33-247. XR 3,506,330 SR CROSS REFERENCE SEARCH ROOM

April 14, 1970 R. G. ALLEN 3,506,330
TELESCOPIC RANGEFINDING GUNSIGHT AUTOMATIC ELEVATION ADJUSTMENT
Filed July 18, 1967 2 Sheets-Sheet 1

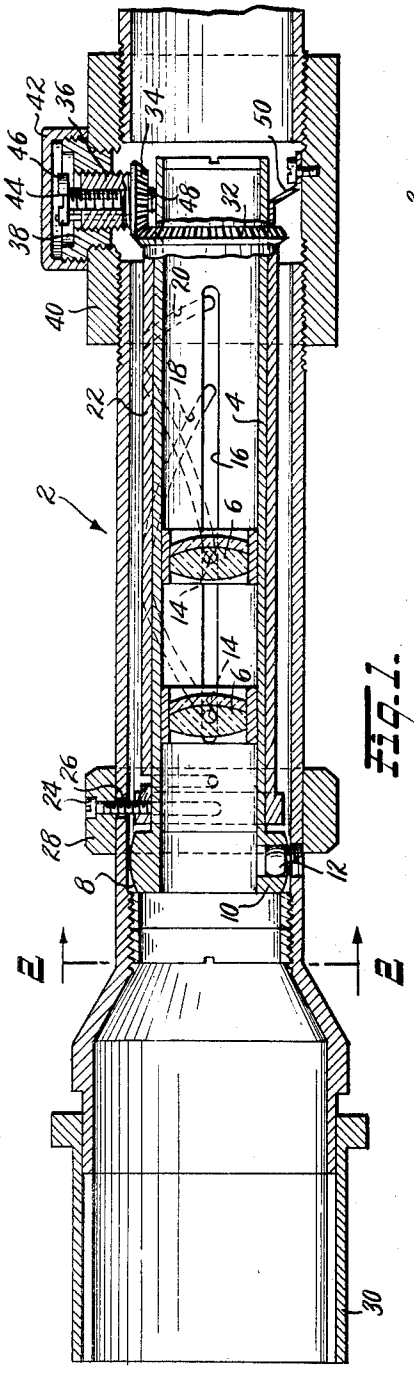


Fig. 1.

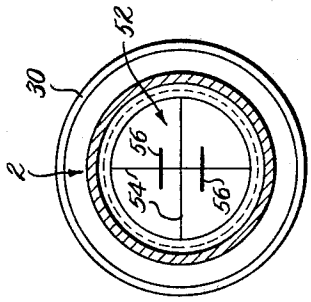


Fig. 2.

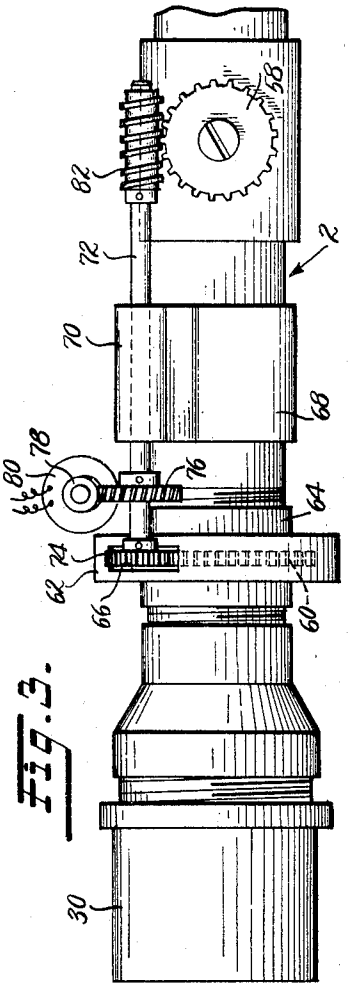


Fig. 3.

