Dec. 16, 1969 HITOSHI GOTOH 3,484,148

TELESCOPIC SIGHT WITH SERPENTINE SPRING PIVOT MEANS

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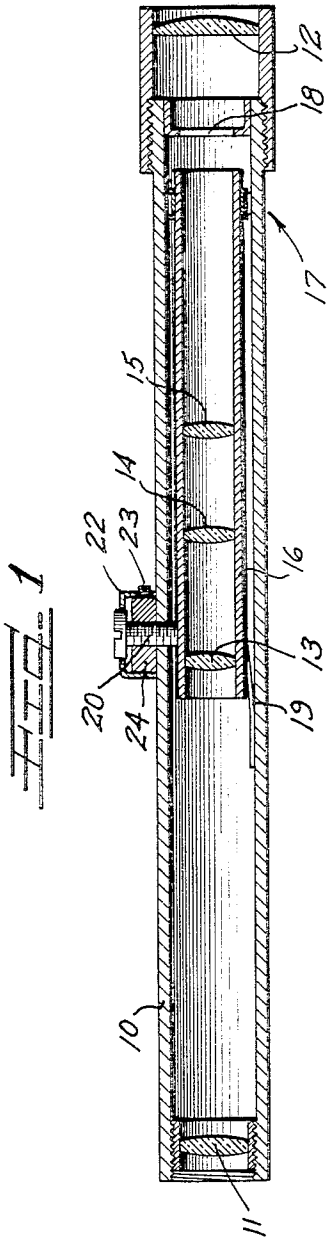


Fig. 1

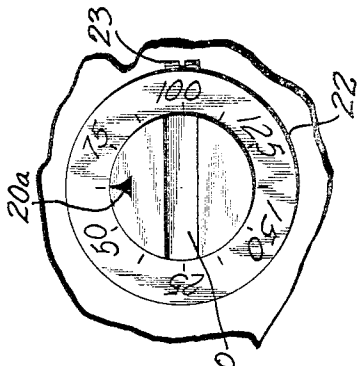


Fig. 4

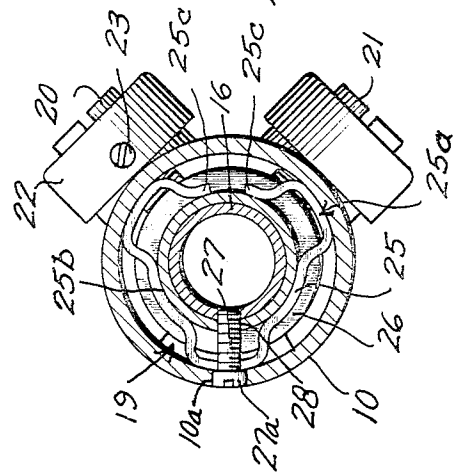


Fig. 3

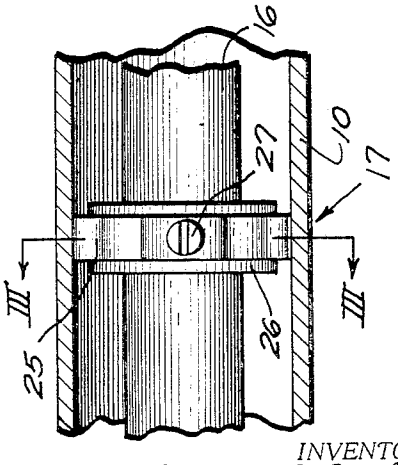


Fig. 2

INVENTOR.
Hitoshi Gotoh

BY Mills, Sherman, Meroni, Gross & Simpson ATTORNEYS

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TELESCOPIC SIGHT WITH SERPENTINE SPRING PIVOT MEANS

Hitoshi Gotoh, 566 Ohaza Kamisuwa, Nagano-ken, Suwa-shi, Japan

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ABSTRACT OF THE DISCLOSURE

A telescopic sight construction providing positive resilient pivotal support in an inexpensive manner for the erection system and providing a direct reading range indicator for such system.

As those skilled in the art of telescopic sights are aware, modern techniques of rifle telescope manufacture have emphasized reduction in cost with substantial improvements in structural soundness. The present invention is concerned with providing a novel and substantially improved adjusting mechanism for inexpensive rifle telescopes such that substantially complete adjustment of the telescope, for sighting purposes, may be made simple, by inexpensive means, and with substantially absolute accuracy.

As those familiar with the art of telescopes, and more particularly, telescopes for use with rifles, are aware, the designs for such constructions have become increasingly sophisticated in recent years. Problems of quality control have been replaced by problems of obtaining a truly satisfactory telescope from the preformer's point of view without the expense of large sums. It is, accordingly, an object of the present invention to provide a rifle telescope of substantially reduced expense without related reduction in quality of performance.

In these circumstances, it has become increasingly important that improvements in rifle telescope constructions include reduction in complexity, both of use and manufacture. In accordance with the principles of the present invention, such savings have been incorporated, while at the same time operation of the rifle telescope has been improved.

