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(54) **Title:** BINOCULAR WITH A BUILT-IN FOCAL PLATE

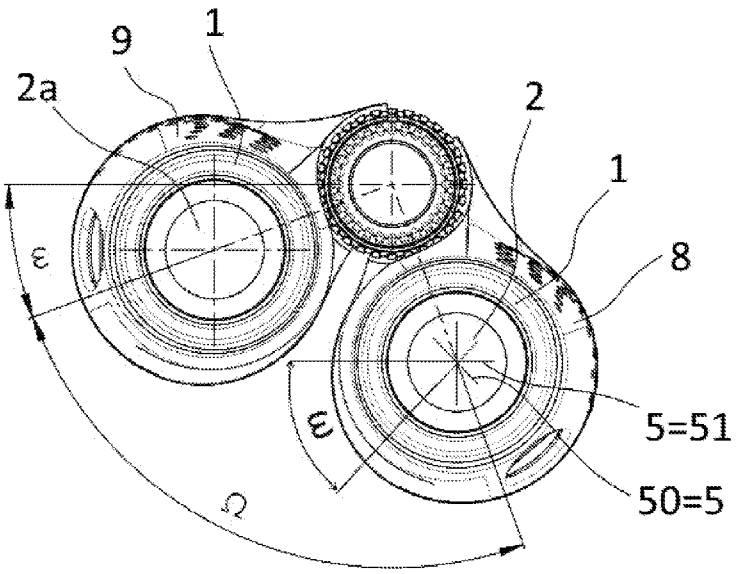

Fig. 3

(57) **Abstract:** The invention relates to a binocular with a built-in focal plate (5), comprising a pair of optical branches (8, 9) connected to each other by a tilting device (10) adapted to set the mutual axial distance between the optical branches (8, 9), whereby the optical branches (8, 9) are terminated with an eyepiece (2, 2a) having an eyecup (1), one of the eyepieces (2, 2a) being provided with a built-in focal plate (5) which is mounted reversibly rotatably about the longitudinal axis (O) of the eyepiece (2). The built-in focal plate (5) is mounted reversibly rotatably, independently of the tilt angle of the branches of the binocular, and is coupled to means adapted to lock the rotated position relative to the longitudinal axis (O) of the eyepiece (2).

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Binocular with a built-in focal plate

Technical field

The invention relates to a binocular with a built-in focal plate, comprising a pair of optical branches connected to each other by a tilting device adapted to set the relative axial distance between the optical branches, whereby the optical branches are terminated with an eyepiece having an eyecup and one of the eyepieces is provided with a built-in focal plate which is mounted reversibly rotatably about the longitudinal axis of the eyepiece.

Background art

Binoculars, produced so far, have an eyepiece which is provided with a fixed built-in focal plate. That means that when changing the setting of the interpupillar distance (changing the angle Ω of the opening of the branches), the focal plate is tilted towards the vertical plane, which must be during observation compensated for by tilting the entire binocular, and that may cause discomfort during observation or it may limit the field of view.

GB 2 291 720 discloses a solution of a binocular comprising a pair of optical branches connected to each other by a tilting device adapted to set the relative axial distance between the optical branches. The optical branches are terminated with an eyepiece having an eyecup and one of the eyepieces is provided with a built-in focal plate which is rotatable about the longitudinal axis of the eyepiece. The rotation of the focal plate is realized by means of geared transmission between the focal plate and the tilting device of the optical branches, wherein gear racks are provided on the circumference of the focal plate and on the circumference of the tilting device of the optical branches, the gear racks being coupled to each other by a rotary transverse shaft having a pair of toothed wheels at both ends, one of these wheels being associated with the gear rack on the focal plate and the other wheel being associated with the gear rack on the circumference of the tilting device of the optical branches. As a result, when the optical branches are tilted, also the focal plate is automatically rotated. The disadvantage of this embodiment is the dependence of the rotation

of the focal plate on the tilt angle of the optical branches and the necessity of precise adjustment of the relative position of the tilting of the optical branches and the rotation of the focus plate. Another disadvantage is the use of mechanical transmission between the tilting of the optical branches and the rotation of the focal plate, which increases the complexity of the binocular construction, reduces its durability and resistance to failure and damage.

Also known is 7x40 EDF binocular which is equipped with a focal plate fixedly mounted in the right-hand eyepiece. Consequently, the focal plate cannot be rotated at all. In the event of a change in the tilting of the optical branches for which the fixed horizontal position of the focal plate has been adjusted, it is therefore necessary to tilt also the entire binocular to use the focal plate, which is impractical and inconvenient.

The aim of the invention is therefore to eliminate or at least reduce the drawbacks of the background art, particularly to enable the user to set the rotation position of the built-in focal plate with respect to the optical branches of the binocular.

Principle of the invention

The aim of the invention is achieved by a binocular with a built-in focal plate, whose principle consists in that the built-in focal plate is reversibly rotatably mounted, independently of the tilt angle of the branches of the binocular, and is coupled to means adapted to lock the rotated position of the focal plate relative to the longitudinal axis of the eyepiece.

