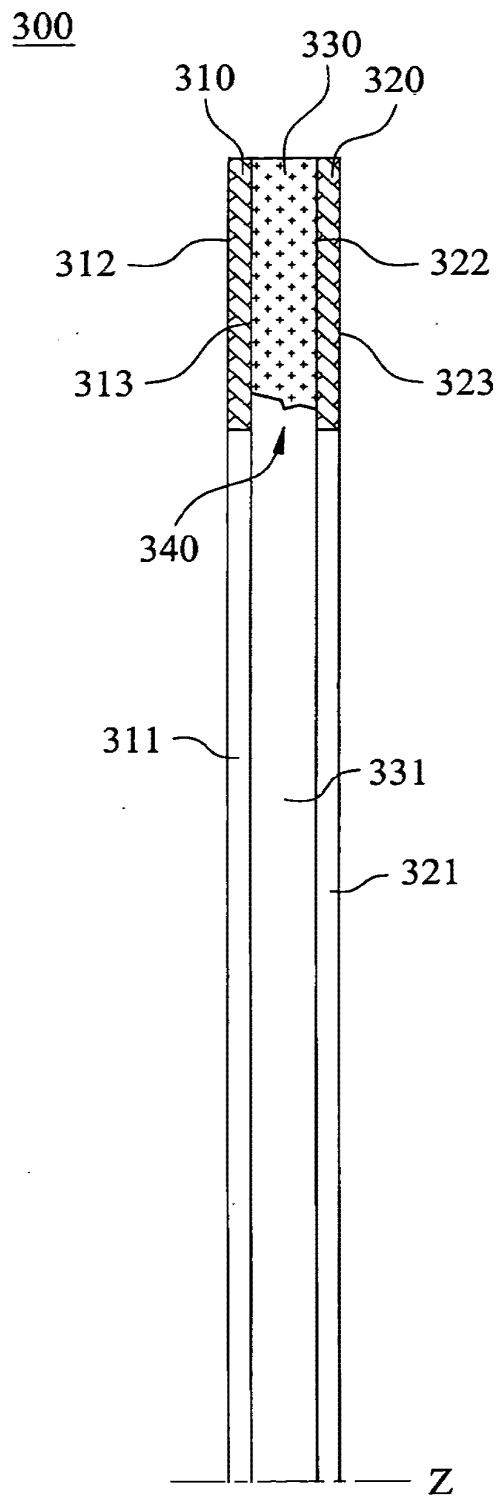
第 2D 圖



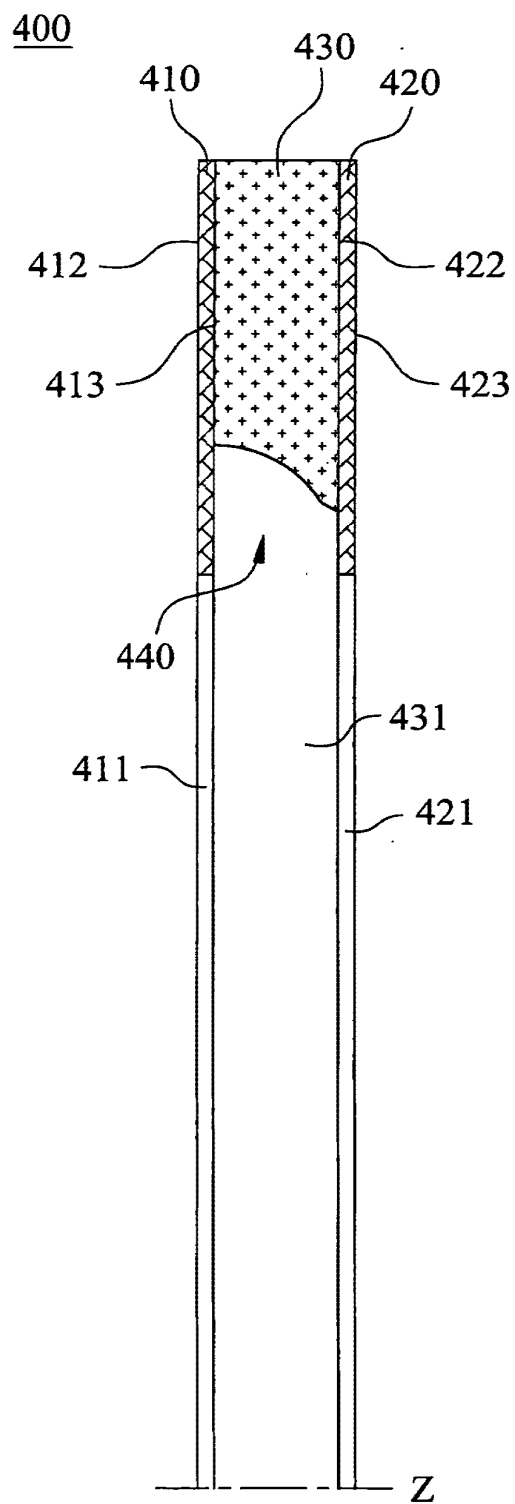
第 2E 圖



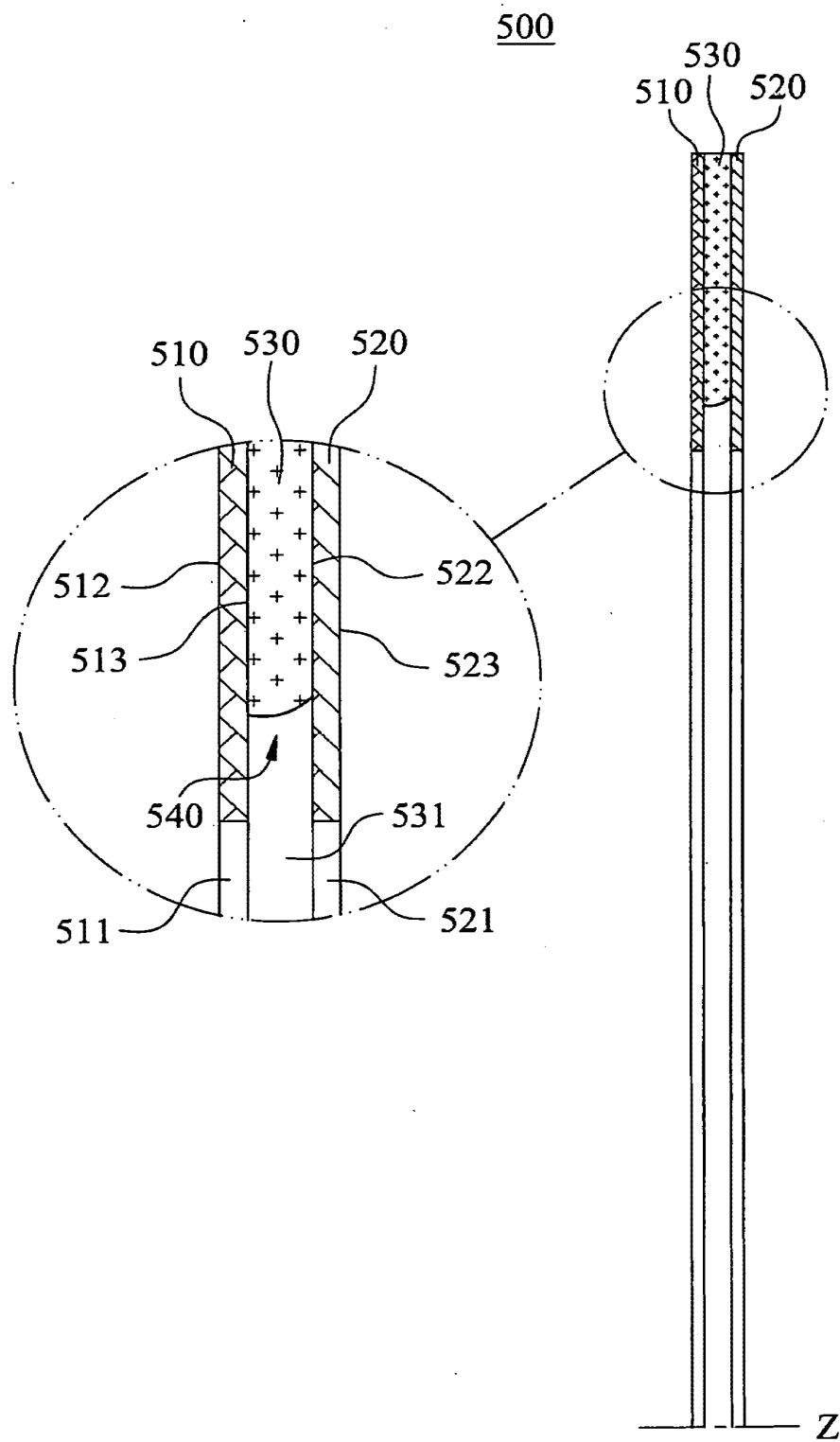
第 3 圖



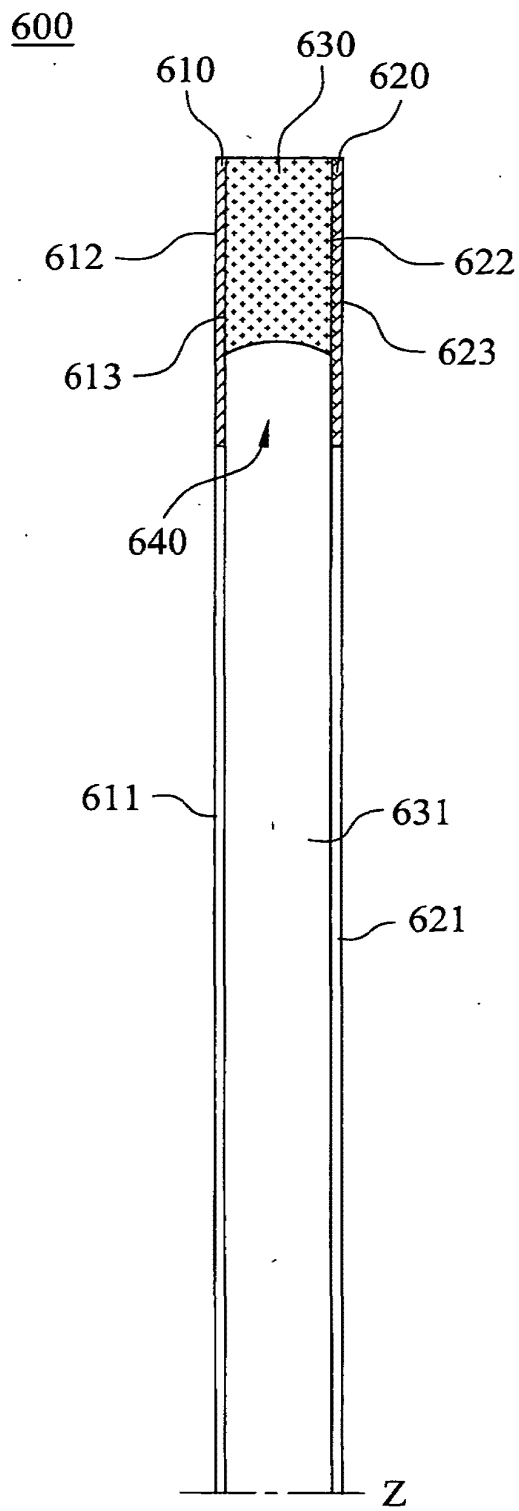
第 4 圖



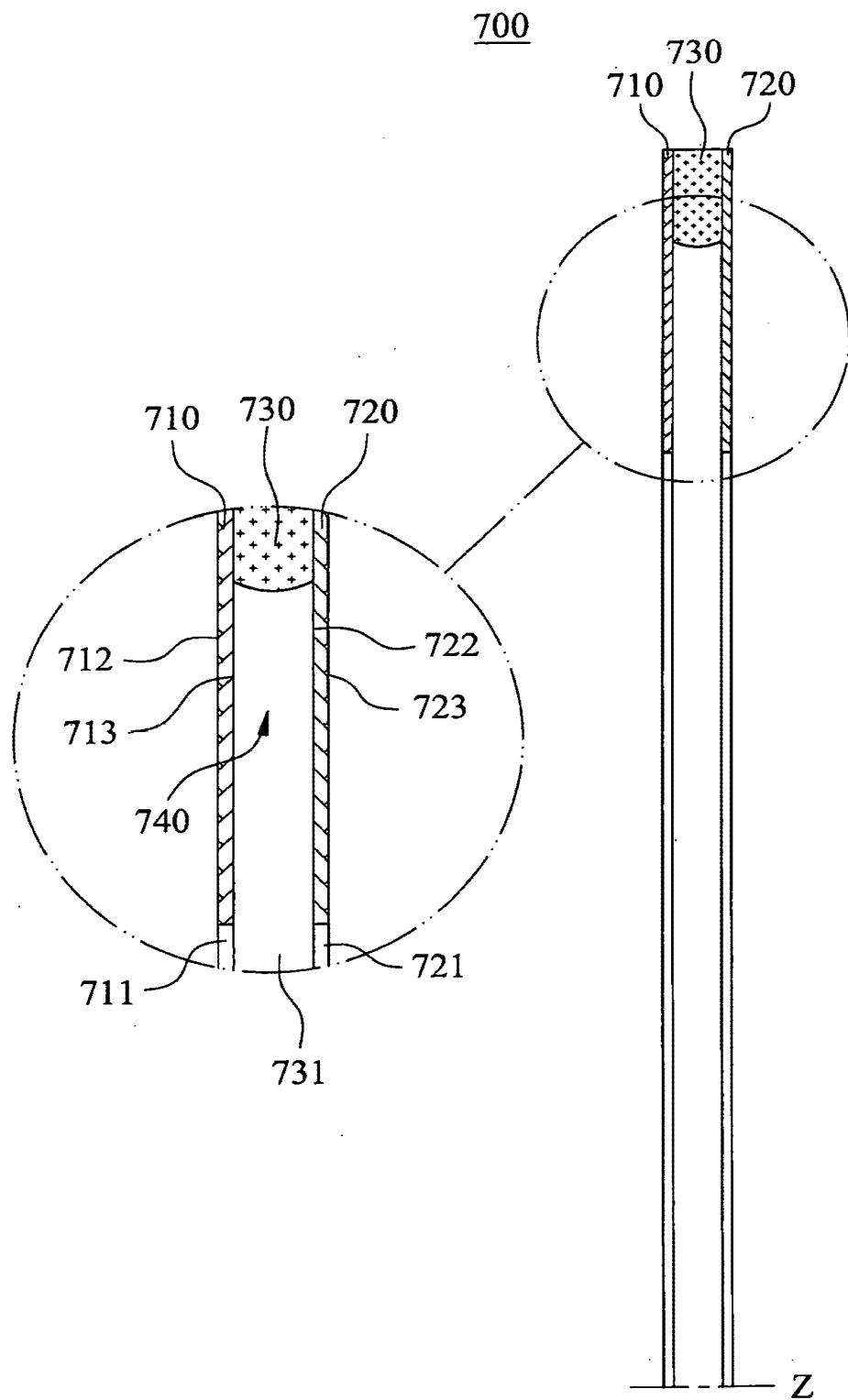
第 5 圖



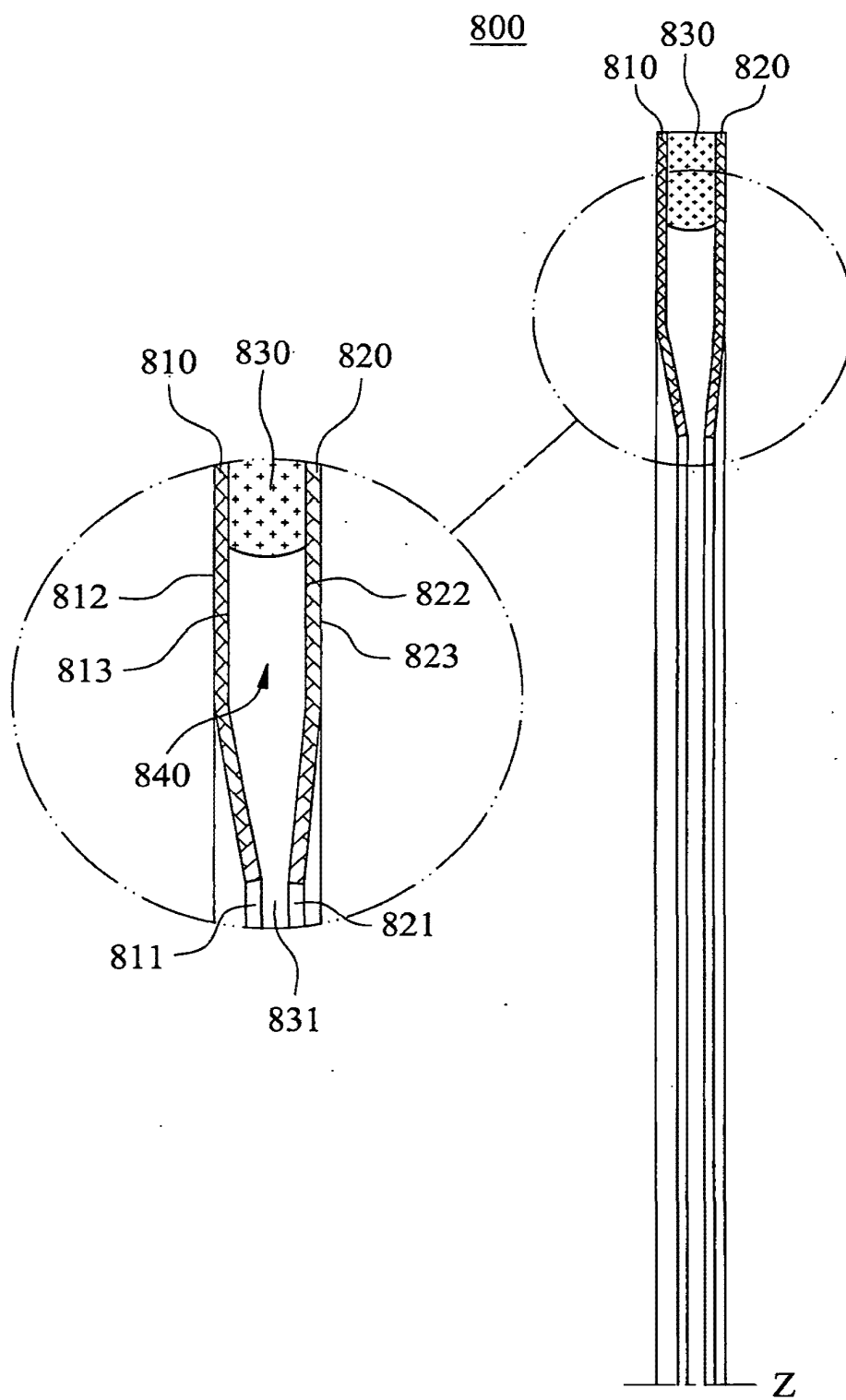
第 6 圖



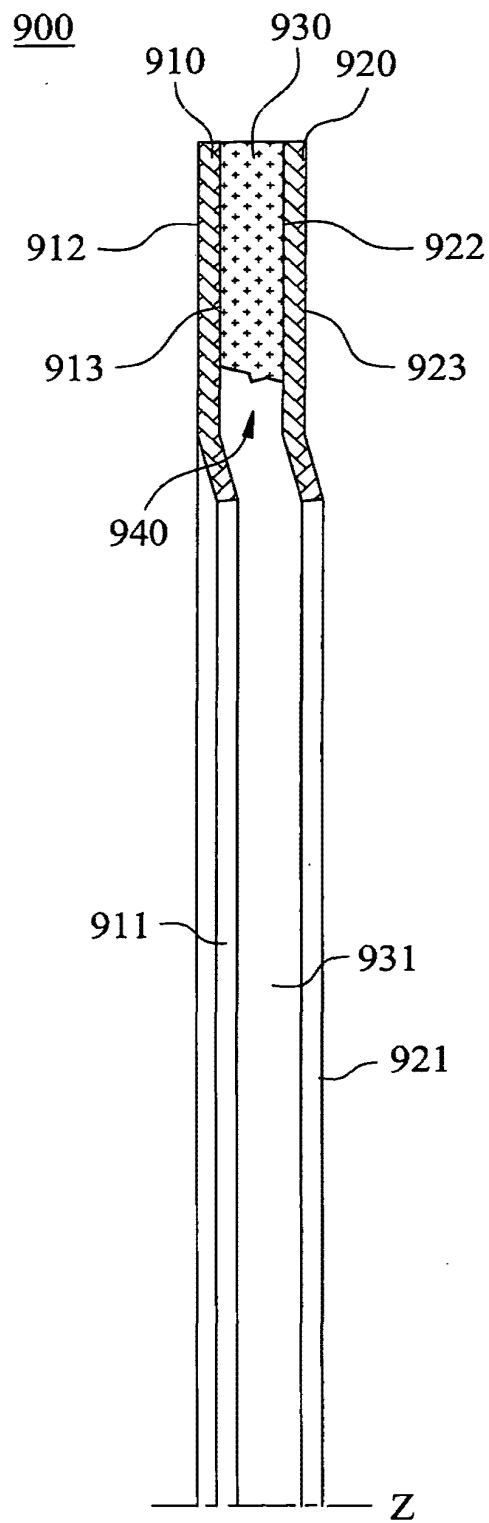
第 7 圖



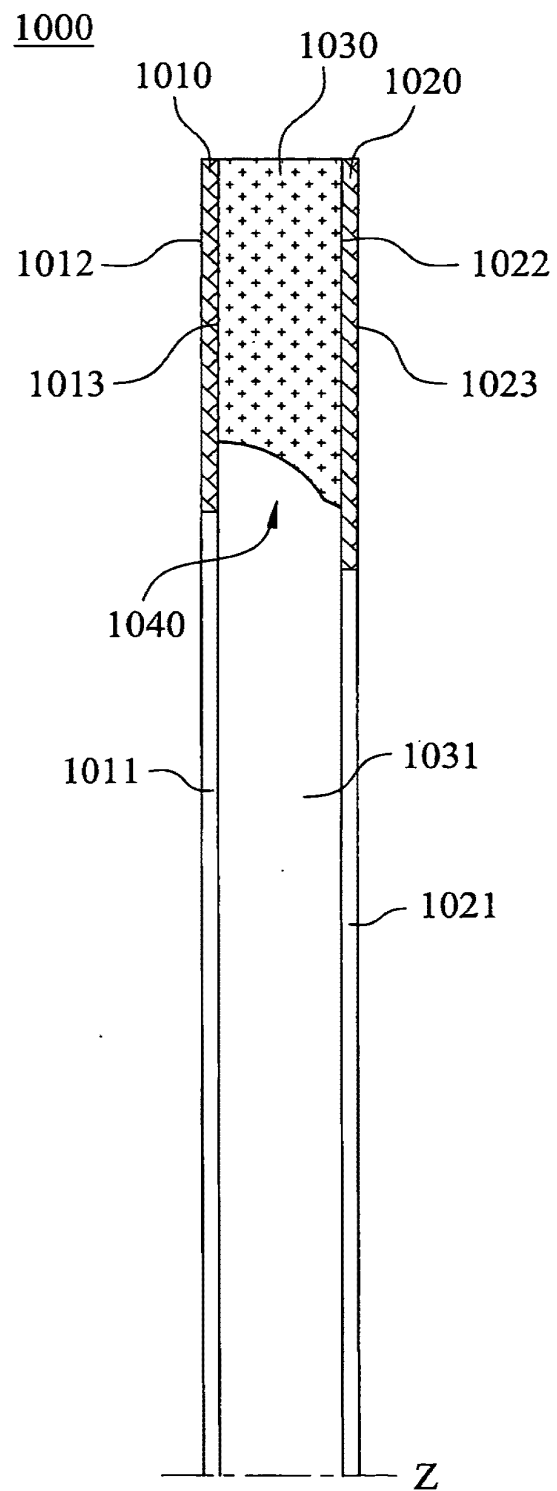
第 8 圖



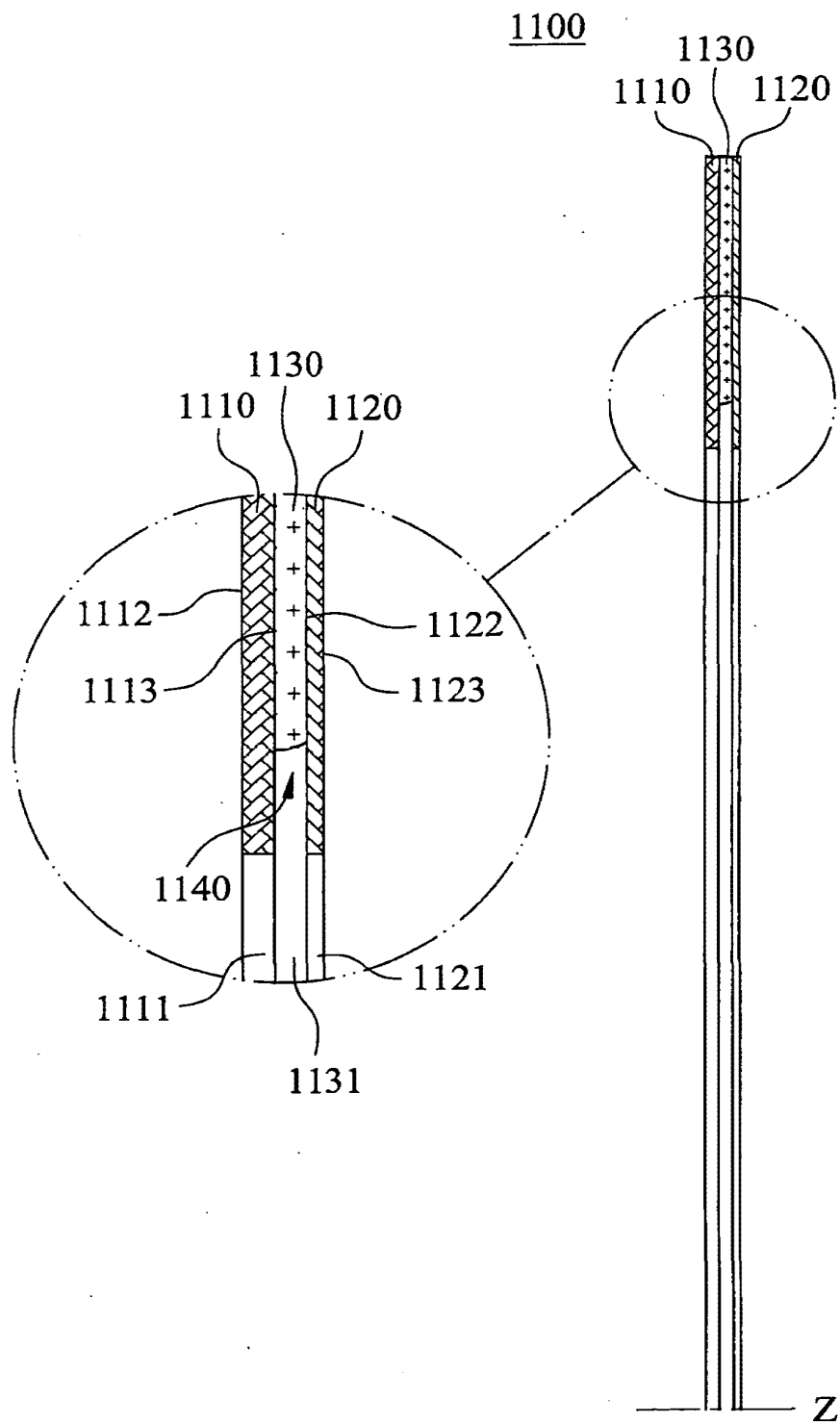
第 9 圖



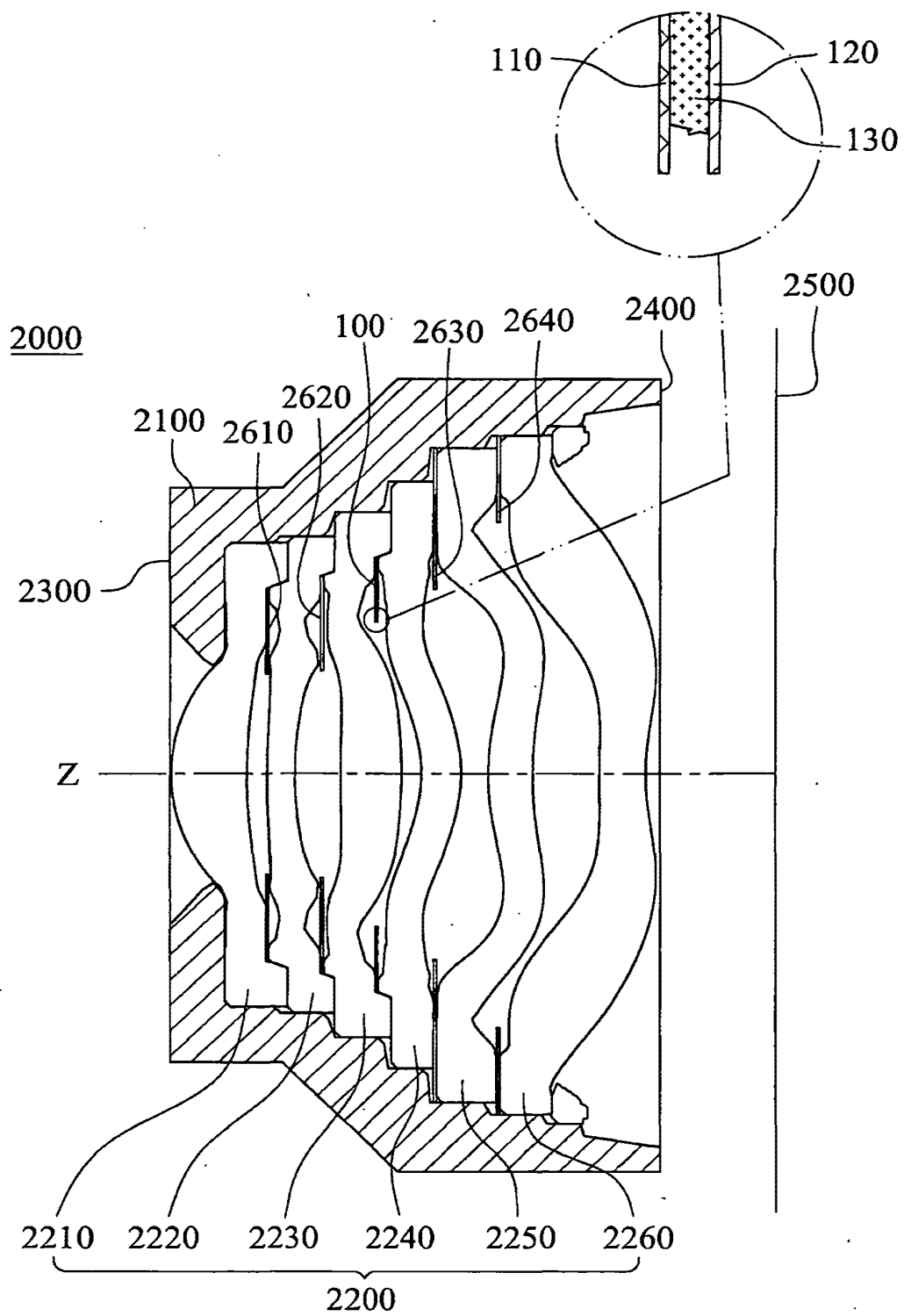
第 10 圖



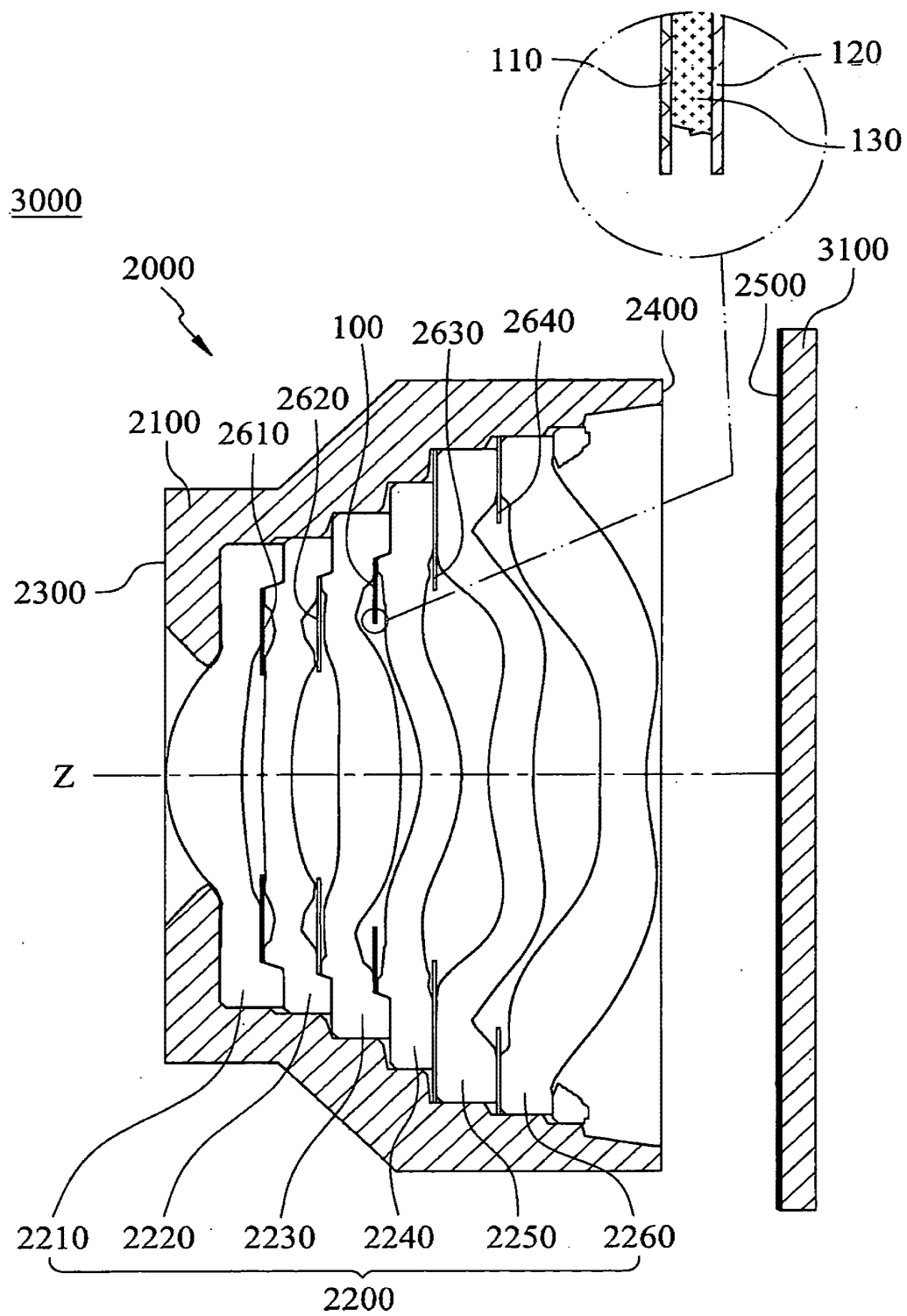
第 11 圖



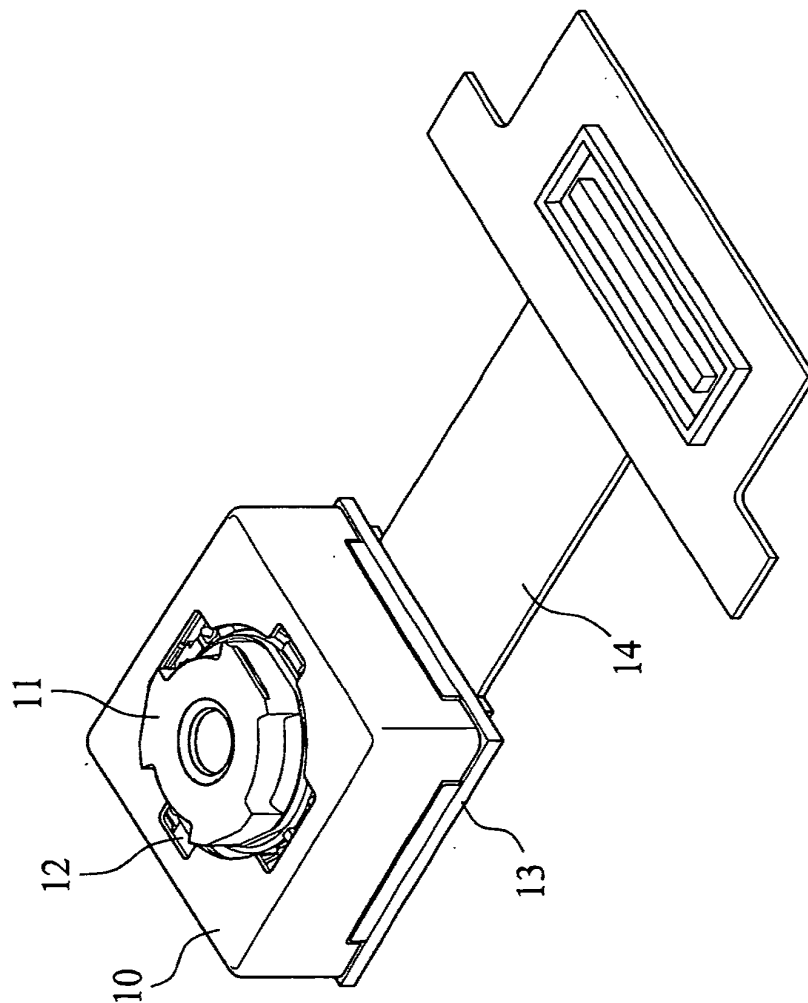
第 12 圖



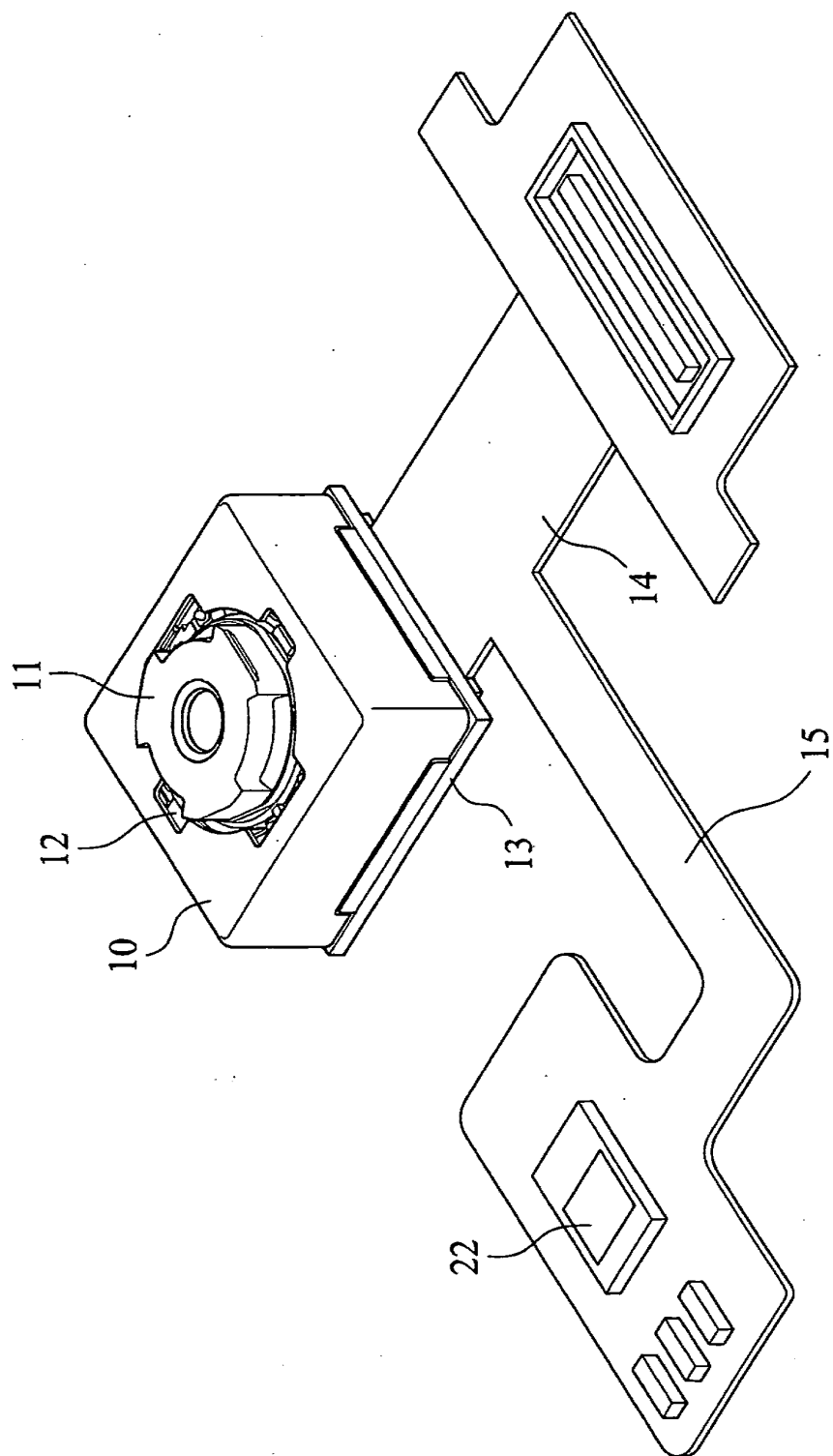
第 13 圖



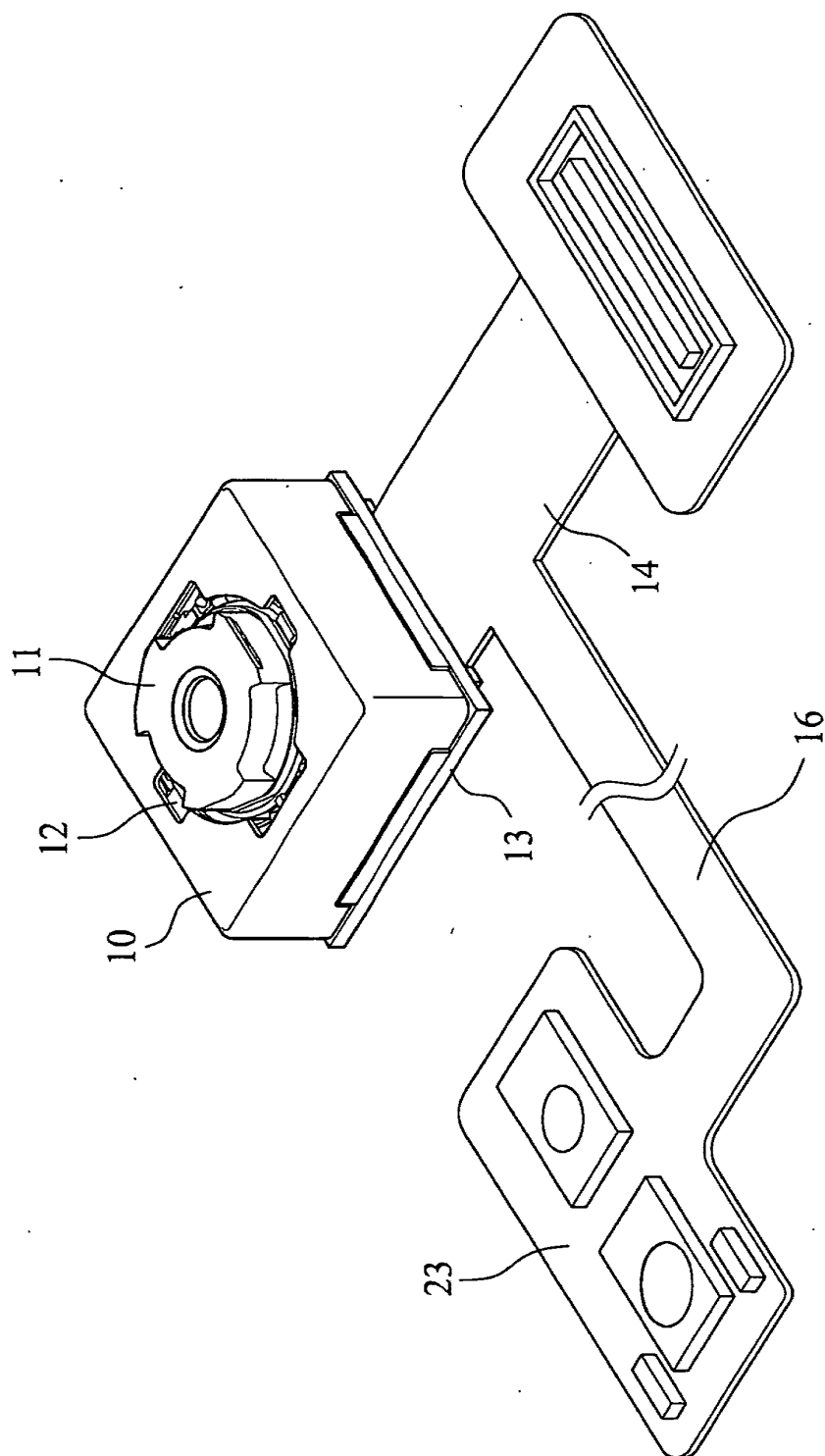
第 14 圖



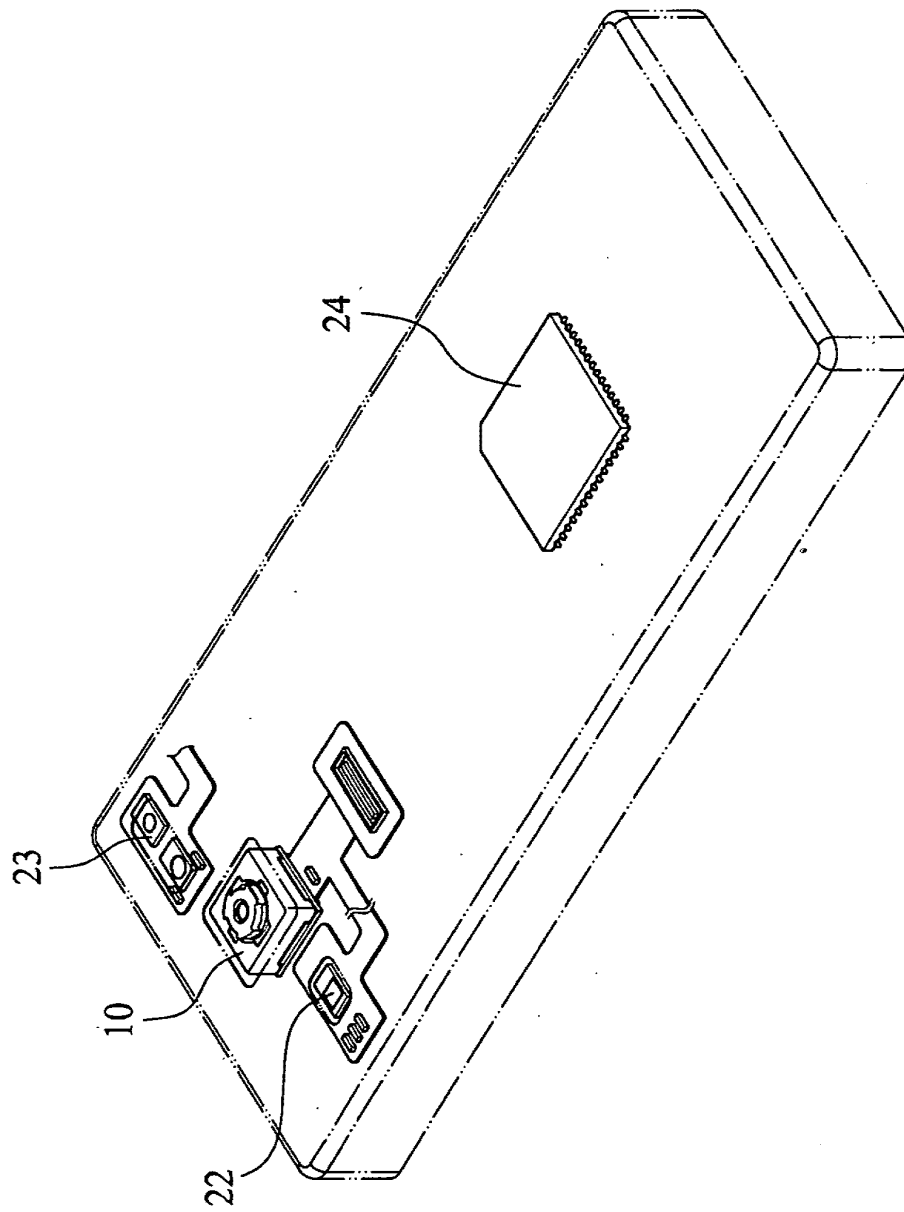
第 15A 圖



第 15B 圖

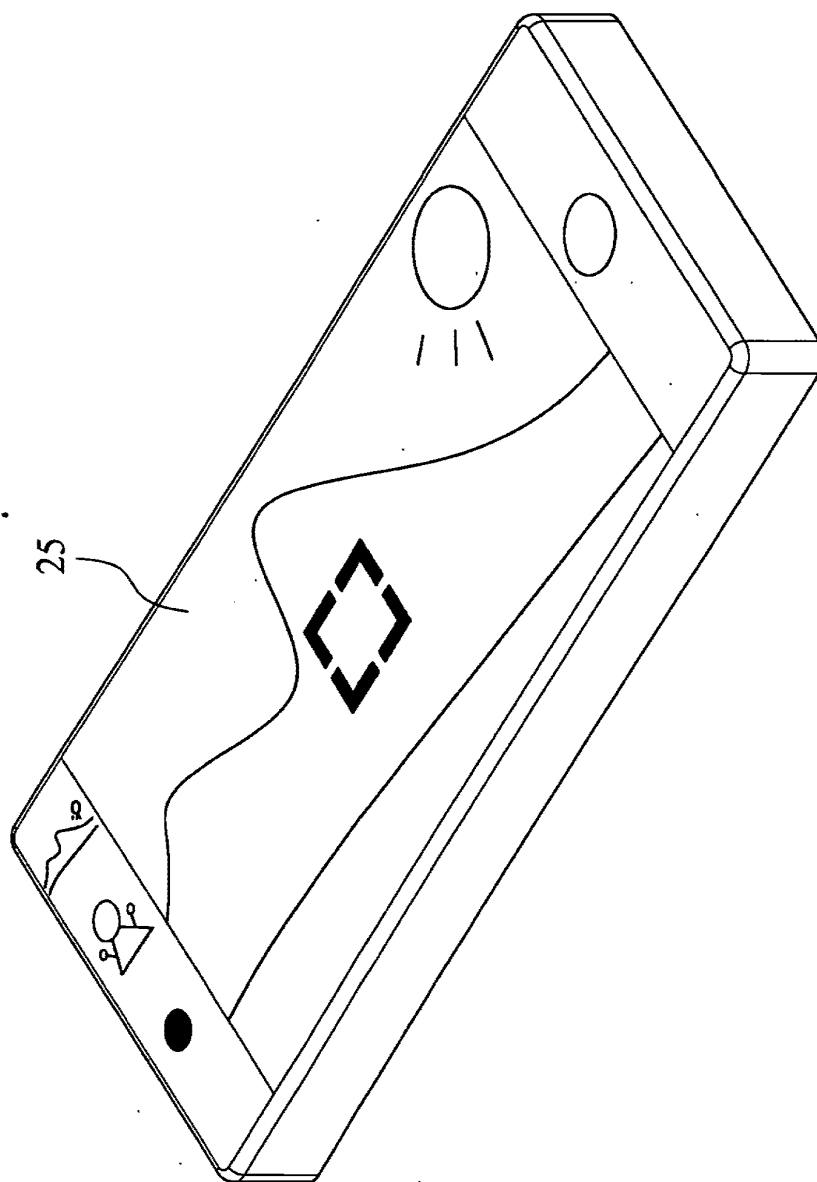


第15C圖

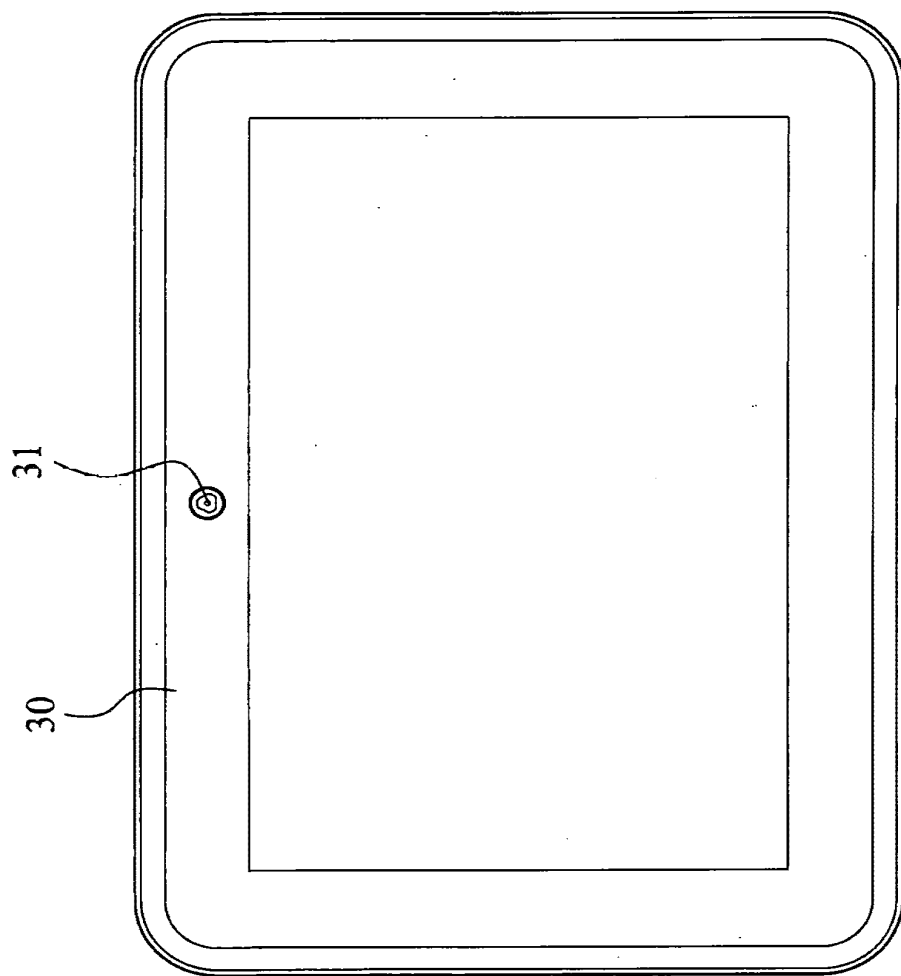


第 16A 圖

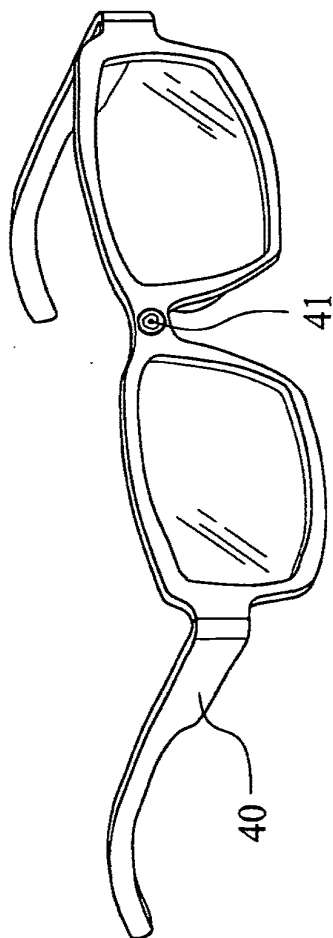
20



第 16B 圖



第17圖



第 18 圖

DFU

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:

Hsu et al.

Serial No.: 15/434,163

Filed: February 16, 2017



Confirmation No. 7080

Group Art Unit: TBA

Examiner: TBA

Docket No. 251236-1700

For: **Light Blocking Sheet, Imaging Lens
Module and Electronic Apparatus**

CLAIM OF PRIORITY TO AND
SUBMISSION OF CERTIFIED COPY OF REPUBLIC OF CHINA (TAIWAN)
APPLICATION PURSUANT TO 35 U.S.C. §119

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

In regard to the above-identified pending patent application and in accordance with 35 U.S.C. §119, Applicants hereby claim priority to and the benefit of the filing date of Republic of China (Taiwan) patent application entitled, "Light Blocking Sheet, Imaging Lens Module and Electronic Apparatus", filed November 14, 2016, and assigned application number 105137120. Further pursuant to 35 U.S.C. §119, enclosed is a certified copy of the Republic of China (Taiwan) patent application.

Respectfully Submitted,

**McClure, Qualey
& Rodack, LLP**

/Daniel R. McClure/

By:

Daniel R. McClure, Reg. No. 38,962

Customer No. 109673



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This collection of information is required by 37 CFR 1.8. The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1.8 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/434,163	02/16/2017	Chih-Wen HSU	251236-1700	7080
109673	7590	09/21/2017		
