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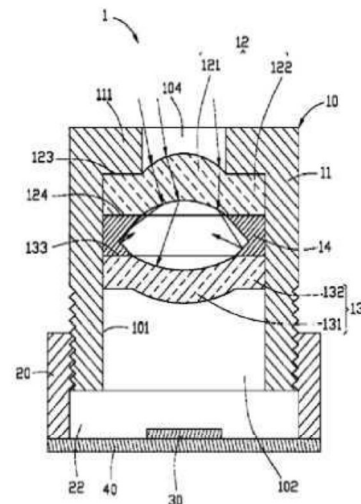
[54] **Title of Invention:**

Claims:2 pages Description:4 pages Drawings: 5 pages

LENS MODULE AND CAMERA MODULE

[57] **Abstract**

This invention provides a lens module, which comprises a lens barrel, a first lens, a second lens, and a spacer ring. The said first lens, spacer ring and second lens are successively installed in the lens barrel along its optical axis. The said spacer ring has a first surface, a second surface opposite said first surface, and an inner wall connecting said first surface and second surface. The first surface is in contact with said first lens, and the second surface is in contact with said second lens. The inner wall comprises a first inclined plane and second inclined plane connected to each other, an angle formed between said first inclined plane and said first surface is an acute angle, and an angle formed between said second inclined plane and said second surface is also an acute angle. The lens module effectively reduces the glare to improve the imaging quality thereof. The invention also provides a camera module with said lens module.



[Claim 1] A lens module, comprising a lens barrel, a first lens, a second lens, and a spacer ring; said first lens, spacer ring and second lens are successively disposed in the lens barrel along an optical axis; said spacer ring has a first surface, a second surface opposite to said first surface, and an inner wall connecting said first surface and second surface; the first surface is in contact with said first lens, and the second surface is in contact with said second lens, wherein said inner wall comprises a first inclined plane and a second inclined plane connected to each other, an angle formed between said first inclined plane and said first surface is an acute angle, and an angle between said second inclined plane and said second surface is also an acute angle.

[Claim 2] The lens module according to claim 1, wherein said angle between said first inclined plane and said first inclined plane is $50^{\circ}\sim 90^{\circ}$.

[Claim 3] The lens module according to claim 1, wherein said first surface and second surface are parallel to each other.

[Claim 4] The lens module according to claim 1, wherein said spacer ring is an annular ring.

[Claim 5] The lens module according to claim 1, wherein said spacer ring comprises a first spacer and a second spacer, both said first and second spacers are of semi-annular structures, said first spacer has a first mating surface, and an angle formed between said first mating surface and said first surface is an acute angle and an angle formed with said second surface is an obtuse angle; said second spacer has a second mating surface corresponding to said first mating surface.

[Claim 6] The lens module according to claim 1, wherein said spacer ring comprises a first spacer ring and a second spacer ring connected with each other, both said first and second spacer rings are of ring structures, said first surface and said first inclined plane are located in said first spacer ring, and said second surface and said second inclined plane are located in said second spacer ring.

[Claim 7] The lens module according to claim 1, wherein said spacer ring is made of a light-tight plastic material.

[Claim 8] A camera module comprising a lens base, an image sensor accommodated in said lens base, and the lens module according to claim 1, said mirror base has a receiving hole corresponding to a lens barrel, and said lens barrel is accommodated in said receiving hole.

[Claim 9] The camera module according to claim 8, wherein the image sensor is located on an image

side of said camera module.

[Claim 10] The camera module according to claim 8, wherein said lens barrel and said lens base are fixed by screw threads.

LENS MODULE AND CAMERA MODULE**TECHNICAL FIELD**

The invention relates to the technical field of optical systems, particularly a lens module to reduce the glare and a camera module provided with the lens module.

BACKGROUND TECHNOLOGY

With the development of multifunctional electronic products, camera modules are widely used in consumer electronic products such as mobile phones, laptops, personal digital assistants, etc. While pursuing multiple functions, people also expect that electronic products have excellent image effects, i.e., camera modules have high-quality imaging quality. Takano, H published an article titled "TWO-PHASE DIRECT-DRIVE MOTOR BUILD INTO A CAMORDERS ZOOM LENS BARREL" in "Consumer Electronics" in February 1995, disclosing a camera module having the advantages of high quality imaging quality and a compact structure.

A camera module is normally composed of a lens barrel equipped with optical elements and a lens base equipped with an image sensor. Please refer to the camera module 200 shown in Figure 5, which includes a lens base 210, a lens barrel 220, a first lens 230, a second lens 240, a spacer ring 250, and an image sensor 260. The spacer ring 250, disposed between the first lens 230 and the second lens 240, is used to separate the first lens 230 and the second lens 240 to prevent any damage caused by friction or collision between these adjacent lenses. The lens barrel 220 is screwed into the lens base 210 through threads to fix and adjust the relative position of the lens barrel 220 and the lens base 210, and to enable the imaging plane of the optical system formed by the optical lens in the lens barrel 220 to form on the image sensor 260. However, a portion of the incident light 270 does not directly enter the image sensor 260 through refraction, but enters the image sensor 260 after being reflected on the surface of the spacer ring 250, thus forming glare, which results in a blurred image. The presence of glare has seriously affected the quality of the captured image.

Therefore, it is necessary to provide a lens module capable of reducing the glare and a camera module provided with such lens module.

SUMMARY OF THE INVENTION

A lens module will be described below with specific embodiments.

The invention provides a lens module, which comprises a lens barrel, a first lens, a second lens and a spacer ring. The first lens, the spacer ring and the second lens are successively arranged in the lens barrel along its optical axis. The spacer ring has a first surface, a second surface opposite to the first surface, and an inner wall connecting the first and second surfaces. The first surface contacts the first lens, and the second surface contacts the second lens, wherein the inner wall comprises a first inclined plane and a second inclined plane connected with each other. The angle formed between the first inclined plane and the first surface is an acute angle, and the angle formed between the second inclined plane and the second surface is also an acute angle. The invention also provides a camera module with the lens module.