The principle of the invention consists in that the eyepiece is not fixedly incorporated in the binocular body, and so if the user changes the inclination of the optical branches, he or she can additionally correct the tilting of the built-in focal plate caused by this, so that the built-in focal plate, independently of the tilt angle of the branches of the binocular, is oriented again in a position allowing comfortable observation. The focal plate is rotated after the eyecup is pressed on with such force that the gear coupling is disengaged and the gear rack is unlocked. Then it is possible to rotate the entire complete eyepiece and thus also the focal plate at any angle of rotation. After releasing the pressure on the

eyecup, the gear coupling is reconnected by the pressure of the springs, thereby fixing the current set position of the focal plate. Subsequently, if the eyecup continues to be rotated, the eyepiece is already moving in the axial direction, thereby performing focusing.

Description of drawings

The invention is schematically represented in a drawing, wherein Fig. 1 shows an axonometric view of the entire binocular assembly, Fig. 2 shows the position of a cross from the side of the eyepieces with the distance between the two branches set at the maximum, Fig. 3 shows the position of the cross from the side of the eyepieces with the distance between the two branches set at the minimum, Fig. 4 shows the integration of the eyepiece into the assembly, Fig. 5 is a detailed structural design of the eyepiece, Fig. 6 is an exploded view of the eyepiece assembly, Figs. 7 and 8 show an axonometric view of a gear coupling.

Specific description

The invention will be described with reference to an exemplary embodiment of a binocular with a built-in focal plate 5, e.g., with a rangefinder scale, etc., which is intended especially for observing objects at great distances.

The binocular in Figs. 1 to 5 comprises a pair of optical branches 8, 9, hereinafter referred to either as “optical branches“ or only “branches“, which are in the middle section of the binocular connected to each other by a tilting device, by which the relative axial distance of the optical branches 8, 9 is set, as shown in Figs. 2 and 3 by the angle Ω.

The two optical branches 8, 9 are terminated with eyepieces 2, 2a having eyecups 1, one of the eyepieces 2, 2a, for example the eyepiece 2, being provided with a built-in focal plate 5, e.g., with a rangefinder scale, etc. The built-in focal plate 5 has no stable, i.e., fixed position relative to the eyepiece 2. According to the invention, the binocular with a built-in focal plate 5 is provided with means for rotating the built-in focal plate 5 into the desired, e.g., horizontal direction at any angle Ω of the mutual rotation of the two optical branches 8, 9,

preferably within the full range of the possible size of the angle Ω of the mutual rotation of the two optical branches 8, 9. The angle ε is an invariable basic angle determined by the construction of the binocular.

The means to rotate the built-in focal plate 5 to the desired direction at any angle Ω of the mutual rotation of the two optical branches 8, 9 are in the illustrated exemplary embodiment designed in such a manner that the eyepiece 2 comprises a tube 20 which is on its outer circumference provided with **a** multi-threaded thread 21, see Figs. 6 and 8, by means of which it is mounted rotatably about the longitudinal axis O of the eyepiece in a corresponding multi-threaded thread 43 on the inner wall of a sleeve 4, see Figs. 6 and 8. The eyepiece 2 is thus rotatably mounted in the sleeve 4.

The built-in focal plate 5 is mounted, here, for example, by means of a holder 51 in the sleeve 4, as shown in Fig. 5.

The sleeve 4 is further mounted with its outer wall reversibly displaceably in the direction of the longitudinal axis O of the eyepiece 2 and rotatably about the longitudinal axis O of the eyepiece 2 in a stationary housing 3, which is mounted in the binocular body, or, more precisely, in a prism cover 7 of the respective optical branch 8, 9.

The sleeve 4 is further provided with a locking means of its rotation about the longitudinal axis O of the eyepiece 2 in the stationary housing 3, i.e. it is provided with a coupling of the sleeve 4 rotation in the stationary housing 3 controlled by reversible displacement of the sleeve 4 in the direction of the longitudinal axis O of the eyepiece 2. In the exemplary embodiment shown, the locking means of the sleeve 4 rotation about the longitudinal axis O of the eyepiece 2 in the stationary housing 3, which is controlled reversibly displaceably in the direction of the longitudinal axis O of the eyepiece 2, is formed by a gear coupling which comprises a gear rack 41 on a flange 40 on the sleeve 4 and a gear rack 31 on a flange 30 on the stationary housing 3 which are arranged opposite each other**.** In an exemplary embodiment (not shown), the locking means of the sleeve 4 rotation about the longitudinal axis O of the eyepiece 2 in the stationary housing 3, which is controlled reversibly displaceably in the direction of the longitudinal axis O of the eyepiece 2, is