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TELESCOPIC RANGEFINDING GUNSIGHT AUTOMATIC ELEVATION ADJUSTMENT

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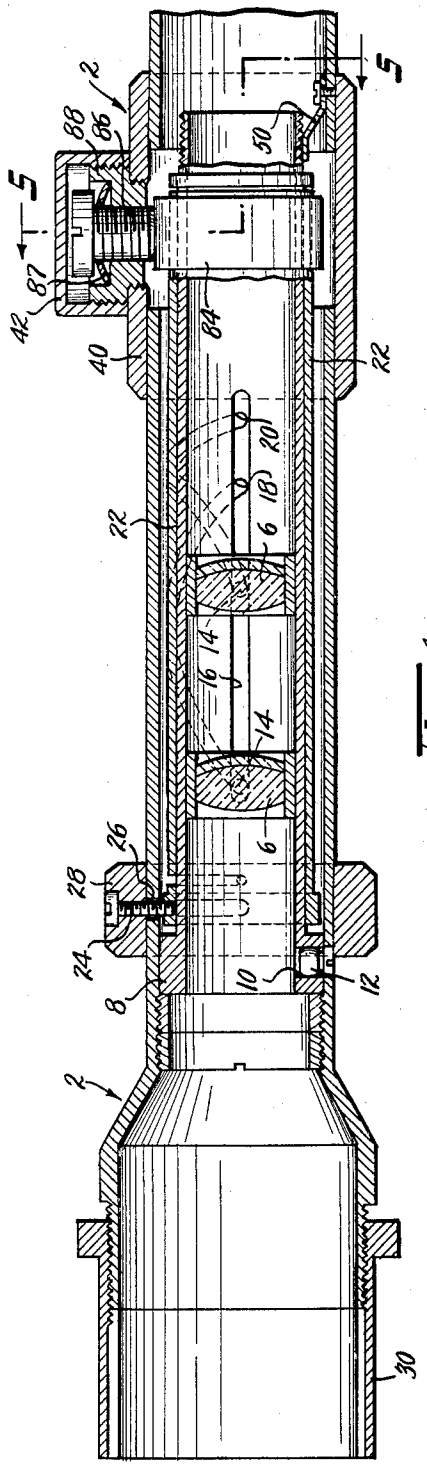


Fig. 4.

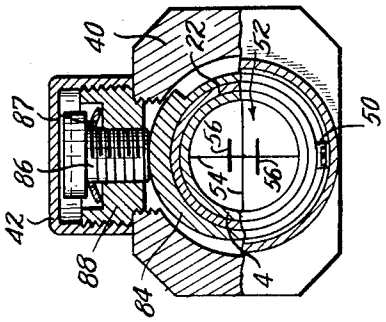


Fig. 5.

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TELESCOPIC RANGEFINDING GUNSIGHT AUTOMATIC ELEVATION ADJUSTMENT

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Int. Cl. G02b 27/32
U.S. Cl. 350—10 5 Claims

ABSTRACT OF THE DISCLOSURE

A telescopic gunsight having rotatable means for changing its magnification and a reference reticle such that adjustment of magnification so that the image of a target of known size bears a preset relation to the reticle is indicative of the distance to the target, and means actuated by the rotatable means for simultaneously changing the elevation of the line of sight relative to the gun.

BACKGROUND OF THE INVENTION

This invention relates to telescopic gunsights having means for changing the degree of magnification of the target operatively connected to means for determining the range to the target and automatically setting the proper elevation into the line of sight as a result of the change in magnification.

Guns, and particularly artillery pieces, have heretofore been provided with range finders which would automatically elevate the line of sight in accordance with the distance to the target. Such range finders, however, usually are complicated in structure and employ spaced prisms establishing two different points of view and are impractical when applied to a rifle. It is also known to provide a rifle with a telescopic gunsight having a rotary member for adjusting the optical elements to change the degree of magnification of the shooter's view of the target. Telescopic gunsights have also been provided with means for changing the elevation of the line of sight but which were separate from and not operationally related to means for changing magnification. In such sights it was necessary to determine the range by other means, then manually elevate the line of sight. Devices for changing the degree of magnification are exemplified by the patent to Burris et al. 3,161,716.

SUMMARY OF THE INVENTION

The present invention comprises a telescopic gunsight having a rotary member for adjusting the degree of magnification of the target image and a fixed reticle so designed that a target of known height can be viewed and the image thereof adjusted as to size until it bears a predetermined relation to the reticle, at which time the amount of rotation imparted to the magnifying means is indicative of the range to the target. That rotary member is drivingly coupled to elevating means for the line of sight whereby the line of sight is automatically adjusted for the correct range without further action on the part of the shooter. In one form of the invention, the rotary member is coupled by bevel gears to a threaded abutment in a supporting housing to advance or retract the abutment and a spring holds an optical tube, the axis of

which constitutes the line of sight, against that abutment and causes it to follow the same as the gears are rotated. The tube referred to is pivotally mounted in the telescope and engages the abutment near one of its ends so that vertical movement at that end will effect tilting of the line of sight. A second embodiment is similar to the first but employs an electric motor to impart rotation to the magnifying means and to the threaded abutment, simultaneously. A third embodiment employs a radial cam on the rotary member, which cam directly abuts a fixed stop in the housing and a spring causes the axis of the rotary member to move toward or from the abutment, depending upon the angular position of the cam.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal sectional view of a telescopic gunsight embodying the principles of the present invention and showing one modification thereof;