As compared with the prior art, the lens module of the present invention can make the light incident on the inner wall of the spaced ring to be reflected to the object side direction by using the direct or indirect scattering or reflection of the first inclined and second inclined planes of the spacer ring, so that the reflected light finally directed towards the image sensor near the image side is dispersed and weakened, which can effectively reduce the glare and improve the imaging quality of the lens module.

DESCRIPTION OF DRAWINGS

Figure 1 is a sectional view of the camera module provided by the first embodiment of the technical solution.

Figure 2 is a sectional view of the spacer ring provided by the first embodiment of the technical solution.

Figure 3 is a sectional view of the spacer ring provided by the second embodiment of the technical solution.

Figure 4 is a sectional view of the spacer ring provided by the third embodiment of the technical solution.

Figure 5 is a sectional view of a camera module in the prior art.

EMBODIMENTS

The lens module of the technical solution and the camera module with this lens module will be further described in detail in combination with multiple embodiments and the accompanying drawings.

Referring to Figures 1 and 2, the camera module 1 provided by the first embodiment of the present invention includes a lens module 10, a lens base 20 and an image sensor 30.

The lens base 20 is provided with a receiving hole 22, and an inner wall of the receiving hole 22 is provided with internal threads. The lens module 10 and image sensor 30 are accommodated on either sides of the receiving hole 22. The lens module 10 is used to form the optical image. The image sensor 30 is located on the image side of the camera module 1, which is connected to a printed circuit board 40 to convert the digital signal of the image sensor 30 into an electrical signal and transmit it externally. The image sensor 30 can be a charge coupled device (CCD) or a complementary metal oxide semiconductor transistor (CMOS) for converting an optical image signal into a digital signal.

Specifically, the lens module 10 includes a lens barrel 11, a first lens 12, a second lens 13 and a spacer ring 14.

The lens barrel 11 is cylindrical having a cylinder wall 101 and a lens cover 111. The lens barrel 11 is provided with external threads matching the lens base 20, so that the lens barrel 11 and the lens base 20 can be secured through a threaded fit. The barrel wall 101 of the lens barrel 11 is enclosed to form a cylindrical receiving hole 102, which is used to accommodate the first lens 12, the spacer ring 14 and the second lens 13. The lens cover 111 is provided with a circular light transmission hole 104, so that external light can be incident into the lens barrel 11 through the light transmission hole 104.

The first lens 12, the spacer ring 14 and the second lens 13 are successively accommodated in the lens barrel 11 along an optical axis. The first lens 12 is close to the object side, and includes a first optical portion 121 located in the center part of the lens and a first non-optical portion 122 arranged around the first optical portion 121. The first optical portion 121 is used to realize the designed optical function during the imaging process. The first non-optical portion 122 does not contribute to imaging and is used to support the first optical portion

121. The first non-optical portion 122 has a first abutting surface 123 and a second abutting surface 124 facing opposite to each other. The first butting surface 123 is in contact against the lens cover 111 of the lens barrel 11. The second butting surface 124 is in contact against the spacer ring 14.

The second lens 13 is close to the imaging side, and includes a second optical portion 131 located in the center part of the lens and a second non-optical portion 132 surrounding the second optical portion 131. The second optical portion 131 is used to realize the designed optical function during the imaging process. The second non-optical portion 132 does not contribute to imaging. The second non-optical portion 132 has a third abutting surface 133 opposite to the first lens 12. The third butting surface 133 is in contact against the spacer ring 14.

The spacer ring 14 is a circular ring located between the first lens 12 and the second lens 13, and used to separate the first lens 12 and the second lens 13. The spacer ring 14 has a first surface 141, a second surface 142 opposite to the first surface 141, and an inner wall 143 and an outer wall 144 connecting the first surface 141 and the second surface 142. The first surface 141 is in contact against the second abutting surface 124 of the first lens 12, and the second surface 142 is in contact against the third abutting surface 133 of the second lens 13.

The inner wall 143 includes a first inclined plane 145 and a second inclined plane 146 connected to each other. The angle formed between the first surface 145 and the first surface 141 is an acute angle θ_1 . The angle formed between the second inclined plane 146 and the second surface 142 is also an acute angle θ_2 . An angle θ is formed between the first inclined plane 145 and the second inclined plane 146. Since the first surface 141 is parallel to the second surface 142, the angle θ is equal to the sum of the acute angle θ_1 and the acute angle θ_2 . Preferably, the value of angle θ ranges from 50° to 90° .

The outer wall 144 is in contact with the barrel wall. If the distance between the inner wall 143 and the outer wall 144 on the first surface 141 is L_1 , and the distance on the second surface 142 is L_2 , then according to the different optical parameters of the first lens 12, the value of L_1 can be either greater than the value of L_2 or less than or equal to the value of L_2 . In this embodiment, the value of L_1 can be greater than the value of L_2 . The spacer ring 14 can be integrally formed or assembled. In this embodiment, the spacer ring 14 is integrally formed. The spacer ring 14 is made of an opaque plastic material.

When the camera module 1 is working, most of the incident light will pass through the first optical portion 121 of the first lens 12 and the second optical portion 131 of the second lens 13 successively, so as to form an image on the image sensor 30 and is transmitted externally by the printed circuit board 40. But a small portion of the light may pass through the first optical portion 121 of the first lens 12 and then hit the inner wall 143 of the spacer ring 14 and reflect. Because the spacer ring 143 in the technical solution has the first inclined plane 145 and the second inclined plane 146 connected to each other, a portion of the light directed to the inner wall 143 may be directly scattered or reflected towards the object side direction by the second inclined plane 146. Another portion of the light directed to the inner wall 143 may first reach the first inclined plane 145, then is scattered or reflected thereby to the second inclined plane 146, and is then scattered or reflected to the object side direction by the second inclined plane 146. Thus, the spacer ring 14 can scatter or reflect the light incident on the inner wall 143 of the spacer ring 14 towards the object side direction as far as possible, which in turn dispersing and weakening the reflected light eventually directed at the image sensor 30 close to the imaging side, and thus avoiding the phenomenon where an image is blurry due to the glare formed from a large amount of reflected light entering the image sensor 30.