formed by another suitable means. In the illustrated exemplary embodiment, the gear racks 41 and 31 are provided on separate bodies which are attached to a respective flange by suitable means, e.g. by screws. To ensure reliable contact, the two gear racks 41 and 31 are pressed against each other by springs 45 which are at their ends provided with sliders 46. To avoid undesired spontaneous disengagement of the above-described displaceably controlled locking means of the sleeve 4 rotation about the longitudinal axis O of the eyepiece 2 in the stationary housing 3, e.g., undesired disengagement of the described gear coupling of the sleeve 4 and the stationary housing 3, the assembly of the sleeve 4 and of the stationary housing 3 is provided with a retainer, e.g., a magnetic and/or spring retainer, wherein in the connected state of the sleeve 4 and the stationary housing 3, the sleeve 4 and the stationary housing 3 are held to each other by the force of the springs 45 and/or by magnetic force. For example, the spring retainer consists ideally of three pressure springs 45 disposed along the circumference of the eyepiece 2, the pressure springs being stretched between the opposing walls of the eyepiece 2 and the below-mentioned eyecup 1, thereby pressing the two gear racks 41 and 31 towards each other. For example, the magnetic retainer is designed in such a manner that the rack gears 41, 31 are made of magnetically active materials attracting each other, or the rack gears 41, 31 are provided with magnets 35, etc. When the two parts of such a coupling are brought closer together, the magnets 35 will adhere to each other and the relative position of the sleeve 4 and the stationary sleeve 3 is fixed. In an exemplary embodiment (not shown), the assembly is designed without springs 45, only with magnets 35.

The assembly is further provided with the above-mentioned eyecup 1, which is mounted unrotatably in relation to the eyepiece 2, together with which the eyecup 1 is rotatable about the longitudinal axis O of the eyepiece 2, whereby the eyecup 1 is via the eyepiece 2 coupled to the sleeve 4 for controlling the reversible displaceable movement of the sleeve 4 in the direction of the longitudinal axis O of the eyepiece 2. In this manner, the rotary movement of the eyepiece 2 and the reversible displacement of the sleeve 4 is preferably controlled by a single element, namely by the eyecup 1. The eyepiece 2 with a built-in focal plate 5 according to the present invention can be

dismantled and replaced with another eyepiece, e.g. an eyepiece without a built-in focal plate 5, or an eyepiece with a different focal distance, with a different focal plate 5, etc.

The invention operates in such a manner that with a change in the relative position of the optical branches 8, 9, the angle Ω changes and, consequently, the built-in focal plate 5 of the eyepiece 2 is rotated, see Fig. 3, which shows the position of the built-in focal plate 50 in the right-hand eyepiece 2, rotated by the angle ω with respect to the required direction, e.g. horizontal direction, which is indicated in Fig. 3 by a solid line of the position of the built-in focal plate 51 in the right-hand eyepiece 2. If the locking means of the sleeve 4 rotation about the longitudinal axis O of the eyepiece 2 in the stationary housing 3, which is controlled reversibly displaceably in the direction of the longitudinal axis O of the eyepiece 2, is connected, e.g., the gear racks 41 and 31 engage with each other, then upon the rotation of the eyecup 1 about the longitudinal axis O of the eyepiece 2, this rotary movement is transmitted to the eyepiece 2, which is consequently also rotated, and due to the multi-threaded threads 21 and 43 and due to the locked rotation of the sleeve 4, it simultaneously moves in the direction of its longitudinal axis O, thereby focusing the image in the respective optical branch 8. If the user requires to change the position of the built-in focal plate 5, the locking means of the rotation of the sleeve 4 about the longitudinal axis O of the eyepiece 2 in the stationary housing 3 is disconnected (e.g. the illustrated gear coupling is disconnected with the gear racks 41 and 31) by moving the eyecup 1 in the direction of the longitudinal axis O of the eyepiece 2, e.g. and by pushing on the eyecup 1. This causes the disengagement of this locking means and the rotation of the sleeve 4 about the longitudinal axis O of the eyepiece 2 in the stationary housing 3 and upon the rotation of the eyecup 1, the eyepiece 2 freely rotates together with the sleeve 4, and therefore the built-in focal plate 5 can be rotated to a required position without changing the focus of the eyepiece 2. After adjusting the built-in focal plate 5 to the required position, the rotation of the sleeve 4 in the stationary housing 3 is locked again by moving the eyecup 1 to the initial position, and the adjusted position of the built-in focal plate 5 is fixed.

PATENT CLAIMS

1. A binocular with a built-in focal plate (5), comprising a pair of optical branches (8, 9) connected to each other by a tilting device adapted **to set** the mutual axial distance of the optical branches (8, 9), whereby the optical branches (8, 9) are terminated with an eyepiece (2, 2a) having an eyecup (1) and one of the eyepieces (2, 2a) is provided with a built-in focal plate (5) which is mounted reversibly rotatably about the longitudinal axis (O) of the eyepiece (2), **characterized in that** the built-in focal plate (5) is mounted reversibly rotatably, independently of the tilt angle of the branches of the binocular, and is coupled to means adapted to lock its rotated position relative to the longitudinal axis (O) of the eyepiece (2).

2. The binocular with a built-in focal plate (5) according to claim 1, **characterized in that** the eyepiece (2) is coupled switchably to rotary means for focusing the eyepiece (2) and to rotary means for rotating the built-in focal plate (5) about the longitudinal axis (O) of the eyepiece (2).

3. The binocular with a built-in focal plate (5) according to claim 1 or 2, **characterized in that** the eyepiece (2) is rotatably mounted about its longitudinal axis (O) in a sleeve (4) which is mounted reversibly displaceably in the direction of the longitudinal axis (O) of the eyepiece (2) and is rotatable about the longitudinal axis (O) of the eyepiece (2) in a stationary housing (3) which is accommodated in the binocular body, whereby the sleeve (4) is further provided with a locking means of the sleeve (4) rotation about the longitudinal axis (O) of the eyepiece (2) in the stationary housing (3), the locking means being controlled reversibly displaceably about the longitudinal axis (O) of the eyepiece (2).