FIG. 2 is a sectional view along the line 2—2 of FIG. 1 and illustrates a preferred form of reticle;

FIG. 3 is a top plan view of a telescopic gunsight comprising a second embodiment;

FIG. 4 is a view similar to FIG. 1 showing a third embodiment of the invention; and

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, numeral 2 indicates a generally tubular structure constituting an outer housing for the telescopic gunsight of the invention. It is contemplated that the housing 2 be fixedly secured to a rifle or the like in any customary manner so as to be held rigidly thereon. Within the tubular housing 2 is a further tube 4 within which erecting lens means 6 are slidably mounted for axial movement therein. The tube 4, at its rearmost end, is preferably formed with a generally spherical portion 8 having a socket 10 into which a ball or pivot member 12 extends. The member 12 is fixed to the housing 2. Thus, the outer or right hand end of tube 4 can be moved in any lateral direction within the housing 2, there being sufficient clearance for this purpose. The optical elements 6 are provided with laterally extending pins 14 projecting through an elongated slot 16 in the tube 4. Those pins 14 also extend into helical slots 18 and 20 in a sleeve 22 rotatably carried by the outer surface of the tube 4. At its rear end the sleeve 22 is provided with a pin or screw 24 extending outwardly through a circumferential slot 26 in the housing 2 and which fixedly joins the sleeve 22 to an adjusting ring 28 rotatably carried by the outer surface of the housing 2. Suitable objective and eyepiece lens systems (not shown) are provided as is customary. It will be obvious that rotation of the ring 28 will cause the erecting lenses 6 to move longitudinally within the tube 4 and relative to each other and the lenses are so designed that such movement will change the degree of magnification of a target viewed through the eyepiece 30. That is, the image seen by the viewer can be made larger or smaller. The structure thus far described may be considered conventional and substantially fully disclosed in the patent previously referred to. To achieve the objectives of the present invention the sleeve 22 is provided

at its forward end with a bevel gear **32** rigidly fixed thereon. The bevel gear **32** meshes with a further bevel gear **34** fixed on a screw-threaded plug **36**, threadedly carried by a support member **38** threaded into coupling member **40** constituting a part of the housing **2**. As shown, a removable protective cap **42** engages the support **38**. A central screw **44** is threaded through the plug **36** and is provided with a head **46** accessible for manual adjustment when the cap **42** is removed. The central screw **44** abuts, at its lower end **48**, with the outer surface of tube **4** to thus limit upward movement of that end of the tube. A suitable leaf spring **50** is mounted within the coupling member **40** and bears at its free end against the bottom surface of the tube **4** so as to constantly urge the same into abutting engagement with the screw **44**. It will be obvious therefore that rotation of the sleeve **22** will cause the gears **32** and **34** to rotate. Rotation of gear **34** will cause the plug **36** to move upwardly or downwardly because of its threaded connection to the support **38**. The central screw **44** rotates and moves with the plug **36** and thus changes the vertical position of the abutment end **48** thereof whereupon the spring **50** will cause the tube **4** to tilt upwardly or downwardly about its rearward end defined by the spherical portion **8** and this tilting movement will adjust the vertical angle of the line of sight established by the axis of the optical elements **6**. The slots **18** and **20** are so configured that they properly coordinate the change in magnification and the degree of tilt of the line of sight.

Referring now to FIG. 2, there is shown therein a reticle generally designated at **52** and preferably located at the focus of the eyepiece, as is conventional. The reticle **52** comprises a transparent member having lines or cross-hairs delineated thereon, such as the cross-hairs **54**. In addition, a pair of short cross-hairs or lines **56** are provided on the reticle a fixed vertical distance apart. The spacing between the lines **56** is predesigned so that operation of the means for adjusting the degree of magnification will magnify an image of the target such that a target of known height (for example, one foot) will appear to exactly occupy the vertical space between the lines **56** and the amount of rotation to achieve that image size is indicative of the range to that target.

In operation, the shooter may select portions of the target known to be about one foot high and adjust the magnification of the described telescopic gunsight until the selected portion of the target extends from one to the other of the lines **56** and the resulting rotation of sleeve **22** and tilting of tube **4** will tilt the line of sight the correct amount for shooting at that target at that range.

