

## Notice

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## CLAIMS CN110082895B

1.

<sup>13</sup> A modularized lens assembly of a finite yoke camera or microscope, characterized in that it includes a zoom assembly, the zoom assembly includes a positive film still group G1B, a negative film active group G2, G3, a negative film active group G4, and a positive film still group G5A, And can reach the optical expansion between 1.15 and 4.65mm<sup>2sr</sup> modular limited yoke lens assembly; also includes an afocal lens module, or module 2, or core zoom module, the afocal lens module includes a positive film group G1B, An active negative film group G2, an active positive film group G3, an active negative film group G4, and a positive film group G5A, the module 2 or the core zoom module includes 5 lens groups, these 5 lens groups include: a static positive film group G1B, A negative film active group G2, a positive film active group G3, a negative film active group G4, and a static positive film group G5A, with an optical extension between 1.15 and 4.65 mm<sup>2sr</sup> (14); it also contains a lens accessory module, or module 1, with one The positive film has a fixed focal length, a large enough aperture and angle combination can provide an optical extension of 1.15 to 4.65mm<sup>2sr</sup> (24); a rear adapter is also included, or the module 3 has a positive film fixed focal length, a large enough aperture and angle combination can be Provides an optical extension of 1.15-4.65mm<sup>2sr</sup> (31).

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<sup>27</sup> 一个模块化的有限轭距相机或显微镜的镜头组件，其特征在于：包括一个变焦组件，所述变焦组件包括正片静止组G1B、负片活动组G2、G3、负片活动组G4、正片静止组G5A，且能达到1.15和4.65mm<sup>2sr</sup>之间光学扩展量的模块化有限轭距镜头组件；还包括一个无焦镜头模块、或者模块2、或者核心变焦模块，所述无焦镜头模块包括一个正片组G1B、一个活动负片组G2、一个活动正片组G3、一个活动负片组G4、一个正片组G5A，所述模块2或者核心变焦模块包括5个镜片组，这5个镜片组包括：一个静止正片组G1B、一个负片活动组G2、一个正片活动组G3、负片活动组G4和静止正片组G5A，其光学扩展量在1.15和4.65 mm<sup>2sr</sup>之间（14）；还包含一个镜头附件模块，或者模块1，有一个正片固定焦距，足够大的孔径和角度组合，可提供1.15-4.65mm<sup>2sr</sup>的光学扩展量（24）；还包括一个后适配器，或者模块3有一个正片固定焦距，足够大的孔径和角度组合，可提供1.15-4.65mm<sup>2sr</sup>的光学扩展量（31）。

2.

<sup>42</sup> The lens assembly according to claim 1, which has a resolution capability of 4,075 to 8,194 pixels in the diagonal range of the entire image plane.

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<sup>45</sup> 根据权利要求1的镜头组件，其分辨能力达到在整个图像平面对角线范围内可以解析4,075至8,194个像素。

3.

<sup>52</sup> The lens assembly according to claim 1, wherein the zoom ratio complies with the equation  $5.5 < M1/M2 < 16$ .

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<sup>54</sup> 根据权利要求1的镜头组件，其变焦比符合等式 $5.5 < M1/M2 < 16$ 。

4.

<sup>60</sup> The lens assembly according to claim 1, whose wavelength correction requires a focal depth of less than 3 from 430-1100nm compared with 550nm.

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<sup>63</sup> 根据权利要求1的镜头组件，其波长校正要求与550nm相比从430-1100nm其焦深小于3。

5.

<sup>69</sup> The lens assembly according to claim 1, whose wavelength correction requires a focal depth of less than 3 from 900 nm to 1700 nm compared with 1200 nm.

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<sup>72</sup> 根据权利要求1的镜头组件，其波长校正要求与1200nm相比从900-1700nm其焦深小于3。

6.

<sup>78</sup> The lens assembly according to claim 1, which has a variety of fixed focal length lenses on the side facing the object, with a positive focal length and a 16-25mm pupil specification.

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81 根据权利要求1的镜头组件，其在面对物体侧有多种固定焦距镜头，带有正片焦距和16-25mm光瞳规格。

7.

88 The lens assembly according to claim 1, which has a plurality of fixed focal length lenses on the side facing the object, the focal length and pupil depth of which are 50, 75, 100, 150 mm or more.

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91 根据权利要求1的镜头组件，其在面对物体侧有多种固定焦距镜头，其正片焦距和瞳深为50, 75, 100, 150mm或以上。

8.