4. The binocular with a built-in focal plate (5) according to claim 3, **characterized in that** the reversibly displaceably controlled locking means of the sleeve (4) rotation about the longitudinal axis (O) of the eyepiece (2) in the stationary housing (3) is formed by a gear coupling.

5. The binocular with a built-in focal plate (5) according to claim 4, **characterized in that** the gear coupling comprises mutually opposed gear racks (41, 31), whereby one of which is located on the sleeve (4) and the other on the stationary housing (3).

6. The binocular with a built-in focal plate (5) according to claim 5, **characterized in that** the gear racks (41, 31) are formed on separate bodies which are attached to a respective part (4, 3).

7. The binocular with a built-in focal plate (5) according to any of claims 4 to 6, **characterized in that** the locking means of the sleeve (4) rotation about the longitudinal axis (O) of the eyepiece (2) in the stationary housing (3) comprises at least one magnet (35) adapted to prevent spontaneous disengagement of the locking means.

8. The binocular with a built-in focal plate (5) according to any of claims 4 to 6, **characterized in that** the locking means of the sleeve (4) rotation about the longitudinal axis (O) of the eyepiece (2) in the stationary housing (3) comprises at least one spring (45) adapted to prevent spontaneous disengagement of the locking means.

9. The binocular with a built-in focal plate (5) according to any of claims 1 to 8, **characterized in that** the eyepiece (2) is coupled to the eyecup (1) which is adapted to control the rotatable movement of the eyepiece (2) and to control the means adapted to lock the rotated position relative to the longitudinal axis (O) of the eyepiece (2) by reversible displaceable movement in the direction of the longitudinal axis (O) of the eyepiece (2).

10. The binocular with a built-in focal plate (5) according to any of claims 1 to 9, **characterized in that** the eyepiece (2) with the eyecup (1) is detachably mounted in the structure.