In the modification illustrated in FIG. 3, it can be assumed that the internal optical system and means for adjusting the same is identical to that described with reference to FIG. 1. However, the gears **32** and **34** are omitted and the threaded plug **36** extends upwardly and outwardly of the housing **2** and has a worm gear **58** fixed to its upper end. Instead of the adjusting ring **28** of FIG. 1, the sleeve **22** is provided with a gear **60** fixed thereto and housed within an auxiliary housing **62** comprising a part of a coupling member **64** and which gear is exposed through a slot **66** in the auxiliary housing. A supporting bracket **68** is mounted on the housing **2** and defines a supporting bearing **70** for a shaft **72**. At its rear end the shaft **72** is provided with a gear **74** fixed thereon and meshing with the gear **60**. A second gear **76** is fixed on the shaft **72** and meshes with a worm drive **79** on the output shaft of an electric motor **80** mounted on the housing **2** by means not shown. At its forward end the shaft **72** has fixed thereon a worm drive **82** meshing with the worm gear **58**.

The operation of the embodiment of FIG. 3 will be obvious to those skilled in the art and provides a motor drive for changing the magnification of the target and simultaneously changing the angle of elevation of the line of sight. It is contemplated that suitable controls be provided within easy reach of the shooter so that he may control operation of the motor **80** to effect the required change of magnification of the target in the manner already described and thereby properly adjust the line of sight to the correct range. Obviously, the embodiment of FIG. 3 will include a reticle such as that described with reference to FIG. 2.

In the embodiment shown in FIGS. 4 and 5, the main elements of the telescope are identical to those shown and described in FIG. 1 and thus identical parts bear the same reference numerals and will not be further described herein. In the FIG. 4 embodiment, however, the gears **32** and **34** are omitted and a radial cam **84** is fixedly secured to the outer surface of the sleeve **22** at its outer end. The leaf spring **50** bears against the forward end of tube **4** and urges the same upwardly to cause the surface of the cam **84** to engage a fixed but manually adjustable abutment defined by an abutment screw **86** threaded through a support member **88** which in turn is threadedly secured to the housing **2**. As in the form of FIG. 1, a removable protective cap **42** is provided. When the cap **42** is removed, manual adjustment of the abutment screw **86** may be made, which adjustment is maintained by spring washer **87**.

As will be obvious, rotation of the ring **28** to effect the desired change in degree of magnification of the target image will cause the sleeve **22** and cam **84** to rotate. Since the outer surface of cam **84** varies in a radial direction, such rotation will permit the tube **4** to be tilted upwardly or forced downwardly to thereby change the vertical angle of the line of sight established by optical elements **6**. The manner in which the shooter manipulates the gunsight of this embodiment is exactly the same as that already described with reference to FIG. 1.

For convenience of illustration the spring **50** is shown at the bottom of the gunsight whereas in practice it will preferably be positioned part way up one side of the housing **2** to serve the dual purpose of holding tube **4** against the tilt adjustment screw and also against a conventional windage adjustment member (not shown).

While a limited number of specific embodiments of the invention are shown and described herein, it is to be noted that the same are merely illustrative of the principles of the invention and that other modifications may be resorted to within the scope of the appended claims.

I claim:

1. In a telescopic gunsight having optical means for establishing a line of sight and for magnifying a shooter's view of a target and movable adjusting means for changing the degree of magnification, fixed reticle means in said line of sight for indicating the degree of magnification of a target of known height whereby movement of said adjusting means to establish a predetermined relation between the shooter's view of a target and said reticle means is indicative of the range to said target, and elevating means for tilting said line of sight in said gunsight, said gunsight comprising: a housing adapted to be fixed to a gun; a barrel tiltably mounted in said housing; said optical means including at least one optical element within and movable along said barrel; said adjusting means comprising a sleeve rotatable about said barrel and means responsive to rotation of said sleeve for moving said optical element along said barrel; said elevating means being drivingly connected to said sleeve for tilting said barrel in said housing and thereby tilting said line of sight in response to rotation of said sleeve to establish a proper sight elevation for shooting at said target.

2. A gunsight as defined in claim **1** wherein said elevating means comprises spring means in said housing urging said barrel to tilt therein; abutments threadedly supported in said housing and limiting the tilting of said barrel by said spring; and gear means interconnecting said sleeve and said abutment whereby rotation of said

sleeve adjusts the position of said abutment and thereby the degree of tilt of said barrel.

3. A gunsight as defined in claim 1 wherein said sleeve is journalled on said barrel and tiltable therewith; said elevating means comprising spring means in said housing urging said barrel to tilt therein; a radial cam extending around the outer periphery of said sleeve; and an abutment in said housing engaging the periphery of said cam to limit tilting of said barrel and sleeve whereby rotation of said sleeve and cam changes the angle of tilt of said barrel.

4. A gunsight as defined in claim 1 including electric motor means arranged to rotate said sleeve.

5. A gunsight as defined in claim 1 including calibrating means for manually changing the direction of said line of sight independently of operation of said elevating means.

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