98 The lens assembly according to claim 1, which has a variety of fixed focal length lenses on the side facing the image or the sensor, the focal length and pupil depth of which are 16-25 mm.

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101 根据权利要求1的镜头组件，其在面对图像或者传感器侧有多种固定焦距镜头，其正片焦距和瞳深为16-25mm。

9.

108 The lens assembly according to claim 1, which has multiple fixed focal length lenses on the side facing the image or the sensor, the focal length and pupil depth of which are 50, 75, 100, 150 mm or more.

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111 根据权利要求1的镜头组件，其在面对图像或者传感器侧有多种固定焦距镜头，其正片焦距和瞳深为50, 75, 100, 150mm或以上。

10.

118 The lens assembly according to claim 1, which comprises an afocal lens segment.

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120 根据权利要求1的镜头组件，其包含一个无焦镜头段。

11.

<sup>126</sup> The lens assembly according to claim 1, wherein the highest magnification is greater than 2.

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<sup>128</sup> 根据权利要求1的镜头组件，其最高放大倍数大于2。

12.

<sup>134</sup> The lens assembly according to claim 1, which uses two or more other modules, including but not limited to lens accessory module, core zoom module, rear adapter module, motorized module, lighting module, sensor module, processing module, interface module, Or any combination of these modules.

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<sup>138</sup> 根据权利要求1的镜头组件，其采用其它2个或者以上的模块，包括但不限于镜头附件模块、核心变焦模块、后适配器模块、机动模块、照明模块、传感器模块、处理模块、接口模块、或者这些模块的任意组合。

13.

<sup>146</sup> The lens assembly according to claim 1, wherein the zoom ratio complies with the equation  $5.5 < M1/M2 < 16$ .

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<sup>148</sup> 根据权利要求1的镜头组件，其变焦比符合等式 $5.5 < M1/M2 < 16$ 。

14.

<sup>154</sup> The lens assembly according to claim 1, with a zoom ratio of 7:1 and an optical extension value of 1.57 mm<sup>2</sup>sr, with a positive film fixed group G1B, a negative film active group G2, a positive film active group G3, a negative film active group G4, and a positive film fixed group G5A .

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<sup>158</sup> 根据权利要求1的镜头组件，其变焦比为7:1，光学扩展量值为1.57 mm<sup>2</sup>sr，带有正片固定组G1B、负片活动组G2、正片活动组G3、负片活动组G4和正片固定组G5A。

15.

<sup>165</sup> The lens assembly according to claim 1, with a zoom ratio of 7:1 and an optical extension value of 1.54mm<sup>2</sup>sr, with a positive film fixed group G1B, a negative film active group G2, a positive film fixed group G3, a negative film active group G4 and a positive film fixed group G5A .

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<sup>169</sup> 根据权利要求1的镜头组件，其变焦比为7:1，光学扩展量值为1.54mm<sup>2</sup>sr，带有正片固定组G1B、负片活动组G2、正片固定组G3、负片活动组G4和正片固定组G5A。

16.

<sup>176</sup> The lens assembly according to claim 1, with a zoom ratio of 7:1 and an optical extension value of 1.58 mm<sup>2</sup>sr, with a positive film fixed group G1B, a negative film active group G2, a negative film active group G3, a negative film active group G4, and a positive film fixed group G5A .

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<sup>180</sup> 根据权利要求1的镜头组件，其变焦比为7:1，光学扩展量值为1.58 mm<sup>2</sup>sr，带有正片固定组G1B、负片活动组G2、负片活动组G3、负片活动组G4和正片固定组G5A。

17.

<sup>187</sup> The lens assembly according to claim 1, with a zoom ratio of 16:1, an optical extension value of 1.58 mm<sup>2</sup>sr, with a positive film fixed group G1B, a negative film active group G2, a positive film active group G3, a negative film active group G4, and a positive film fixed group G5A .

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<sup>191</sup> 根据权利要求1的镜头组件，其变焦比为16:1，光学扩展量值为1.58 mm<sup>2</sup>sr，带有正片固定组G1B、负片活动组G2、正片活动组G3、负片活动组G4和正片固定组G5A。

18.

<sup>198</sup> The lens assembly according to claim 1, with a zoom ratio of 6.2:1 and an optical extension value of 2.88mm<sup>2</sup>sr, with a positive film fixed group G1B, a negative film active group G2, a positive film active group G3, a negative film active group G4 and a positive film fixed group G5A .