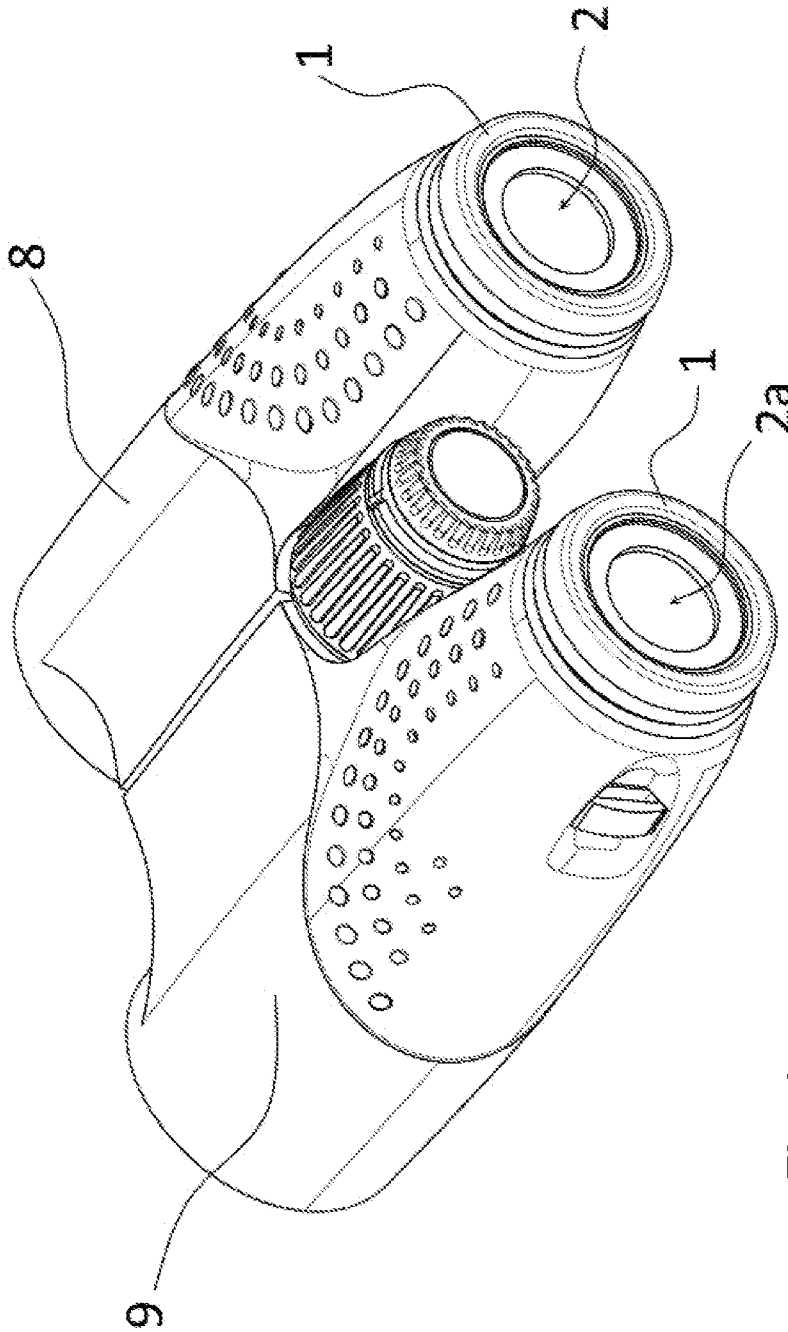

Fig. 1

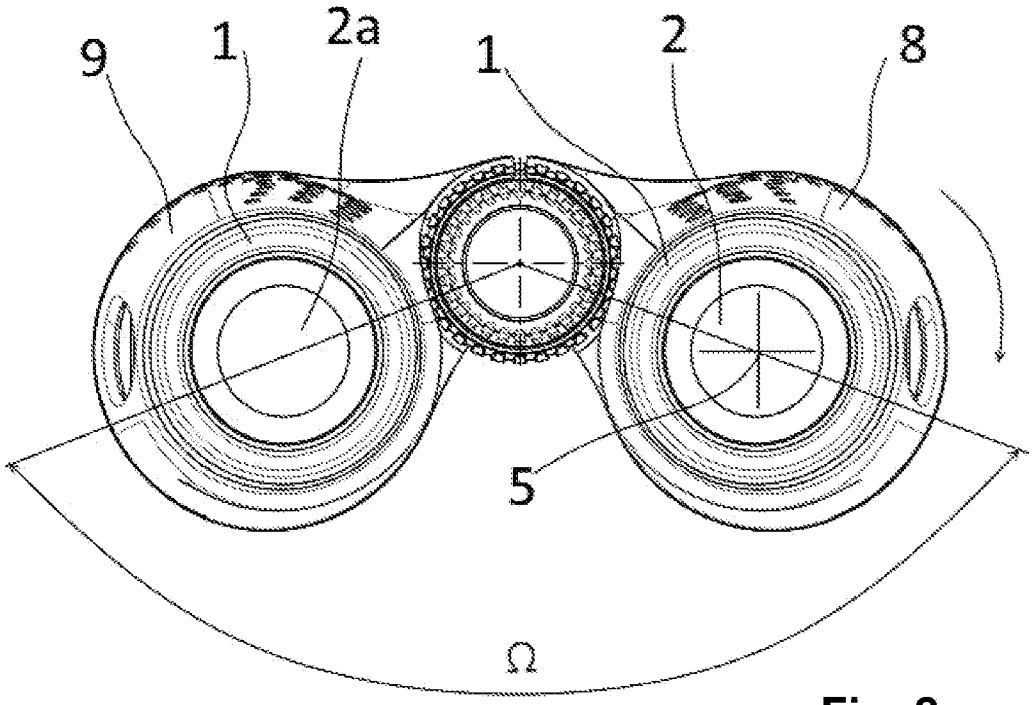

Fig. 2