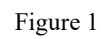
Of course, in order to facilitate manufacturing and molding, the spacer ring can also be divided into a plurality of parts for assembly and manufacture. Referring to Figure 3, a spacer ring 24 provided by the second embodiment of the technical solution includes a first spacer 241 and a second spacer 242. The first spacer 241 and the second spacer 242 are both semi-annular structures. The first spacer 241 has a first mating surface 243, and the second spacer 242 has a second mating surface 244 corresponding to the first mating surface 243. Preferably, the first mating surface 243 and the second mating surface 244 are both inclined planes. In this embodiment, the angle formed between the first mating surface 243 and the first surface 245 is an acute angle, and the angle formed with the second surface 246 is an obtuse angle. The angle formed between the second mating surface 244 and the first surface 245 is an obtuse angle, and the angle formed with the second surface 246 is an acute angle. Moreover, the angle formed between the first mating surface 243 and the first surface 245 is equal to the angle formed between the second mating surface 244 and the second surface 246, and the angle formed between the first mating surface 243 and the second mating surface 246 is equal to the angle formed between the second mating surface 244 and the first surface 245. Thus, the first spacer 241 and the second spacer 242 can be joined against each other by the first mating surface 243 and the second mating surface 244, and the spacer ring 24 can be formed by adhesive bonding or other means. Thus, the spacer ring 24 has a first inclined plane 247 and a second inclined plane 248. The angle formed between the first inclined plane 247 and the second inclined plane 248 is an acute angle. Preferably, the angle formed between the first inclined plane 247 and the second inclined plane 248 ranges from 50° to 90°.

Referring to Figure 4, a spacer ring 34 provided by the third embodiment of the technical solution includes a first spacer ring 341 and a second spacer ring 342. The first spacer ring 341 and the second spacer ring 342 are circular rings. The first spacer ring 341 has a first surface 343, a third surface 347, and a first inclined plane 345. The second spacer ring 342 has a second surface 344, a fourth surface 348, and a second inclined plane 346. Thus, the first spacer 341 and the second spacer 342 can be joined against each other by the third surface 347 and the fourth surface 348, and the spacer ring 34 can be formed by adhesive bonding or other means. The angle formed between the first inclined plane 345 and the second inclined plane 346 is an acute angle. Preferably, the angle formed between the first inclined plane 345 and the second inclined plane 346 ranges from 50° to 90°.

Of course, when the lens module includes three or more lenses, it can further include two or more spacer rings, so that a spacer ring is set between any two adjacent lenses. In addition, the spacer ring can also be disposed between the lens and an infrared cut-off filter. In summary, the spacer ring can be set between any two optical elements that produce glare due to reflection, to avoid the formation of glare.

As compared with the prior art, the lens module of this technical solution has the following advantages: it can make the light incident on the inner wall of the spacer ring to be reflected towards the object side direction by using the direct or indirect scattering or reflection effect of the first and second inclined planes of the spacer ring, so that the reflected light finally directed towards the image sensor near the image side is dispersed and weakened, which can effectively reduce the glare and improve the imaging quality of the lens module.

It is understandable that modifications and variations can be made by those skilled in the art according to the technical concept of the technical solution, and all these changes and variations should fall within the scope of the claims of the technical solution.