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<sup>202</sup> 根据权利要求1的镜头组件，其变焦比为6.2:1，光学扩展量值为2.88mm<sup>2</sup>sr，带有正片固定组G1B、负片活动组G2、正片活动组G3、负片活动组G4和正片固定组G5A。

19.

<sup>209</sup> The lens assembly according to claim 1, with a zoom ratio of 5.7:1, an optical extension value of 4.62mm<sup>2</sup>sr, with a positive film fixed group G1B, a negative film active group G2, a positive film fixed group G3, a negative film active group G4, and a positive film fixed group G5A .

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<sup>213</sup> 根据权利要求1的镜头组件，其变焦比为5.7:1，光学扩展量值为4.62mm<sup>2</sup>sr，带有正片固定组G1B、负片活动组G2、正片固定组G3、负片活动组G4和正片固定组G5A。

20.

<sup>220</sup> The lens assembly according to claim 1, whose wavelength correction requires a focal depth of less than 3 from 430-1100nm compared with 550nm.

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<sup>223</sup> 根据权利要求1的镜头组件，其波长校正要求与550nm相比从430-1100nm其焦深小于3。

21.

<sup>229</sup> The lens assembly according to claim 1, whose wavelength correction requires a focal depth of less than 3 from 900 nm to 1700 nm compared with 1200 nm.

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<sup>232</sup> 根据权利要求1的镜头组件，其波长校正要求与1200nm相比从900-1700nm其焦深小于3。

22.

<sup>238</sup> The lens assembly according to claim 1, which has an external entrance pupil of 50, 75, 100, 150 mm or deeper.

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<sup>241</sup> 根据权利要求1的镜头组件，其具有50, 75, 100, 150mm或者更深的外部入射光瞳。

23.

<sup>247</sup> The lens assembly according to claim 1, which has an entrance pupil of 16-25 mm.

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<sup>249</sup> 根据权利要求1的镜头组件，其具有16-25mm的入射光瞳。

24.

<sup>255</sup> The lens assembly according to claim 1, which has a working distance/F1 ratio of 0.75 or more.

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<sup>257</sup> 根据权利要求1的镜头组件，其具有0.75以上的工作距离/F1比值。

25.

<sup>263</sup> The lens assembly according to claim 1, wherein the relative angle between the telecentric main beam and the object perpendicular to the plane is greater than  $2^\circ$ .

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<sup>266</sup> 根据权利要求1的镜头组件，其远心主光束与平面垂直的物体的相对角度大于 $2^\circ$ 。

26.

<sup>272</sup> The lens assembly according to claim 1, which is used together with other modules to provide wavelength correction. Compared with 550nm, the focal depth is less than 3 from 430nm to 1100nm.

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<sup>275</sup> 根据权利要求1的镜头组件，其与其它模块共同使用，提供波长校正，与550nm相比，从430-1100nm焦深小于3。

27.

<sup>282</sup> The lens assembly according to claim 1, which is used in conjunction with other modules to provide wavelength correction. Compared with 1200nm, the focal depth from 900nm to 1700nm is less than 3.

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<sup>285</sup> 根据权利要求1的镜头组件，其与其它模块共同使用，提供波长校正，与1200nm相比，从900-1700nm焦深小于3。

28.

<sup>292</sup> The lens assembly according to claim 1, which has an external entrance pupil of 50, 75, 100, 150 mm or deeper.

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<sup>295</sup> 根据权利要求1的镜头组件，其具有50, 75, 100, 150mm或者更深的外部入射光瞳。

29.

<sup>301</sup> The lens assembly according to claim 1, which has an entrance pupil of 16-25 mm.

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<sup>303</sup> 根据权利要求1的镜头组件，其具有16-25mm的入射光瞳。

30.

<sup>309</sup> The lens assembly according to claim 1, which has a D3/F3 ratio of less than 0.9.

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<sup>311</sup> 根据权利要求1的镜头组件，其具有小于0.9的D3/F3比值。

31.

<sup>317</sup> The lens assembly according to claim 1, whose wavelength correction requires a focal depth of less than 3 from 430-1100nm compared with 550nm.

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<sup>320</sup> 根据权利要求1的镜头组件，其波长校正要求与550nm相比从430-1100nm其焦深小于3。

32.