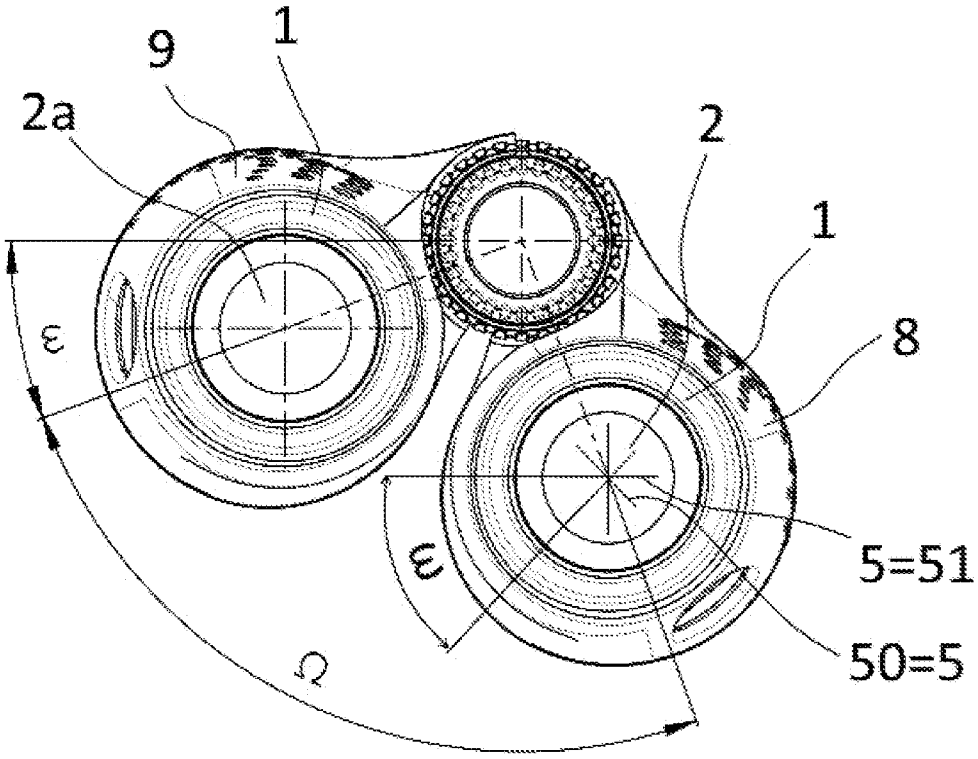

Fig. 3

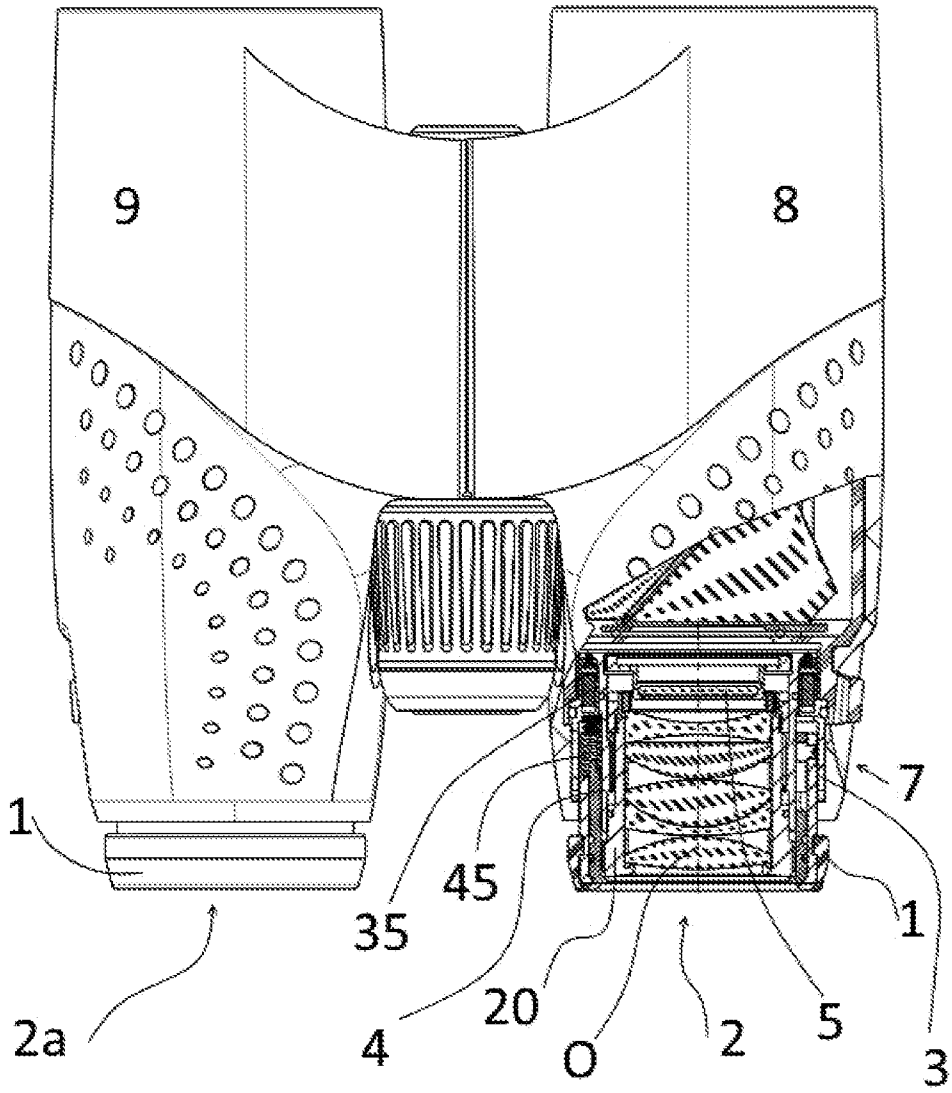

Fig. 4