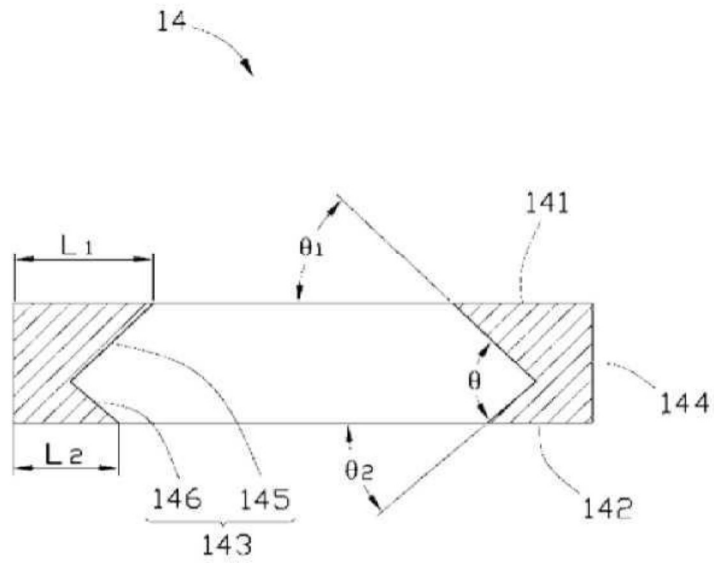


Figure 2

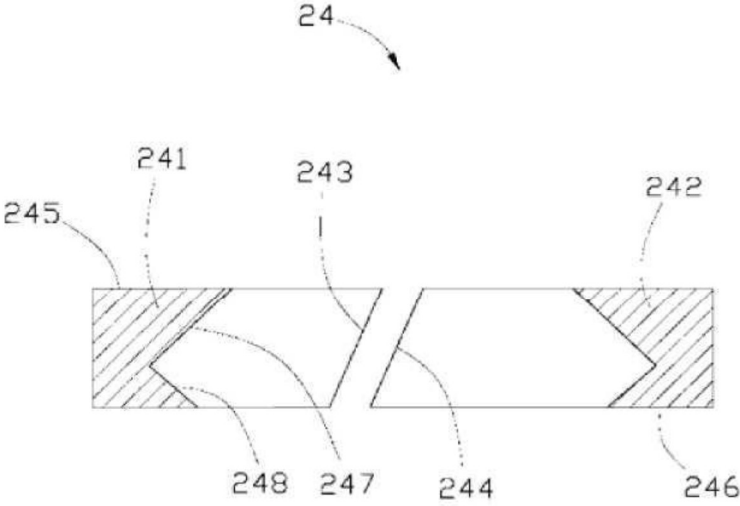


Figure 3

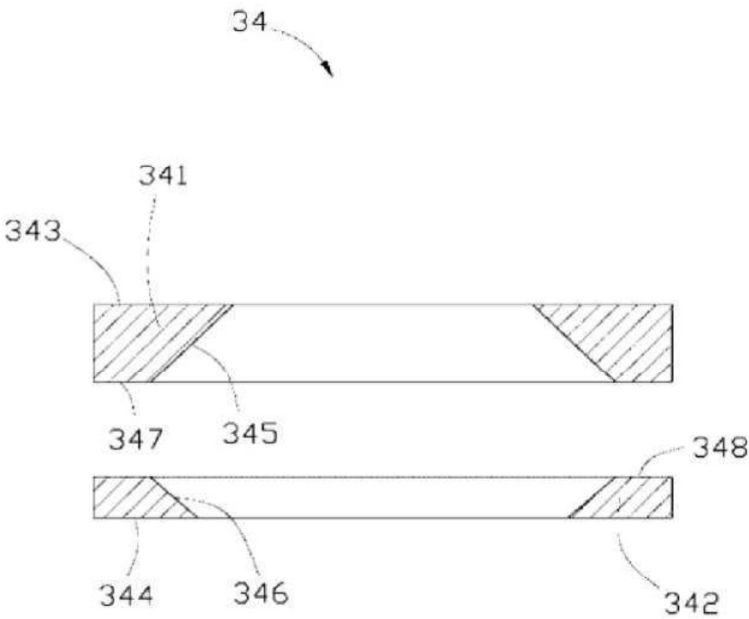


Figure 4

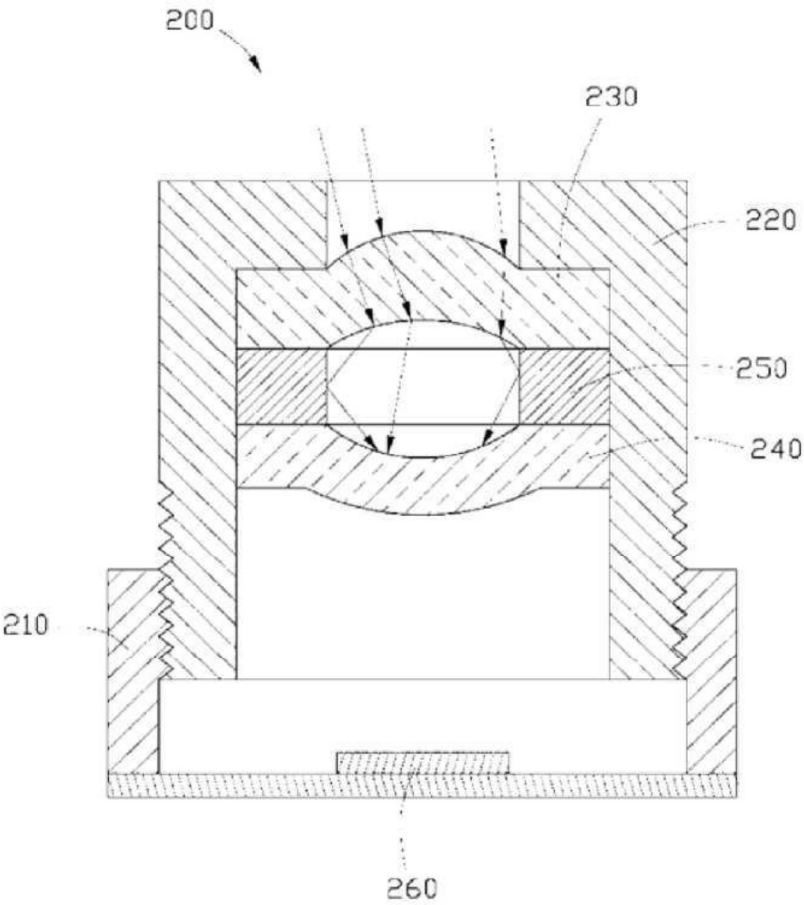


Figure 5

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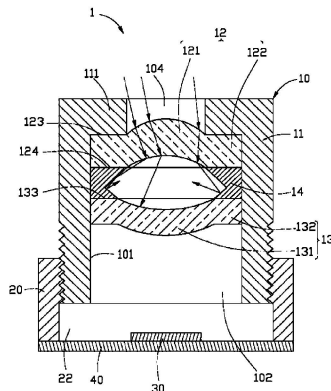
权利要求书 2 页 说明书 4 页 附图 5 页

[54] 发明名称

镜头模组及相机模组

[57] 摘要

本发明提供一种镜头模组，其包括镜筒、第一镜片、第二镜片以及间隔环。所述第一镜片、间隔环和第二镜片沿光轴依次设置于镜筒内。所述间隔环具有第一表面、与第一表面相对的第二表面以及连接第一表面和第二表面的内壁。所述第一表面与第一镜片接触，所述第二表面与第二镜片接触。所述内壁包括相连接的第一斜面和第二斜面，所述第一斜面与第一表面的夹角为锐角，所述第二斜面与第二表面的夹角也为锐角。所述镜头模组可有效减少眩光，可以提高镜头模组的成像品质。本发明还提供一种具有该镜头模组的相机模组。