<sup>326</sup> The lens assembly according to claim 1, the wavelength correction requirement is from 900-1700nm and the focal depth is less than 3 compared with 1200nm, M1 is the highest magnification of the lens, and M2 is the lowest magnification of the lens;

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<sup>330</sup> 根据权利要求1的镜头组件，其波长校正要求与1200nm相比从900-1700nm其焦深小于3, M1是镜头的最高放大倍数，M2是镜头的最低放大倍数；



334 The depth of field is defined as,  $DOF = \pm \frac{W.D.}{2 \cdot NA^2}$ ,

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336 景深定义为， $DOF = \pm \frac{W.D.}{2 \cdot NA^2}$ ，

339 Among them:  $\lambda$  is the wavelength, NA is the optical parameter numerical aperture;

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341 其中： $\lambda$  是波长，NA是光参数数值孔径；

344 W.D. Is the working distance of the lens attachment;

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346 W.D. 是镜头附件的工作距离；

349 F1 is the focal length of the front lens attachment;

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351 F1是前镜头附件的焦距；

354 D3 is the optical path of the rear adapter shown in Figure X08;

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356 D3是图X08所示的后适配器的光程；

359 F3 is the focal length of the rear adapter.

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361 F3是后适配器的焦距。

### 33.

367 A finite yoke camera, comprising: the lens assembly described in any one of claims 1-32; an image sensor for capturing images on the image plane of the optical assembly; a screen or interface for communicating with an external screen, or two, Used to display the image captured in the image sensor.

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371 一有限轭距相机，包括：在权利要求1-32中任何一条中所述的镜头组件；用于捕捉图像位于光学组件图像平面上的图像传感器；与外屏幕通信的屏幕或者接口，或者两者，用来显示图像传感器中捕捉到的图像。

34.

<sup>379</sup> The finite yoke distance camera according to claim 32, including a digital microscope.

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<sup>381</sup> 根据权利要求32的有限轭距相机，包括一只数码显微镜。

35.

<sup>387</sup> A finite yoke camera, comprising: the lens assembly described in any one of claims 1-32; and an eyepiece, positioned and configured so that the image formed by the lens assembly can be seen through the eyepiece.

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<sup>390</sup> 一只有限轭距相机，包括：在权利要求1-32中任何一条中所述的镜头组件；一个目镜，定位和配置使得可以通过目镜看到镜头组件所形成的图像。

36.

<sup>397</sup> The finite yoke distance camera according to claim 35, including a microscope.

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<sup>399</sup> 根据权利要求35的有限轭距相机，包括一只显微镜。

37.

<sup>405</sup> The finite yoke lens assembly according to claim 1, further comprising a lens accessory module placed on the object side of the zoom component, and a rear adapter lens assembly placed on the image side of the zoom component.

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<sup>409</sup> 根据权利要求1的有限轭距镜头组件，进一步包括置于变焦部件的物侧上的一只镜头附件模块，以及一只置于变焦部件的像侧的后适配器镜头组件。

38.

416 The lens assembly according to claim 37, wherein the zoom component includes five lens groups, including a zoom triplet, two movable groups placed on either side of the third group, and any one of the zoom triplet Two stationary groups on the side.

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420 根据权利要求37的镜头组件，其中变焦部件包括五个镜头组，包括一只变焦三联体，包括两只置于第三组的任一侧上的活动组，以及置于变焦三联体的任一侧上的两只静止组。

39.

427 The lens assembly according to claim 38, wherein the two active groups include a negative film active group and two static groups including a positive film still group.

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430 根据权利要求38的镜头组件，其中两个活动组包括负片活动组和两个包含正片静止组的静止组。

40.

436 The lens assembly according to claim 39, wherein the third group includes a positive film active group.

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438 根据权利要求39的镜头组件，其中，第三组包括一个正片活动组。

41.

444 The lens assembly according to claim 39, wherein the third group includes a negative film active group.

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446 根据权利要求39的镜头组件，其中，第三组包括一个负片活动组。

42.

452 The lens assembly according to claim 39, wherein the third group includes a positive film still group.

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454 根据权利要求39的镜头组件，其中，第三组包括一个正片静止组。

43.

<sup>460</sup> The lens assembly according to claim 37, wherein the lens accessory module and the rear adapter lens assembly each include a positive film still lens group.

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<sup>463</sup> 根据权利要求37的镜头组件，其中，镜头附件模块和后适配器镜头组件每个都包括一个正片静止镜头组。