McClure, Qualey & Rodack, LLP 3100 Interstate North Circle Suite 150 Atlanta, GA 30339			EXAMINER KIM, SU C	
			ART UNIT	PAPER NUMBER
			2899	
			NOTIFICATION DATE	DELIVERY MODE
			09/21/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

uspatents@mqlaw.com
dan.mcclure@mqlaw.com
gina.silverio@mqlaw.com

Office Action Summary	Application No. 15/434,163	Applicant(s) HSU ET AL.	
	Examiner Su C. Kim	Art Unit 2899	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 2/16/2017.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) ☒ Claim(s) 1-23 is/are pending in the application.
5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-23 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 2/16/2017 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☒ All b) ☐ Some** c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) ☒ Notice of References Cited (PTO-892) | 3) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date <u>2/16/2017</u> . | 4) ☐ Other: ____. |

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-22 are is/are rejected under 35 U.S.C. 103 as being unpatentable over Cho et al. (US 2015/0022896) in view of Kim et al. (US 2016/0349504).

Regarding claim 1, Cho discloses that a light blocking sheet, comprising:

a first outer layer 142 comprising a first opening;

a second outer layer 148 comprising a second opening;

an inner substrate layer 140 disposed between the first outer layer 142 and the second outer layer 144, wherein the inner substrate layer 140 connects the first outer layer 142 to the second outer layer 144, and the inner substrate layer 140 comprises a substrate opening 24 (Fig. 3); and

a central axis coaxial L (Fig. 3) with the first opening, the second opening and the substrate opening;

wherein a minimum diameter of the substrate opening is $\varnothing_{smin}$, a diameter of the first opening is $\varnothing_1$, a diameter of the second opening is $\varnothing_2$, and the following conditions are satisfied (Fig. 3).

Cho fails to teach $\varnothing_{smin} > \varnothing_1$; and $\varnothing_{smin} > \varnothing_2$.