【权利要求1】 一种镜头模组，其包括镜筒、第一镜片、第二镜片以及间隔环，所述第一镜片、间隔环和第二镜片沿光轴依次设置于镜筒内，所述间隔环具有第一表面、与第一表面相对的第二表面以及连接第一表面和第二表面的内壁，所述第一表面与第一镜片接触，所述第二表面与第二镜片接触，其特征在于，所述内壁包括相连接的第一斜面和第二斜面，所述第一斜面与第一表面的夹角为锐角，所述第二斜面与第二表面的夹角也为锐角。

【权利要求2】 如权利要求1所述的镜头模组，其特征在于，所述第一斜面与第二斜面的夹角为 $50^{\circ} \sim 90^{\circ}$ 。

【权利要求3】 如权利要求1所述的镜头模组，其特征在于，所述第一表面和第二表面平行。

【权利要求4】 如权利要求1所述的镜头模组，其特征在于，所述间隔环为圆环。

【权利要求5】 如权利要求1所述的镜头模组，其特征在于，所述间隔环包括第一间隔部与第二间隔部，所述第一间隔部与第二间隔部均为半环形结构，第一间隔部具有第一配合面，所述第一配合面与第一表面的夹角为锐角，与第二表面的夹角为钝角，所述第二间隔部具有与第一配合面对应的第二配合面。

【权利要求6】 如权利要求1所述的镜头模组，其特征在于，所述间隔环包括相连接的第一间隔环与第二间隔环，所述第一间隔环与第二间隔环均为环形结构，所述第一表面和第一斜面位于第一间隔环，所述第二表面和第二斜面位于第二间隔环。

【权利要求7】 如权利要求1所述的镜头模组，其特征在于，所述间隔环的材料为不透光塑料。

【权利要求8】 一种相机模组，其包括镜座、收容于镜座的影像传感器以及如权利要求1所述的镜头模组，所述镜座具有与镜筒相对应的收容孔，所述镜筒收容于所述收容孔。

【权利要求9】 如权利要求8所述的相机模组，其特征在于，所述影像传感器位

于所述相机模组的像侧。

【权利要求10】 如权利要求8所述的相机模组，其特征在于，所述镜筒与镜座通过螺纹配合固定。

镜头模组及相机模组

技术领域

本发明涉及光学系统技术领域，尤其涉及一种可减少眩光的镜头模组及具有该镜头模组的相机模组。

背景技术

随着电子产品多功能化的发展，相机模组在手机、笔记本电脑、个人数字助理等消费性电子产品中得到广泛应用。人们在追求多功能化的同时，也希望电子产品具有优良的影像效果，即，希望相机模组具有高质量的成像品质。Takano, H发表在1995年2月的“Consumer Electronics”上的一篇名为“Two-phase direct-drive motor built into a camcorders zoom lens barrel”文章中，揭示了一种相机模组，其具有高质量的成像品质，同时具有结构紧凑的优点。

相机模组通常是由装有光学元件的镜筒与设置有影像感测器的镜座组成。请参阅图5所示的相机模组200，其包括镜座210、镜筒220、第一镜片230、第二镜片240、间隔环250，及影像感测器260。间隔环250设置于第一镜片230与第二镜片240之间，其用于间隔第一镜片230与第二镜片240，以防止相邻镜片之间发生摩擦或碰撞而受损。镜筒220通过螺纹旋入镜座210中固定调整镜筒220与镜座210的相对位置，并使镜筒220内的光学镜片所形成的光学系统的成像面落在所述影像感测器260上。然而，部分入射光线270并非直接通过折射后进入影像感测器260，而是在间隔环250的表面经过反射后进入影像感测器260，从而形成眩光，造成影像模糊，眩光的存在严重影响了所拍摄影像的品质。

因此，有必要提供一种能减少眩光的镜头模组及具有该镜头模组的相机模组。

发明内容

下面将以具体实施例说明一种镜头模组。

本发明提供一种镜头模组，其包括镜筒、第一镜片、第二镜片以及间隔环，所述第一镜片、间隔环和第二镜片沿光轴依次设置于镜筒内，所述间隔环具有第一表面、与第一表面相对的第二表面以及连接第一表面和第二表面的内壁，所述第一表面与第一镜片接触，所述第二表面与第二镜片接触，其特征在于，所述内壁包括相连接的第一斜面和第二斜面，所述第一斜面与第一表面的夹角为锐角，所述第二斜面与第二表面的夹角也为锐角。本发明还提供一种具有该镜头模组的相机模组。

相对于现有技术，本技术方案的镜头模组利用所述间隔环的第一斜面和第二斜面的直接或间接的散射或反射作用，可以使入射到间隔环的内壁的光线反射到物侧方向，使得最终射向靠近像侧的影像传感器的反射光分散减弱，可有效减少眩光，提高镜头模组的成像品质。

附图说明

图1是本技术方案第一实施例提供的相机模组的剖视图。

图2是本技术方案第一实施例提供的间隔环的剖视图。

图3是本技术方案第二实施例提供的间隔环的剖视图。

图4是本技术方案第三实施例提供的间隔环的剖视图。

图5是现有技术中相机模组的剖视图。

具体实施方式

下面将结合多个实施例和附图对本技术方案的镜头模组及具有该镜头模组的相机模组作进一步的详细说明。

请一并参阅图1及图2，本技术方案第一实施例提供的相机模组1包括镜头模组10、镜座20以及影像传感器30。

所述镜座20具有收容孔22，所述收容孔22的内壁设置有内螺纹。所述镜头模组10和影像传感器30收容于收容孔22的两侧。所述镜头模组10用于形成光学成像。所述影像传感器30位于相机模组1的像侧，其与印刷电路板40相连接以将影像传感器30的数字信号转换为电信号并传输至外界。所述影像传感器30可以为电荷耦合器件（Charge Coupled Device，简称CCD）或互补金属氧化物半导体晶体管（Complementary Metal Oxide Semiconductor Transistor，简称CMOS），用于将光学成像信号转换成数字信号。