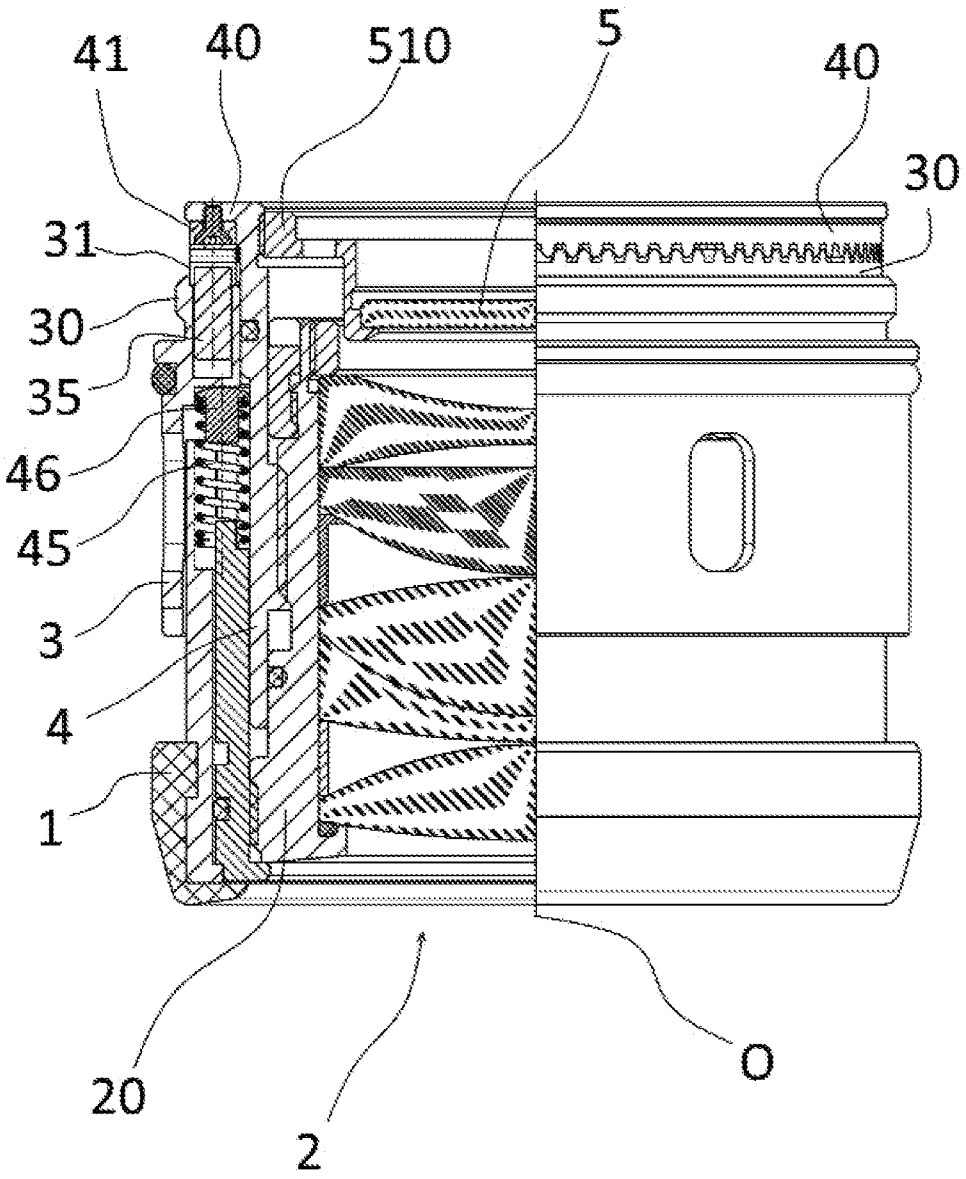

Fig. 5

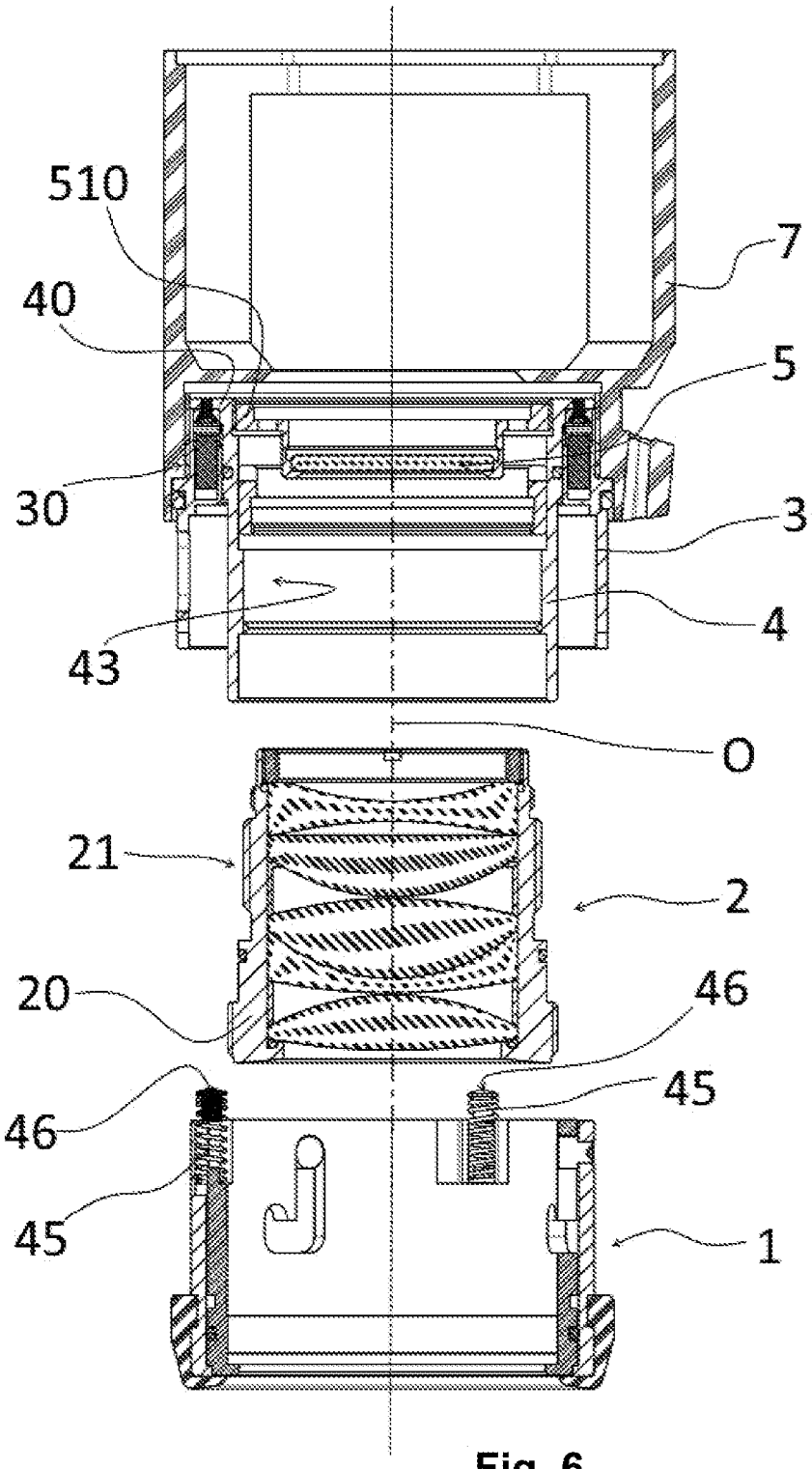

Fig. 6