However, Kim suggests that $\varnothing_{smin} > \varnothing_1$; and $\varnothing_{smin} > \varnothing_2$ by forming a concave portion near a center portion of the light blocking sheet (Fig. 4A) by modifying side wall of light blocking sheet.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Cho with $\varnothing_{smin} > \varnothing_1$; and $\varnothing_{smin} > \varnothing_2$ as taught by Kim in order to reduce light reflection by providing side wall shape that are satisfied that $\varnothing_{smin} > \varnothing_1$; and $\varnothing_{smin} > \varnothing_2$ and also, the claim would

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have been obvious because a particular know technique was recognized as part of the ordinary capabilities of one skilled in the art.

Reclaim 2, Cho & Kim disclose that the inner substrate layer is made of a plastic material, and each of the first outer layer and the second outer layer is made of a black carbon-containing material (paragarph 0020, Cho).

Reclaim 3, Cho & Kim fail to specify that the minimum diameter of the substrate opening is $\varnothing_{smin}$, the diameter of the first opening is $\varnothing_1$, the diameter of the second opening is $\varnothing_2$, and the following conditions are satisfied:

$$2.0 \text{ pm} < (\varnothing_{smin} - \varnothing_1)/2 < 200 \text{ pm}; \text{ and}$$

$$2.0 \text{ pm} < (\varnothing_{smin} - \varnothing_2)/2 < 200 \text{ pm}.$$

However, notwithstanding, one of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain minimum diameter of the substrate opening related to the diameter of the first opening and second opening, because it would have been to obtain a certain minimum diameter of the substrate opening related to the diameter of the first opening and second opening to enhance semiconductor devices by reducing the light reflection at the side wall of spacers.

Reclaim 4, Cho & Kim fail to specify that the minimum diameter of the substrate opening is $\varnothing_{smin}$, the diameter of the first opening is $\varnothing_1$, the diameter of the second opening is $\varnothing_2$, and the following conditions are satisfied:

$$3.0 \text{ pm} < (\varnothing_{smin} - \varnothing_1)/2 < 85 \text{ pm}; \text{ and}$$

$$3.0 \text{ } \mu\text{m} < (\phi_{\text{min}} - \phi_2)/2 < 85 \text{ } \mu\text{m}.$$

However, notwithstanding, one of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain minimum diameter of the substrate opening related to the diameter of the first opening and second opening, because it would have been to obtain a certain minimum diameter of the substrate opening related to the diameter of the first opening and second opening to enhance semiconductor devices by reducing the light reflection at the side wall of spacers.