具体地，所述镜头模组10包括镜筒11、第一镜片12、第二镜片13以及间隔环14。

所述镜筒11为圆筒体，包括筒壁101以及镜头盖111。所述镜筒11设置有与所述镜座20相配合的外螺纹，从而镜筒11与镜座20可通过螺纹配合固定。所述镜筒11的筒壁101围合形成圆柱形的收容孔102，所述收容孔102用于收容所述第一镜片12、间隔环14和第二镜片13。所述镜头盖111具有一个圆形的透光孔104，以使外界的光线能通过透光孔104入射到镜筒11内。

所述第一镜片12、间隔环14和第二镜片13沿光轴依次收容于镜筒11内。所述第一镜片12靠近物侧，其包括位于镜片中心部分的第一光学部121和环绕第一光学部121设置的第一非光学部122。所述第一光学部121用于在成像过程中实现设计的光学功能。所述第一非光学部122不参与成像，用于支撑第一光学部121。所述第一非光学部122具有相对的第一抵靠面

123与第二抵靠面124。所述第一抵靠面123与镜筒11的镜头盖111接触抵靠。所述第二抵靠面124与间隔环14接触抵靠。

所述第二镜片13靠近像侧，其包括位于镜片中心部分的第二光学部131和环绕第二光学部131的第二非光学部132。所述第二光学部131用于在成像过程中实现设计的光学功能。所述第二非光学部132不参与成像。所述第二非光学部132具有与第一镜片12相对的第三抵靠面133。所述第三抵靠面133与间隔环14接触抵靠。

所述间隔环14为圆环，位于第一镜片12和第二镜片13之间，用于间隔第一镜片12与第二镜片13。所述间隔环14具有第一表面141、与第一表面141相对的第二表面142以及连接第一表面141与第二表面142的内壁143与外壁144。所述第一表面141与第一镜片12的第二抵靠面124接触抵靠，所述第二表面142与第二镜片13的第三抵靠面133接触抵靠。

所述内壁143包括相连接的第一斜面145和第二斜面146。所述第一斜面145与第一表面141的夹角为锐角 θ_1 。所述第二斜面146与第二表面142的夹角也为锐角 θ_2 。所述第一斜面145与第二斜面146之间形成一个夹角 θ 。由于所述第一表面141与第二表面142平行，因而，所述夹角 θ 的大小等于锐角 θ_1 与锐角 θ_2 之和。优选地，所述夹角 θ 的值的范围为 $50^\circ \sim 90^\circ$ 。

所述外壁144与筒壁相接触。若所述内壁143与外壁144在第一表面141上的距离为 L_1 ，在第二表面142上的距离为 L_2 ，则根据第一镜片12的光学参数的不同， L_1 的值既可以大于 L_2 的值，也可以小于或等于 L_2 的值。本实施例中， L_1 的值既可以大于 L_2 的值。所述间隔环14可以一体成型，也可以组装构造。本实施例中，所述间隔环14为一体成型。所述间隔环14的材料为不透光塑料。

当所述相机模组1工作时，大部分入射光线会依次穿过所述第一镜片12的第一光学部121、第二镜片13的第二光学部131，从而在影像感测器30上形成影像并由印刷电路板40传输至外界，但可能有小部分光线在穿过第一镜片12的第一光学部121后，会射向间隔环14的内壁143并发生反射。由于本技术方案中的间隔环143具有相连接的第一斜面145和第二斜面146，因而，射向内壁143的一部分光线可能会直接被第二斜面146散射或反射到物侧方向。射向内壁143的另一部分光线可能会先到达所述第一斜面145，再由第一斜面145散射或反射到第二斜面146，再经第二斜面146散射或反射到物侧方向。从而，所述间隔环14可以将入射到间隔环14的内壁143的光线尽量散射或反射到物侧方向，分散并减弱了最终射向靠近像侧的影像传感器30的反射光，避免了大量反射光进入到影像传感器30而形成眩光，使影像模糊的现象。

当然，为了便于制造成型，间隔环也可分成多个部分进行组装制造。请参阅图3，本技术方案第二实施例提供的间隔环24包括第一间隔部241和第二间隔部242。所述第一间隔部241和第二间隔部242均为半环形结构。所述第一间隔部241具有第一配合面243，所述第二间隔部242具有与第一配合面243相对应的第二配合面244。优选地，所述第一配合面243与第二配合面244均为斜面。本实施例中，所述第一配合面243与第一表面245的夹角为锐角，与第二表面246的夹角为钝角。所述第二配合面244与第一表面245的夹角为钝角，与第二表面246的夹角为锐角。且，第一配合面243与第一表面245的夹角等于第二配合面244与第二表面246的夹角，第一配合面243与第二配合面246的夹角等于第二配合面244与第一表面245的夹角。从而，第一间隔部241与第二间隔部242可通过第一配合面243与第二配合面244相互承靠进行接合，并用粘合剂粘合或其他方式固定形成间隔环24。从而，所述间隔环24具有第一斜面247与第二斜面248。所述第一斜面247与第二斜面248的夹角为锐角。优选地，所述第一斜面247与第二斜面248的夹角的范围为 $50^{\circ} \sim 90^{\circ}$ 。

请参阅图4，本技术方案第三实施例提供的间隔环34包括第一间隔环341和第二间隔环342。所述第一间隔环341与第二间隔环342均为圆环形。第一间隔环341具有第一表面343、第三表面347以及第一斜面345。第二间隔环342具有第二表面344、第四表面348以及第二斜面346。从而，第一间隔部341与第二间隔部342可通过第三表面347与第四表面348的相互承靠进行接合，并用粘合剂粘合或其他方式固定形成间隔环34。所述第一斜面345与第二斜面346的夹角为锐角。优选地，所述第一斜面345与第二斜面346的夹角的范围为 $50^{\circ} \sim 90^{\circ}$ 。