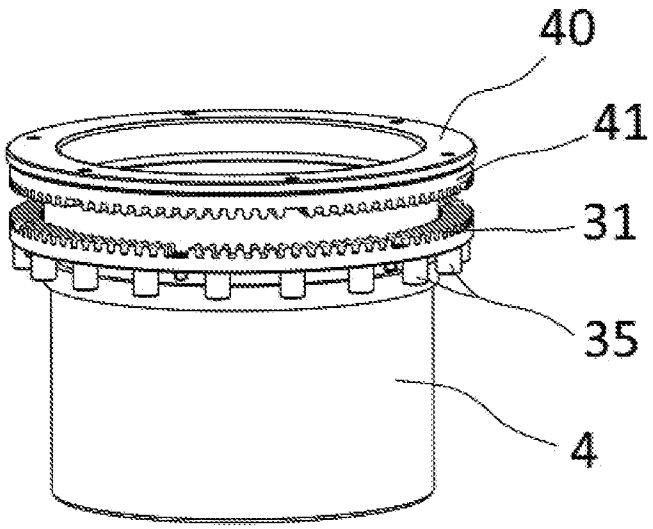

Fig. 7

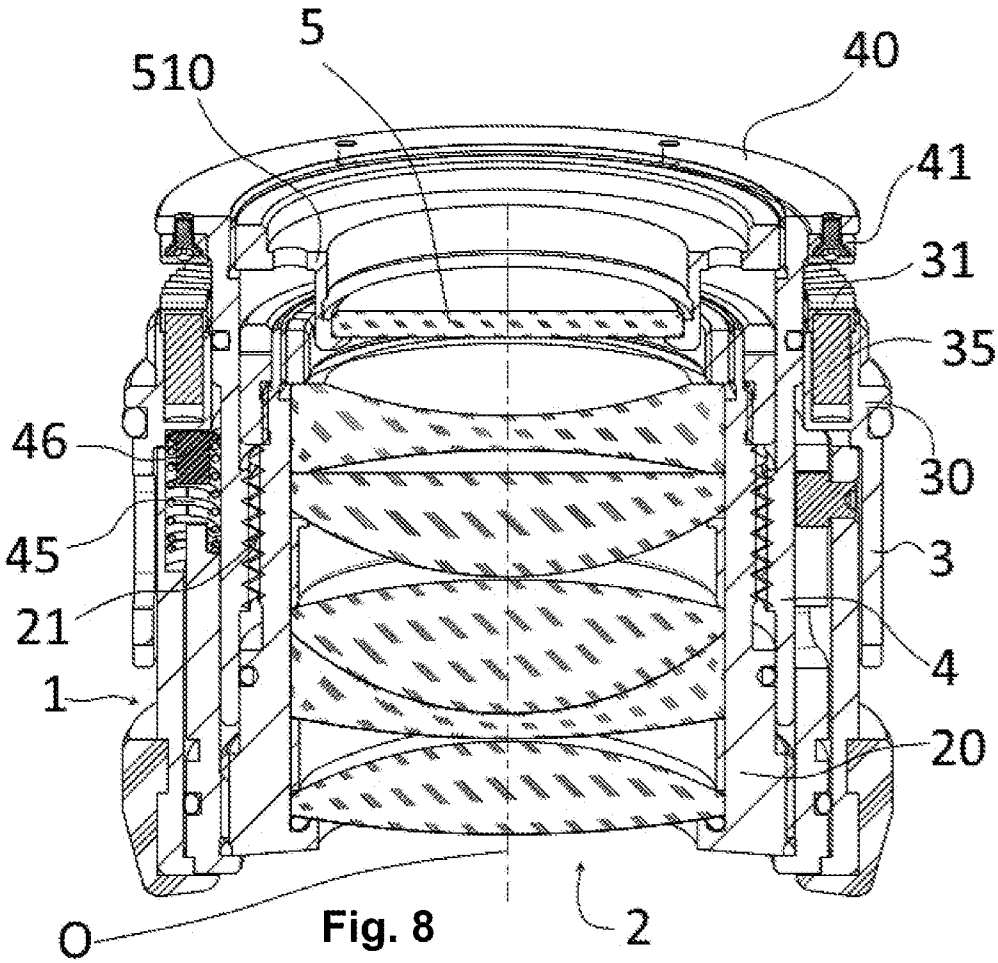

Fig. 8