Reclaim 5, Cho & Kim disclose that an air layer located between the first outer layer and the second outer layer, wherein the air layer is close to the first opening and the second opening 20a (Kim, Fig. 4A).

Reclaim 6, Cho & Kim fail to specify that a length parallel to the central axis of the air layer is d , and the following condition is satisfied:

$$5 \text{ } \mu\text{m} < d < 49 \text{ } \mu\text{m}.$$

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain length parallel to the central axis of the air layer, because it would have been to obtain a certain length parallel to the central axis of the air layer to enhance semiconductor devices by reducing the light reflection at the side wall of spacers.

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Reclaim 8, Cho & Kim fail to specify that a length parallel to the central axis of the air layer is d , a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$0.12 < d/t < 0.67.$$

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain length parallel to the central axis of the air layer, because it would have been to obtain a certain length parallel to the central axis of the air layer to enhance semiconductor devices by reducing the light reflection at the side wall of spacers.

Reclaim 9, Cho & Kim fail to specify that the diameter of the first opening is $\varnothing 1$, the diameter of the second opening is $\varnothing 2$, and the following condition is satisfied:

$$0.93 < \varnothing 1 / \varnothing 2 < 1.07.$$

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain diameter of the first opening and diameter of the second opening, because it would have been to obtain a certain diameter of the first opening and diameter of the second opening to enhance semiconductor devices by reducing the light reflection at the side wall of spacers.

Reclaim 10, Cho & Kim fail to specify that a maximum outer diameter of the light blocking sheet is $\varnothing$, a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$1 < 1000t/\varnothing < 50.$$