当然，所述镜头模组包括三个或三个以上的镜片时，其还可以包括两个或两个以上的间隔环，从而在任意相邻两个镜片之间均设置一个间隔环。另外，所述间隔环也可设置于镜片与红外截止滤光片之间。总之，由于反射而产生眩光的任何两个光学元件之间均可通过设置所述间隔环以避免眩光的形成。

相对于现有技术，本技术方案的镜头模组具有如下优点：其利用所述间隔环的第一斜面和第二斜面的直接或间接的散射或反射作用，可以使入射到间隔环的内壁的光线反射到物侧方向，使得最终射向靠近像侧的影像传感器的反射光分散减弱，可有效减少眩光，并提高镜头模组的成像品质。

可以理解的是，对于本领域的普通技术人员来说，可以根据本技术方案的技术构思做出其它各种相应的改变与变形，而所有这些改变与变形都应属于本技术方案权利要求的保护范围。

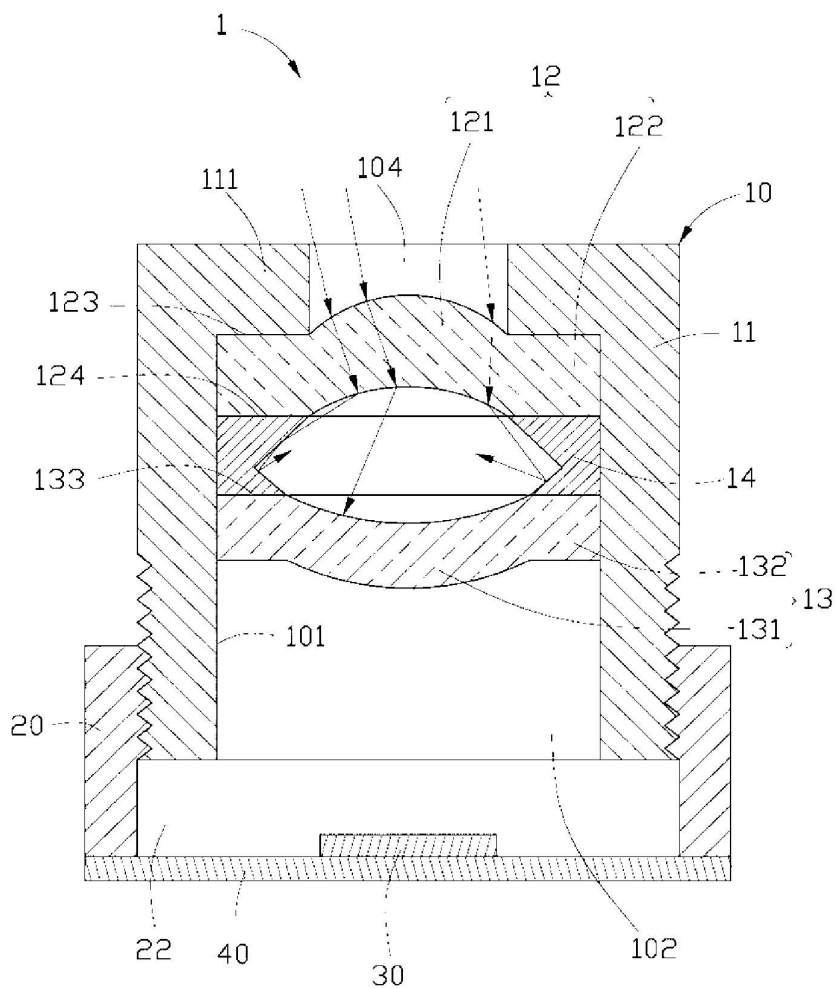


图 1

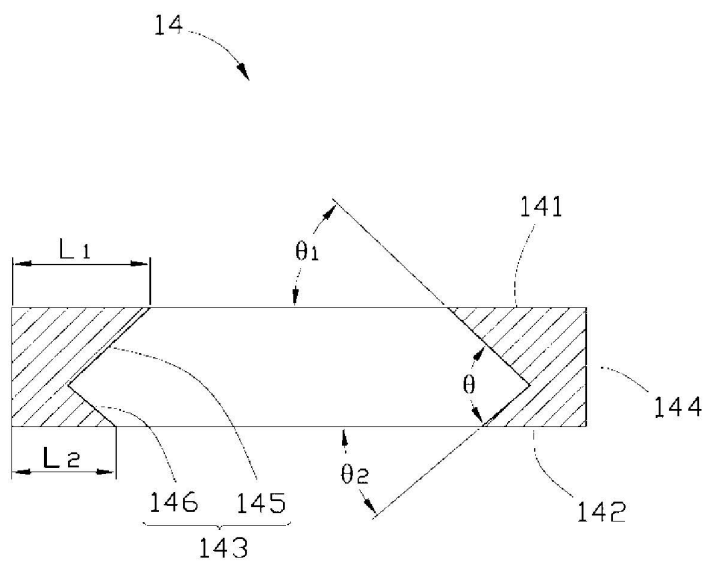


图 2

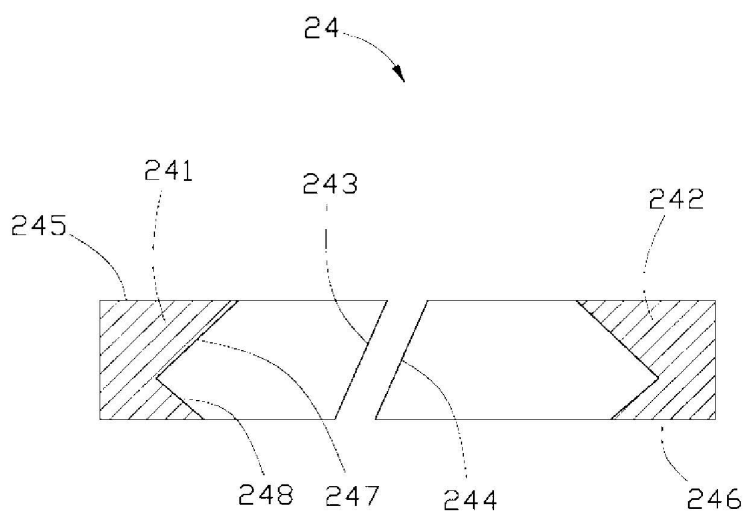


图 3

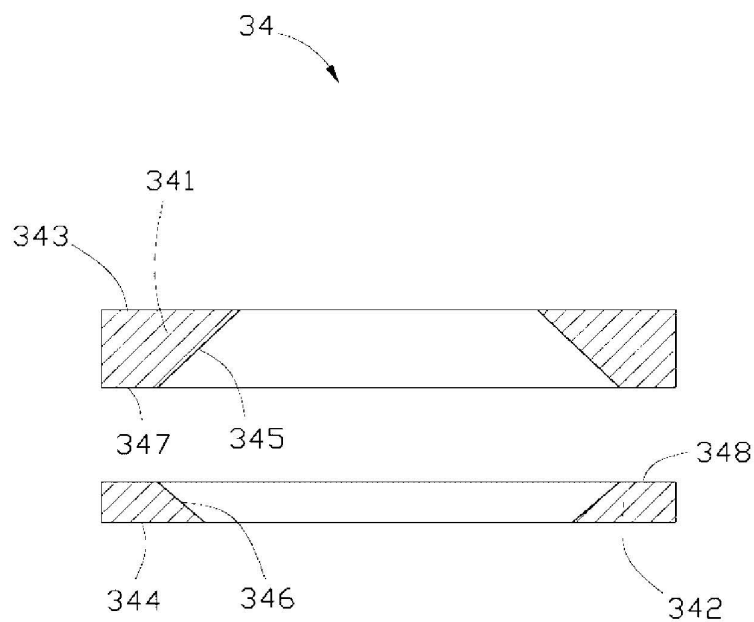


图 4

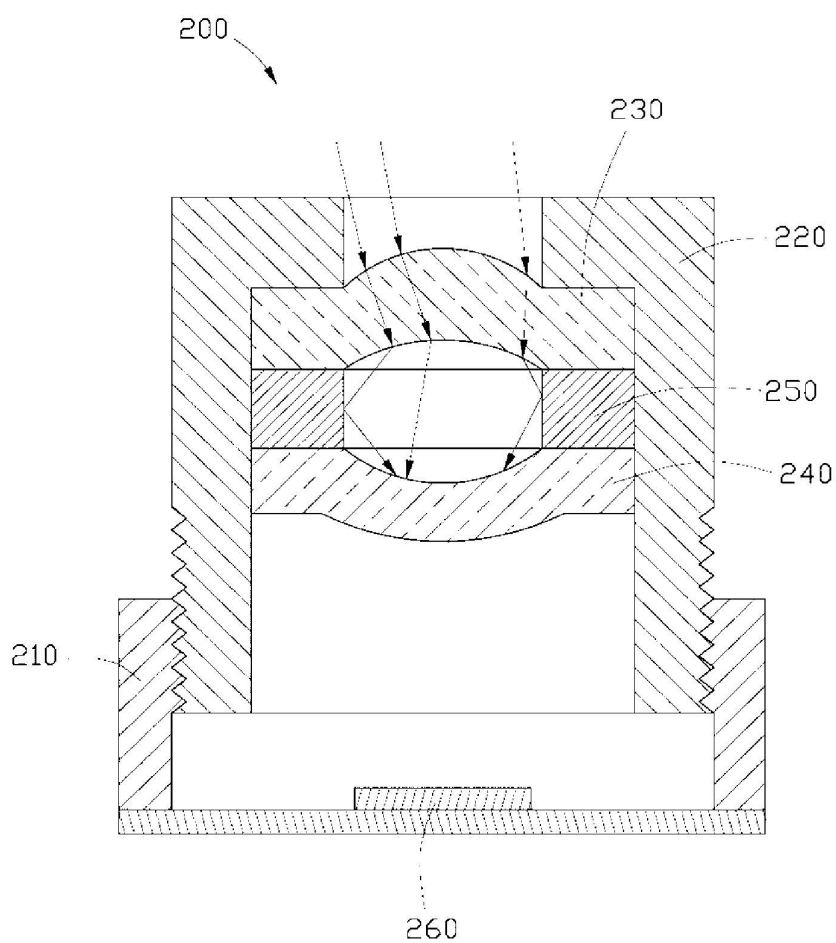


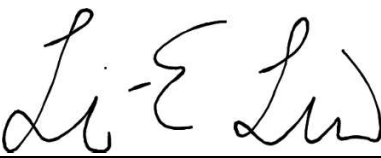
图 5

I, LI-E LIU, declare as follows:

1. I am over eighteen years of age and fully competent to make this affidavit. I have personal knowledge of the information contained in this affidavit, and it is true and accurate to the best of my knowledge.
2. I am a translator fluent in the Chinese and English languages.
3. I translated the Chinese patent file CN101634738A into English and the English translation is a true and accurate translation of the Chinese patent file CN101634738A.

I declare under penalty of perjury of the laws of the United States of America that the foregoing information is true and accurate to the best of my knowledge. I understand that willful false statements and the like are punishable by fine or imprisonment, or both {18 U.S.C. § 1001} and may jeopardize the validity of the application or any patent issuing thereon.

Executed on: March 7, 2024, at 2796 E Coventry Lane, Salt Lake City,
UT, 84121

(sign here) 

Signed by Li-E Liu