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain ratio of maximum outer diameter of the light blocking sheet and thickness of the light blocking sheet, because it would have been to a certain ratio of maximum outer diameter of the light blocking sheet and thickness of the light blocking sheet to enhance semiconductor devices by reducing the light reflection at the side wall of spacers.

Regarding claim 11, Cho & Kim disclose that an imaging lens module, comprising:

- a barrel 10 (Fig. 1);

- an optical lens 12a & b (Fig. 1) assembly disposed in the barrel 10; and

- the light blocking sheet of claim 1 disposed in the barrel (Fig. 6 in view of Kim).

Reclaim 12, Cho & Kim disclose that the first outer layer of the light blocking sheet further comprises a first surface corresponding to an object-side surface of the imaging lens module, the second outer layer of the light blocking sheet further comprises a second surface corresponding to an image-side surface of the imaging lens module, and at least one of the first surface and the second surface comprises an anti-reflection film coated thereon (Cho, Fig. 6).

Reclaim 13, Cho & Kim disclose that the anti-reflection film comprises a silicon dioxide material layer (paragaph 0020, Cho).

Reclaim 1413, Cho & Kim disclose that only one of the first surface and the second surface comprises the anti-reflection film coated thereon (Fig. 6, Cho).

Regarding claim 15, Cho & Kim disclose that an electronic apparatus, comprising:

the imaging lens module of claim 11; and
an image sensor disposed on an image surface of the imaging lens module (Fig. 1).

Regarding claim 16, Cho & Kim disclose that a light blocking sheet, comprising:
a first outer layer comprising a first opening;
a second outer layer comprising a second opening;
an inner substrate layer disposed between the first outer layer and the second outer layer, wherein the inner substrate layer connects the first outer layer to the second outer layer, and the inner substrate layer comprises a substrate opening;
an air layer located between the first outer layer and the second outer layer, wherein the air layer is close to the first opening and the second opening; and
a central axis coaxial with the first opening, the second opening and the substrate opening;
wherein a length parallel to the central axis of the air layer is d , and the following condition is satisfied (Cho in view of Kim).

Cho & Kim fail to specify that $5\text{ }\mu\text{m} < d < 50\text{ }\mu\text{m}$.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain length parallel to the central axis of the air layer, because it would have been to obtain a certain length parallel to the central axis of the air layer to

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enhance semiconductor devices by reducing the light reflection at the side wall of spacers.

Reclaim 17, Cho & Kim disclose that the inner substrate layer is made of a plastic material, and each of the first outer layer and the second outer layer is made of a black carbon-containing material (Cho, paragraph 0020).

Reclaim 18, Cho & Kim disclose that a thickness of each of the inner substrate layer, the first outer layer and the second outer layer is uniform (Fig. 4A, Kim).

Reclaim 19, Cho & Kim fail to specify that a minimum diameter of the substrate opening is ϕ_{smin} , a diameter of the first opening is ϕ_1 , a diameter of the second opening is ϕ_2 , and the following conditions are satisfied:

$$3.0 \text{ } \mu\text{m} < (\phi_{smin}-\phi_1)/2 < 85 \text{ } \mu\text{m}; \text{ and } 3.0 \text{ } \mu\text{m} < (\phi_{smin}-\phi_2)/2 < 85 \text{ } \mu\text{m}.$$

However, notwithstanding, one of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain minimum diameter of the substrate opening related to the diameter of the first opening and second opening, because it would have been to obtain a certain minimum diameter of the substrate opening related to the diameter of the first opening and second opening to enhance semiconductor devices by reducing the light reflection at the side wall of spacers.

Reclaim 20, Cho & Kim fail to specify that the length parallel to the central axis of the air layer is d , a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$0.12 < d/t < 0.67.$$

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use a certain length parallel to the central axis of the air layer, because it would have been to obtain a certain length parallel to the central axis of the air layer to enhance semiconductor devices by reducing the light reflection at the side wall of spacers.

Regarding claim 21, Cho & Kim disclose that an imaging lens module, comprising: a barrel 10;

an optical lens 12a-b assembly disposed in the barrel; and

the light blocking sheet of claim 16 disposed in the barrel.

Reclaim 22, Cho & Kim disclose that the first outer layer of the light blocking sheet further comprises a first surface corresponding to an object-side surface of the imaging lens module, the second outer layer of the light blocking sheet further comprises a second surface corresponding to an image-side surface of the imaging lens module, and at least one of the first surface and the second surface comprises an anti-reflection film coated thereon (Cho, paragraph 0020).

Reclaim 23, Cho & Kim disclose that an electronic apparatus, comprising: the imaging lens module of claim 21, and an image sensor disposed on an image surface of the imaging lens module (Cho's Fig. 1).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Su C. Kim whose telephone number is (571)272-5972. The examiner can normally be reached on Monday - Friday, 8:00AM to 4:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dale Page can be reached on (571) 270-7877. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Su C. Kim
Primary Examiner
Art Unit 2899

/Su C. Kim/

Application/Control Number: 15/434,163

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Art Unit: 2899

Primary Examiner, Art Unit 2899

Notice of References Cited	Application/Control No. 15/434,163		Applicant(s)/Patent Under Reexamination HSU ET AL.	
	Examiner Su C. Kim		Art Unit 2899	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2015/0022896 A1	01-2015	Cho; Hung-Chang	G02B13/0035	359/601
*	B	US-2016/0349504 A1	12-2016	KIM; Duck Hun	G02B27/0018	1/1
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	27783	(H01L31/16 or H01L33/44 or H01L33/58).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/13 08:22
S7	158	S6 and S5	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 10:27
S6	27783	(H01L31/16 or H01L33/44 or H01L33/58).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/13 10:27
S5	27504	(LENS) with (spacer light near2 block\$3 light near2 shield\$3)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 10:27
S10	101	(LENS) with (spacer light near2 block\$3 light near2 shield\$3) with (carbon)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 10:36
S20	10	S6 AND S19	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 11:29
S19	1505	(LENS) with (spacer block\$3 shield\$3) with (curv\$3 indent\$3)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 11:29
S21	2903	(SECOND NEAR2 LENS) with (spacer light near2 block\$3 light near2 shield\$3)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 11:30
L2	29	(SECOND NEAR2 LENS) with (spacer light near2 block\$3 light near2 shield\$3) same (side) with (curv\$3 bend\$3)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 12:42
L3	103	(SECOND NEAR2 LENS) with (spacer light near2 block\$3 light near2 shield\$3) same (side) with (curv\$3 bend\$3 convex concav\$3)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 12:43
L6	405	(LENS) with (spacer ring light near2 block\$3 light near2 shield\$3) with (curv\$3 bend\$3 convex concav\$3) and (carbon)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 12:54
L5	4367	(LENS) with (spacer ring light near2 block\$3 light near2 shield\$3) with (curv\$3 bend\$3 convex concav\$3)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 12:54
L10	874	9 not (6 3)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 13:15
L9	1027	(LENS) with (spacer ring light near2 block\$3 light near2 shield\$3) with (side wall vertical) with (curv\$3 bend\$3 convex concav\$3)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 13:15
L14	5353	(G02B27/0018 G02B5/003	US-PGPUB;	OR	OFF	2017/09/13

		G02B7/021 G02B13/0045).cpc.	USPAT; USOCR			14:10
L15	161	14 and (spacer light near2 block\$3 light near2 shield\$3) with (curv\$3 bend\$3 curvature)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 14:11
L16	161	14 and (spacer light near2 block\$3 light near2 shield\$3 damp\$3) with (curv\$3 bend\$3 curvature)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 14:17
L19	161	14 and (spacer light near2 block\$3 light near2 shield\$3 damp\$3) with (curv\$3 bend\$3 curvature)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 14:18
L18	4	14 and 17	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 14:18
L17	2179	(LEN optic microlens) and (spacer light near2 block\$3 light near2 shield\$3 damp\$3) with (curv\$3 bend\$3 curvature)	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/13 14:18
L25	1563	("Largan precision").as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/13 16:45
L26	11	25 and (spacer) and (LENS) and (barrel)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/13 16:46
L28	6	("Largan precision").as. and ((lens) and (barrel) and (spac\$3)).clm.	US-PGPUB; USPAT	OR	OFF	2017/09/13 16:49
L31	1	29 and ((lens) and (barrel) and (spac\$3)).clm.	US-PGPUB; USPAT	OR	OFF	2017/09/13 16:50
L30	6	28 and ((lens) and (barrel) and (spac\$3)).clm.	US-PGPUB; USPAT	OR	OFF	2017/09/13 16:50
L29	313	(Chih-wen near2 HSU).in. (chih-wen near2 Cheng).in. (Ming-ta near2 Chou).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/09/13 16:50

EAST Search History (Interference)

< This search history is empty>

9/ 13/ 2017 4:53:40 PM
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Doc code: IDS

PTO/SB/08a (03-15)

Doc description: Information Disclosure Statement (IDS) Filed

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Application Number		
Filing Date		2017-02-16
First Named Inventor	Hsu, et al.	
Art Unit		
Examiner Name	/SU C KIM/	
Attorney Docket Number	251236-1700	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number		
Filing Date		2017-02-16
First Named Inventor	Hsu, et al.	
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Attorney Docket Number	251236-1700	

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number			
Filing Date		2017-02-16	
First Named Inventor	Hsu, et al.		
Art Unit			
Examiner Name			
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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Daniel R. McClure/	Date (YYYY-MM-DD)	2017-02-15
Name/Print	Daniel R. McClure	Registration Number	38,962

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Search Notes 	Application/Control No. 15434163	Applicant(s)/Patent Under Reexamination HSU ET AL.
	Examiner SU C KIM	Art Unit 2899

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
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US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

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SEARCH NOTES		
Search Notes	Date	Examiner
(H01L31/16 or H01L33/44 or H01L33/58).cpc. with text search	9/13/2017	
East Text search	9/13/2017	SK
(G02B27/0018 G02B5/003 G02B7/021 G02B13/0045).cpc. with Text search	9/13/2017	SK
Inventors and assignee search	9/13/2017	SK
	9/13/2017	SK

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/SU C KIM/ Primary Examiner.Art Unit 2899
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:
Hsu, et al.

Confirmation No. 7080

Serial Number: 15/434,163

Examiner: Kim, Su C.

Filed: February 16, 2017

Group Art Unit: 2899

Title: Light Blocking Sheet, Imaging Lens
Module and Electronic Apparatus

MQR Ref. 251236-1700

TLC Ref.: CP-3556-US

AMENDMENT AND RESPONSE TO NON-FINAL OFFICE ACTION

Mail Stop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Director:

The Office Action mailed September 21, 2017 has been carefully considered. In response,
Applicant submits the following amendments and remarks.

In the Specification

The paragraph beginning on page 2, line 17 is amended as follows:

A structure of the conventional light blocking sheet can refer to Fig. 1A and Fig. 1B. Fig. 1A is a front schematic view of a conventional light blocking sheet 1. Fig. 1B is a partially cross-sectional view taken along line 1b-1b of the light blocking sheet 1 in Fig. 1A. As shown in Fig. 1A and Fig. 1B, the light blocking sheet 1 is annular and has a three-layer structure. The three layers are an outer layer L1, a substrate layer L3 and an outer layer L2, respectively. Each of the outer layer L1, the substrate layer L3 and the outer layer L2 has a circular inner hole (the reference numerals are omitted). A diameter of the circular inner hole of the outer layer L1, a diameter of the circular inner hole of the substrate layer L3 and a diameter of the circular inner hole of the outer layer L2 are identical. In other words, a surface facing the circular inner hole of the outer layer L1, a surface facing the circular inner hole of the substrate layer L3 and a surface facing the circular inner hole of the outer layer L2 are aligned with one another (the surfaces are called inner surfaces hereinafter, and the reference numerals of the inner surfaces are omitted). When an incident light M1 and an incident light M'1 strike one of the inner surfaces, a reflected light R1 and a reflected light R'1 are generated. When the light blocking sheet 1 is applied to an imaging lens module, the reflected light R1 and the reflected light R'1 will enter into the imaging lens module and interfere with the image. As a result, the conventional light blocking sheet 1 cannot eliminate stray lights effectively.

In the Claims

This listing of claims will replace all prior versions, and listings, of claims.

Listing of Claims

1. (Currently Amended) A light blocking sheet, comprising:

a first outer layer comprising a first opening;

a second outer layer comprising a second opening;

an inner substrate layer disposed between the first outer layer and the second outer layer, wherein the inner substrate layer connects the first outer layer to the second outer layer, and the inner substrate layer comprises a substrate opening; and

a central axis coaxial with the first opening, the second opening and the substrate opening;

wherein a minimum diameter of the substrate opening is Φ_{min} , a diameter of the first opening is Φ_1 , a diameter of the second opening is Φ_2 , and the following conditions are satisfied:

$$\Phi_{\text{min}} > \Phi_1 \underline{2.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi_1)/2 < 200 \mu\text{m}}; \text{ and}$$

$$\Phi_{\text{min}} > \Phi_2 \underline{2.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi_2)/2 < 200 \mu\text{m}}.$$

2. (Original) The light blocking sheet of claim 1, wherein the inner substrate layer is made of a plastic material, and each of the first outer layer and the second outer layer is made of a black carbon-containing material.

3. (Canceled)

4. (Original) The light blocking sheet of claim 1, wherein the minimum diameter of the substrate opening is Φ_{smin} , the diameter of the first opening is Φ_1 , the diameter of the second opening is Φ_2 , and the following conditions are satisfied:

$$3.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi_1)/2 < 85 \mu\text{m}; \text{ and}$$

$$3.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi_2)/2 < 85 \mu\text{m}.$$

5. (Original) The light blocking sheet of claim 1, further comprising:

an air layer located between the first outer layer and the second outer layer, wherein the air layer is close to the first opening and the second opening.

6. (Original) The light blocking sheet of claim 5, wherein a length parallel to the central axis of the air layer is d , and the following condition is satisfied:

$$5 \mu\text{m} < d < 49 \mu\text{m}.$$

7. (Original) The light blocking sheet of claim 5, wherein a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$5 \mu\text{m} < t < 49 \mu\text{m}.$$

8. (Original) The light blocking sheet of claim 5, wherein a length parallel to the central axis of the air layer is d , a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$0.12 < d/t < 0.67.$$

9. (Currently Amended) The light blocking sheet of claim [[3]]1, wherein the diameter of the first opening is $\Phi 1$, the diameter of the second opening is $\Phi 2$, and the following condition is satisfied:

$$0.93 < \Phi 1 / \Phi 2 < 1.07.$$

10. (Currently Amended) The light blocking sheet of claim [[3]]1, wherein a maximum outer diameter of the light blocking sheet is Φ , a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$1 < 1000t / \Phi < 50.$$

11. (Original) An imaging lens module, comprising:

a barrel;

an optical lens assembly disposed in the barrel; and

the light blocking sheet of claim 1 disposed in the barrel.

12. (Original) The imaging lens module of claim 11, wherein the first outer layer of the light blocking sheet further comprises a first surface corresponding to an object-side surface of the imaging lens module, the second outer layer of the light blocking sheet further comprises a second surface corresponding to an image-side surface of the imaging lens module, and at least one of the first surface and the second surface comprises an anti-reflection film coated thereon.

13. (Original) The imaging lens module of claim 12, wherein the anti-reflection film comprises a silicon dioxide material layer.

14. (Original) The imaging lens module of claim 12, wherein only one of the first surface and the second surface comprises the anti-reflection film coated thereon.

15. (Original) An electronic apparatus, comprising:
the imaging lens module of claim 11; and
an image sensor disposed on an image surface of the imaging lens module.

16. (Currently Amended) A light blocking sheet, comprising:
a first outer layer comprising a first opening;
a second outer layer comprising a second opening;
an inner substrate layer disposed between the first outer layer and the second outer layer, wherein the inner substrate layer connects the first outer layer to the second outer layer, and the inner substrate layer comprises a substrate opening;

an air layer located between the first outer layer and the second outer layer, wherein the air layer is close to the first opening and the second opening; and

a central axis coaxial with the first opening, the second opening and the substrate opening;

wherein a length parallel to the central axis of the air layer is d , **a minimum diameter of the substrate opening is Φ_{smin} , a diameter of the first opening is Φ_1 , a diameter of the second opening is Φ_2** , and the following ~~condition is~~ **conditions are** satisfied:

$$5 \mu\text{m} < d < 50 \mu\text{m};$$

$$\underline{2.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi_1)/2 < 200 \mu\text{m}; \text{ and}}$$

$$\underline{2.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi_2)/2 < 200 \mu\text{m}.$$

17. (Original) The light blocking sheet of claim 16, wherein the inner substrate layer is made of a plastic material, and each of the first outer layer and the second outer layer is made of a black carbon-containing material.

18. (Original) The light blocking sheet of claim 17, wherein a thickness of each of the inner substrate layer, the first outer layer and the second outer layer is uniform.

19. (Currently Amended) The light blocking sheet of claim 17, wherein [[a]] **the** minimum diameter of the substrate opening is Φ_{smin} , [[a]] **the** diameter of the first opening is Φ_1 , [[a]] **the** diameter of the second opening is Φ_2 , and the following conditions are satisfied:

$$3.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi_1)/2 < 85 \mu\text{m}; \text{ and}$$

$$3.0 \mu\text{m} < (\Phi_{\text{smin}} - \Phi_2)/2 < 85 \mu\text{m}.$$

20. (Original) The light blocking sheet of claim 17, wherein the length parallel to the central axis of the air layer is d , a thickness of the light blocking sheet is t , and the following condition is satisfied:

$$0.12 < d/t < 0.67.$$

21. (Original) An imaging lens module, comprising:
a barrel;
an optical lens assembly disposed in the barrel; and
the light blocking sheet of claim 16 disposed in the barrel.

22. (Original) The imaging lens module of claim 21, wherein the first outer layer of the light blocking sheet further comprises a first surface corresponding to an object-side surface of the imaging lens module, the second outer layer of the light blocking sheet further comprises a second surface corresponding to an image-side surface of the imaging lens module, and at least one of the first surface and the second surface comprises an anti-reflection film coated thereon.

23. (Original) An electronic apparatus, comprising:
the imaging lens module of claim 21, and
an image sensor disposed on an image surface of the imaging lens module.

Remarks

The Examiner is thanked for the thorough examination of the present application. The Office Action, however, tentatively rejected all claims 1-23. In response, Applicant submits the foregoing amendments and the following remarks. Applicant respectfully requests reconsideration of the rejections for at least the following reasons.

Amendments

After entry of the foregoing amendments, claims 1-2 and 4-23 remain pending in this application. By this amendment, claims 1, 9, 10, 16 and 19 are amended, and claim 3 is canceled. Support for the amendments to claims 1 and 16 can be found in lines 11-12, page 11 of the specification. Claims 9, 10, and 19 are amended accordingly. No new matter has been added to the application by these amendments.

Claim Rejections - 35 U.S.C. § 103

The Office Action rejected claims 1-23 under 35 U.S.C. § 103 as allegedly being unpatentable over Cho et al. (US 2015/0022896, hereinafter, Cho) in view of Kim et al. (US 2016/0349504, hereinafter, Kim). Applicant respectfully requests reconsideration of these rejections.

To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. *See, e.g., Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985).

In order to expedite prosecution and without conceding to the Examiner's positions, Applicant submits the foregoing amendments in claims.

"All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

However, Cho and Kim fail to disclose, teach or suggest all the words in the amended claims 1 and 16 of the present application.

As amended, claims 1 and 16 recite:.

1. A light blocking sheet, comprising:
a first outer layer comprising a first opening;
a second outer layer comprising a second opening;
an inner substrate layer disposed between the first outer layer and the second outer layer, wherein the inner substrate layer connects the first outer layer to the second outer layer, and the inner substrate layer comprises a substrate opening; and
a central axis coaxial with the first opening, the second opening and the substrate opening;
wherein a minimum diameter of the substrate opening is Φ_{min} , a diameter of the first opening is $\Phi 1$, a diameter of the second opening is $\Phi 2$, and the following conditions are satisfied:

$12.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi 1)/2 < 200 \mu\text{m}; \text{ and}$
 $22.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi 2)/2 < 200 \mu\text{m}."$

16. A light blocking sheet, comprising:
a first outer layer comprising a first opening;
a second outer layer comprising a second opening;
an inner substrate layer disposed between the first outer layer and the second outer layer, wherein the inner substrate layer connects the first outer layer to the second outer layer, and the inner substrate layer comprises a substrate opening;
an air layer located between the first outer layer and the second outer layer, wherein the air layer is close to the first opening and the second opening; and
a central axis coaxial with the first opening, the second opening and the substrate opening;

wherein a length parallel to the central axis of the air layer is d , **a**
minimum diameter of the substrate opening is Φ_{min} , a diameter of the first opening is $\Phi 1$, a diameter of the second opening is $\Phi 2$, and the following conditions are satisfied:

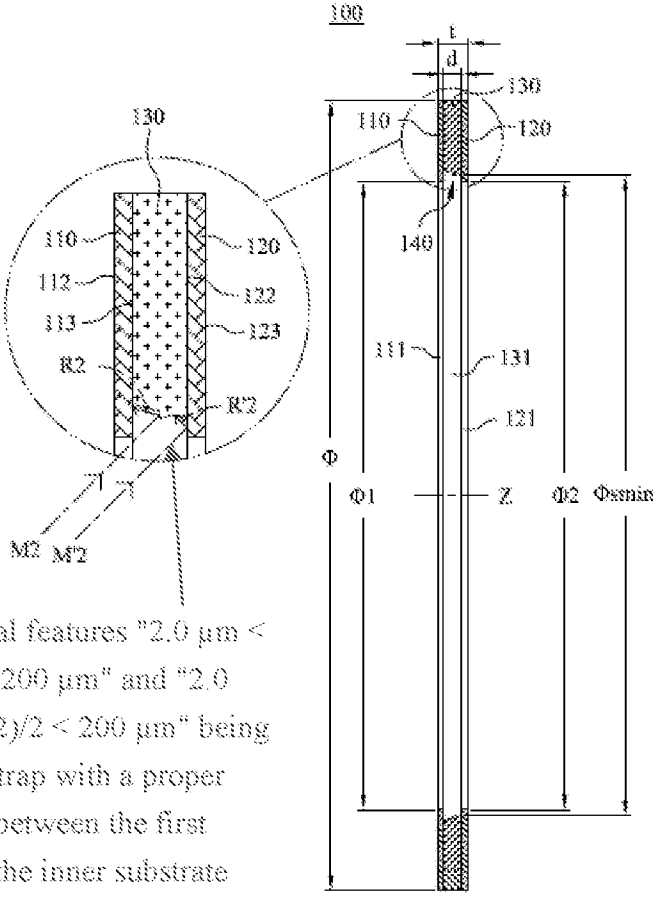
$5 \mu\text{m} < d < 50 \mu\text{m};$

$2.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_1)/2 < 200\ \mu\text{m}; \text{ and}$
 $2.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_2)/2 < 200\ \mu\text{m}."$

(Emphasis added). Claims 1 and 16 patently define over the cited art for at least the reason that the cited art fails to disclose the features emphasized above.

Specifically, both of Cho and Kim fail to teach the technical features " $2.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_1)/2 < 200\ \mu\text{m}$ " and " $2.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_2)/2 < 200\ \mu\text{m}$ " of the amended claims 1 and 16.

Table 1 (below) shows Fig. 2C of the present application, with annotations.

Table 1	
 With the technical features "$2.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_1)/2 < 200\ \mu\text{m}$" and "$2.0\ \mu\text{m} < (\Phi_{\text{smin}} - \Phi_2)/2 < 200\ \mu\text{m}$" being satisfied, a light trap with a proper depth is formed between the first outer layer 110, the inner substrate 130 and the second outer layer 120.	
Fig. 2C	

The light blocking sheet according to the present application was described as follows:

"As shown in Fig. 2C, when an incident light M2 and an incident light M'2 strike a surface of the

inner space (air layer 140), i.e. the surface of the inner substrate layer 130 facing the substrate opening 131, the second surface 113 of the first outer layer 110 or the first surface 122 of the second outer layer 120, **a reflected light R2 and a reflected light R'2 generated thereby tend to reflect again in the inner space (air layer 140).** Accordingly, **the light blocking sheet 100 can effectively attenuate an intensity of the light reflected therefrom.** When the light blocking sheet 100 is applied to an imaging lens module, the stray light can be effectively reduced, and the image quality can be enhanced", which is mentioned in line 24, page 9 to line 7, page 10 of the specification of the present application. **That is, the mechanism for reducing the stray light according to the present application is to form a light trap** (i.e. the inner space formed between the first outer layer 110, the inner substrate layer 130 and the second outer layer 120), once the incident light strike therein, the intensity thereof is attenuated by repeated reflections. With the technical features " $2.0\ \mu\text{m} < (\Phi_{\text{min}} - \Phi_1)/2 < 200\ \mu\text{m}$ " and " $2.0\ \mu\text{m} < (\Phi_{\text{min}} - \Phi_2)/2 < 200\ \mu\text{m}$ ", the depth of the light trap is proper, and the effect for trapping the incident light is more significant. Furthermore, when the light blocking sheet is applied to an imaging lens module, no matter which side of the light blocking sheet (the side of the first outer layer or the side of the second outer layer) is facing the object side of the imaging lens module, the effect for reducing the stray light can be provided in either case.

Moreover, the stray light has no directionality. That is, the stray light may enter into the light trap from both sides (the left side and the right side) of the light blocking sheet, and all can be trapped by the light trap due to the proper depth of the light trap.

However, Cho and Kim fail to disclose, teach and suggest the reduction of stray light by forming a light trap.

rotated 90 degrees in counterclockwise direction.

Table 2	
Fig. 3 disclosed by Cho	Fig. 4A disclosed by Kim

As shown in the left column of Table 2, Cho disclosed the features " $\Phi_{\text{min}} = \Phi_1$ " and " $\Phi_{\text{min}} > \Phi_2$ ". That is, Cho fails to teach the technical features " $2.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi_1)/2 < 200 \mu\text{m}$ " and " $2.0 \mu\text{m} < (\Phi_{\text{min}} - \Phi_2)/2 < 200 \mu\text{m}$ ". There is no light trap formed between the first outer layer 142, the inner substrate layer 140 and the second outer layer 144. Accordingly, a person having ordinary skill in the art cannot obtain the amended claims 1 and 16 easily in view of Cho.

As shown in the right column of Table 2, Kim discloses a wall surface 20a formed on the light blocking sheet 20, which is recited as follows: "Referring to FIG. 4A, a wall surface 20a of a spacer 20 is formed to be concave in order to prevent light reflected by the wall surface 20 a to pass through the light blocking hole...", paragraph [0040] disclosed by Kim.

However, the mechanism for reducing the stray light disclosed by Kim is fundamentally different from that of the present application. The mechanism for reducing the stray light disclosed by Kim is as follows: "Further, **the wall surface 20a of the spacer 20 is a curved surface preventing light from being incident on other portions except for the edge portion 27.**", paragraph [0041] disclosed by Kim. That is, the wall surface 20a is for enhancing the probability of light striking on the edge portion 27, which is not for forming a light trap. As long as the wall surface 20a is concave, the desired effect of enhancing the probability of light striking on the edge portion 27 can be achieved. Accordingly, a person having ordinary skill in the art would have no reasonable motivation to adjust the relation of Φ_{min} , Φ_1 and Φ_2 to obtain to the technical features " $2.0\ \mu\text{m} < (\Phi_{\text{min}} - \Phi_1)/2 < 200\ \mu\text{m}$ " and " $2.0\ \mu\text{m} < (\Phi_{\text{min}} - \Phi_2)/2 < 200\ \mu\text{m}$ ". Accordingly, the amended claims 1 and 16 cannot be obtained easily in view of Kim.

Furthermore, when the light blocking sheet 20 disclosed by Kim is applied to an imaging lens module, when the side of the light blocking sheet 20 facing the object side of the imaging lens module is changed (i.e., the edge portion 27 facing the object side is changed to face the image side), the effect for reducing the stray light cannot be provided.

Moreover, the stray light has no directionality. That is, the stray light may strike on the light blocking sheet 20 from both sides (the left side and the right side). As shown in the right column of Table 2, when the light strikes on the left side of the light blocking sheet 20, the effect for enhancing the probability of light striking on the edge portion 27 desired by Kim can be

achieved. However, when the light strikes on the right side of the light blocking sheet 20, the effect for enhancing the probability of light striking on the edge portion 27 desired by Kim cannot be achieved. **In other words, the effect for reducing stray light provided by the light blocking sheet 20 disclosed by Kim is significantly inferior to the light blocking sheet according to the amended claims 1 and 16.**

To sum up, Cho and Kim fail to disclose, teach or suggest all the words in the amended claims 1 and 16 of the present application. The mechanism for reducing the stray light according to the amended claims 1 and 16 of the present application is completely different from that disclosed by Cho and Kim. Moreover, the effect for reducing stray light according to the amended claims 1 and 16 of the present application is obviously better than that disclosed by Cho and Kim. Accordingly, the amended claims 1 and 16 patently define over Cho in view of Kim.

Moreover, claims 2 and 4-15 depend on the amended claim 1, and claims 17-23 depend on the amended claim 16. Accordingly, claims 2 and 4-23 are patentable over Cho in view of Kim for the same reasons as claims 1 and 16. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

INTERNET COMMUNICATIONS

Pursuant to MPEP 502.03: "Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with me concerning any subject matter of this application by electronic mail. I understand that a copy of these communications will be made of record in the application file."

Conclusion

For all of the aforementioned reasons, applicants submit that the specification and claims are now in proper form, and that the claims define patentably over the prior art of record. Therefore, applicants respectfully request allowance for this case at the Office Action's earliest convenience.

Any amendments made herein are made without prejudice, disclaimer, or waiver of the subject matter previously embodied in the claims, or Applicant's right to pursue other embodiments supported by the specification.

Should the Examiner feel that further discussion of the application and the Amendment is conducive to prosecution and allowance thereof, please do not hesitate to contact the undersigned by phone (678-483-8899) or email (dan.mcclure@mqlrlaw.com).

No fee is believed to be due in connection with this submission. If, however, any fee is believed to be due, you are hereby authorized to charge any such fee to deposit account No. 50-5954.

Respectfully submitted,

/Daniel R. McClure/

By:

Daniel R. McClure
Registration No. 38,962

Customer No. 109673

Electronic Acknowledgement Receipt

EFS ID:	31265355
Application Number:	15434163
International Application Number:	
Confirmation Number:	7080
Title of Invention:	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS
First Named Inventor/Applicant Name:	Chih-Wen HSU
Customer Number:	109673
Filer:	Daniel R. McClure
Filer Authorized By:	
Attorney Docket Number:	251236-1700
Receipt Date:	18-DEC-2017
Filing Date:	16-FEB-2017
Time Stamp:	21:03:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	00521309.PDF	209394	no	16
			68bc54d3bd716a8a10d194cc21bf2ab875c78f50		

Warnings:

Information:	
Total Files Size (in bytes):	209394
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.	

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/434,163	Filing Date 02/16/2017	☐ To be Mailed
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ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO**APPLICATION AS FILED – PART I**

(Column 1)

(Column 2)

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

(Column 1)

(Column 2)

(Column 3)

AMENDMENT	12/18/2017	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	* 22	Minus	** 23	= 0	X \$80 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	X \$420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

(Column 1)

(Column 2)

(Column 3)

AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =
	☐ Application Size Fee (37 CFR 1.16(s))					
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
ALLYSON PURNELL

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

109673 7590 04/10/2018
McClure, Qualey & Rodack, LLP
3100 Interstate North Circle
Suite 150
Atlanta, GA 30339

EXAMINER

KIM, SU C

ART UNIT

PAPER NUMBER

2899

DATE MAILED: 04/10/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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15/434,163

02/16/2017

Chih-Wen HSU

251236-1700

7080

TITLE OF INVENTION: LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0	\$0	\$1000	07/10/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

109673 7590 04/10/2018
McClure, Qualey & Rodack, LLP
3100 Interstate North Circle
Suite 150
Atlanta, GA 30339

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/434,163	02/16/2017	Chih-Wen HSU	251236-1700	7080

TITLE OF INVENTION: LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0	\$0	\$1000	07/10/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
KIM, SU C	2899	257-080000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
- 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/434,163	02/16/2017	Chih-Wen HSU	251236-1700	7080
109673	7590	04/10/2018	EXAMINER	
McClure, Qualey & Rodack, LLP			KIM, SU C	
3100 Interstate North Circle			ART UNIT	PAPER NUMBER
Suite 150			2899	
Atlanta, GA 30339				

DATE MAILED: 04/10/2018

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/434,163	Applicant(s) HSU ET AL.	
	Examiner Su C. Kim	Art Unit 2899	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 12/18/2017.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 1,2 and 4-23. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) ☒ All b) ☐ Some *c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|--|
| 1. ☐ Notice of References Cited (PTO-892) | 5. ☐ Examiner's Amendment/Comment |
| 2. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 6. ☒ Examiner's Statement of Reasons for Allowance |
| 3. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 7. ☐ Other _____. |
| 4. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____. | |

/Su C. Kim/
Primary Examiner, Art Unit 2899

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

Allowable Subject Matter

Claims 1-2 & 4-23 are allowed over the prior art and applicant argument filed on 12/18/2017.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Su C. Kim whose telephone number is (571)272-5972. The examiner can normally be reached on Monday - Friday, 8:00AM to 4:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dale Page can be reached on (571) 270-7877. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2899

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Su C. Kim
Primary Examiner
Art Unit 2899

/Su C. Kim/
Primary Examiner, Art Unit 2899

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S51	68	S50 and diameter with (substrate wafer) and (diameter) with (open\$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/02/28 09:45
S52	2	("7457052").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/02/28 09:52
S53	11	("6429422" "6597401" "6802420" "7221524" "7231143").PN. OR ("7457052").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/02/28 09:53
S54	1204	(optical near2 spac\$3) with (diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/02/28 10:29
S57	555	(optical near2 spac\$3 light near2 sheld\$ light near2 block\$3) with (open\$3 window hole) same diameter and (LENS)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/02/28 12:01
L2	1659	(LARGAN near2 PRECISION).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/02/28 15:00
L3	351	(Chih-Wen near2 HSU).in. (Chih-Wei near2 CHENG).in. (Ming-Ta near2 CHOU).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/02/28 15:02
L4	5	(2 and 3) and (optical near2 spac\$3 light near2 sheld\$ light near2 block\$3) with (open\$3 window hole) same diameter and (LENS)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/02/28 15:06
L13	251	((minimum near diameter) and (first near2 diameter) and (second near2 diameter) and (opening hole window)).dm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/02/28 15:16

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp

L14	480	(optical near2 spac\$3 light near2 sheld\$ light near2 block\$3) with (open\$3 window hole) same diameter and (LENS)	US- PGPUB; USPAT	OR	OFF	2018/02/28 15:18
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2/ 28/ 2018 3:34:38 PM
C:\ Users\ skim2\ Documents\ EAST\ Workspaces\ 15434163.wsp

Search Notes 	Application/Control No. 15434163	Applicant(s)/Patent Under Reexamination HSU ET AL.
	Examiner SU C KIM	Art Unit 2899

CPC- SEARCHED		
Symbol	Date	Examiner
H01L31/16	2/28/2018	SK
H01L33/44	2/28/2018	SK
H01L33/58	2/28/2018	SK

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
(H01L31/16 or H01L33/44 or H01L33/58).cpc. with text search	9/13/2017	
East Text search	9/13/2017	SK
(G02B27/0018 G02B5/003 G02B7/021 G02B13/0045).cpc. with Text search	9/13/2017	SK
Inventors and assignee search	9/13/2017	SK
(H01L31/16 or H01L33/44 or H01L33/58).cpc. with text search	9/13/2017	SK
East Text search	2/28/2018	SK
Inventors and assignee search	2/28/2018	SK
claim search	2/28/2018	SK

INTERFERENCE SEARCH

	/SU C KIM/ Primary Examiner.Art Unit 2899
--	--

US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	Interference search	2/28/2018	SK

	/SU C KIM/ Primary Examiner.Art Unit 2899
--	--

Issue Classification 	Application/Control No. 15434163	Applicant(s)/Patent Under Reexamination HSU ET AL.	
	Examiner SU C KIM	Art Unit 2899	

CPC						
Symbol					Type	Version
H01L		31	/	16	F	2013-01-01
H01L		33	/	58	I	2013-01-01
H01L		33	/	44	I	2013-01-01
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CPC Combination Sets				
Symbol	Type	Set	Ranking	Version

NONE		Total Claims Allowed:	
		22	
(Assistant Examiner)	(Date)		
/SU C KIM/	03/05/2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2C

Bibliographic Data

Application No: 15434163

Foreign Priority claimed:

☒ Yes ☐ No

35 USC 119 (a-d) conditions met:

☒ Yes ☐ No

☐ Met After Allowance

Verified and Acknowledged:

/SU C KIM/

Examiner's Signature

Initials

Title:

LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND
ELECTRONIC APPARATUS

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
02/16/2017	257	2899	251236-1700
RULE			

APPLICANTS

LARGAN PRECISION CO., LTD., Taichung City, TAIWAN

INVENTORS

Chih-Wen HSU, Taichung City, TAIWAN

Chih-Wei CHENG, Taichung City, TAIWAN

Ming-Ta CHOU, Taichung City, TAIWAN

CONTINUING DATA

FOREIGN APPLICATIONS

TAIWAN 105137120 11/14/2016

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/23/2017

STATE OR COUNTRY

TAIWAN

ADDRESS

McClure, Qualey & Rodack, LLP

3100 Interstate North Circle

Suite 150

Atlanta, GA 30339

UNITED STATES

FILING FEE RECEIVED

\$1,600

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

109673 7590 04/10/2018
McClure, Qualey & Rodack, LLP
 3100 Interstate North Circle
 Suite 150
 Atlanta, GA 30339

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/434,163	02/16/2017	Chih-Wen HSU	251236-1700	7080

TITLE OF INVENTION: LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1000	\$0	\$0	\$1000	07/10/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
KIM, SU C	2899	257-080000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 McClure, Qualey

2 & Rodack, LLP

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

LARGAN PRECISION CO., LTD.

TAICHUNG CITY, TAIWAN

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☒ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☒ Payment by credit card. ~~XXXXXX XXXX XXXX~~
- ☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 50-5954 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Daniel R. McClure/

Date May 9, 2018

Typed or printed name Daniel R. McClure

Registration No. 38,962

Electronic Patent Application Fee Transmittal

Application Number:	15434163			
Filing Date:	16-Feb-2017			
Title of Invention:	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS			
First Named Inventor/Applicant Name:	Chih-Wen HSU			
Filer:	Daniel R. McClure/Gina Silverio			
Attorney Docket Number:	251236-1700			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1000

Electronic Acknowledgement Receipt

EFS ID:	32572025
Application Number:	15434163
International Application Number:	
Confirmation Number:	7080
Title of Invention:	LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS
First Named Inventor/Applicant Name:	Chih-Wen HSU
Customer Number:	109673
Filer:	Daniel R. McClure/Gina Silverio
Filer Authorized By:	Daniel R. McClure
Attorney Docket Number:	251236-1700
Receipt Date:	09-MAY-2018
Filing Date:	16-FEB-2017
Time Stamp:	08:44:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 1000
RAM confirmation Number	050918INTEFSW08451700
Deposit Account	505954
Authorized User	Gina Silverio

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)
37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	00563427.PDF	1601354	no	1
			cc6f0b2369588fa340f133ea75f0878a09f33e8a		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30402	no	2
			3daa5fe1007afc36e928c72c93673624e2f0e3da		

Warnings:

Information:

Total Files Size (in bytes):	1631756
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/434,163	02/16/2017	Chih-Wen HSU	251236-1700

CONFIRMATION NO. 7080

PUBLICATION NOTICE



OC00000099613019

109673
McClure, Qualey & Rodack, LLP
3100 Interstate North Circle
Suite 150
Atlanta, GA 30339

Title:LIGHT BLOCKING SHEET, IMAGING LENS MODULE AND ELECTRONIC APPARATUS

Publication No.US-2018-0138351-A1

Publication Date:05/17/2018

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/434,163	06/12/2018	9997660	251236-1700	7080

109673 7590 05/23/2018
McClure, Qualey & Rodack, LLP
3100 Interstate North Circle
Suite 150
Atlanta, GA 30339
UNITED STATES OF AMERICA

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Chih-Wen HSU, Taichung City, TAIWAN;
LARGAN PRECISION CO., LTD., Taichung City, TAIWAN;
Chih-Wei CHENG, Taichung City, TAIWAN;
Ming-Ta CHOU, Taichung City, TAIWAN;

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