In recent years, rifle telescopes have been constructed in which elevation and windage adjustments are accomplished by means of adjustment of the erector lens system, rather than by adjustment of the reticle per se. Although in earlier systems, the lens systems were rigidly mounted within the main telescope barrel, it has been found that the adjustments of the erector lenses, en masse, are capable of providing an extremely desirable rifle telescope if the adjustment movement of the lens systems can be accomplished without weakening the system's ability to resist physical shock. In accordance with the principles of the present invention, a novel and substantially improved, yet very inexpensive, pivot device is provided for securing one end of the erector lens-mounting barrel relative to the rifle telescope main tube. Additionally, the invention contemplates the provision of a novel, improved, mechanism for adjusting the other end of the pivoted erector tube, thereby providing a novel, simplified, rifle telescope adjustment mechanism.

Pursuant to the present invention, the rifle telescope erector lenses are mounted rigidly within a sub-barrel. This sub-barrel is pivotally mounted at its forward or rearward end, preferably at its rearward end, by means of a serpentine metallic spring element which encircles the erector barrel and varies between effective diameters substantially the same as the outside diameter of the erector barrel and diameter which is substantially the same as the

internal diameter of the main barrel. This serpentine spring is held against longitudinal movement relative to the main barrel and the erector barrel. The opposite end of the erector tube is provided with a screw adjustment acting against a spring arranged to provide, with the ammunition of the type for which the telescope is designed, a direct reading adjustment by which the known range may be correleted with a reference point to adjust the rifle telescope instantly to the desired point of impact.

It is, accordingly, an object of the present invention to provide a new and improved system for mounting and adjusting a rifle telescope erector lens system.

Another object of the present invention is to provide a novel direct-reading sight adjustment.

Still a further object of the present invention is to provide a novel, universal pivot mount for erector barrels or the like.

A feature of the invention is the provision of a mounting and adjusting screw for the elevation adjustment of a sight which provides direct elevation readings in range units.

Still a further feature of the invention is the provision of a pivot connection between a pair of concentric tubes which comprises a serpentine spring snugly co-operating with both tubes and axially fixed with respect to both.

Still other and further objects and features of the invention will at once become apparent to those skilled in the art from a consideration of the attached drawings and the following specification, wherein a preferred form of the invention is shown, by way of illustration only, and wherein:

FIGURE 1 is a side-elevational view in cross-section of a rifle telescope constructed in accordance with the principles of the present invention;

FIGURE 2 is an enlarged side view of the erector tube suspension system shown in FIGURE 1 as viewed from an angle approximately 45° from the horizontal;

FIGURE 3 is a cross-sectional view taken along the line III—III of FIGURE 2; and

FIGURE 4 is a plan view, enlarged, of one embodiment of the adjusting screw employed for elevation adjustment in accordance with the principles of the present invention.

As shown on the drawings:

As may be seen from a consideration of the drawings, the rifle telescope of the present invention comprises a main tube **10** having an objective lens **11** and an eyepiece lens **12**. Intermediate between the lenses **11** and **12** an erector lens system comprising a collector lens **13** and erector lenses **14** and **15** is rigidly mounted within an erector barrel **16**. The erector barrel **16** is of a smaller diameter than the main tube and is mounted, in the embodiment illustrated, for pivotal movement about its rear, or eyepiece, end as indicated generally at **17**. The other end of the erector barrel or tube is biased by means of a spring **19** into firm contact with an elevation adjustment screw **20** and a windage screw **21**. A reticle, in any form, but conventionally in the form of a cross-hair, is provided at **18**.

In operation, the rifle telescope of the present invention is rigidly secured, by securing the main tube **10**, to a rifle or similar weapon in a rigid manner. This attachment may take any number of forms which comprise no part of the present invention, but which ordinarily consists of one or more rigid mounts arranged to attach the tube **10** in a position substantially parallel to the barrel of the rifle. With such attachment, the elevation screw **20** is positioned with its longitudinal axis in a generally vertical direction while the windage adjustment screw **21** is substantially horizontally disposed. With this arrangement the spring **19** lies substantially on the bisector of

the angle between the screws **20** and **21** to provide a substantial spring bias against both screws. In the embodiment illustrated, the pivot **17** comprises a serpentine spring **25** which is mounted in a circular channel **26** and is longitudinally secured relative to the tube **16** as well as the tube **10** by means of a screw **27**, which similarly lies on the bisector of the angle between screws **20** and **21**.

The pivot **17** comprising the spring **25**, channel **26** and screw **27** provides an extremely strong and yet highly flexible mounting capable of providing universal pivotal motion over relatively narrow angles of deflection without introducing vibration or looseness. As may be seen in the drawing, the serpentine spring **25** is of substantial width and has regularly alternating shoulder segment portions **25***a* and cradle segment portions **25***b*. The shoulder segment portions **25***a* are on a diameter equal to but normally slightly larger than the internal diameter of the main sight tube member **10** and thrust tightly frictionally toward the internal perimeter of the sight tube member. The cradle segment portions **25***b* are on a diameter substantially smaller than the diameter about the segments **25***a* and arranged to thrust tightly frictionally toward the outside perimeter of the erector tube **16**, being for this purpose normally on a slightly smaller diameter than the outside diameter of the channel **26**. Accordingly, upon installation into the tube **10**, a tight-oppositely thrusting friction fit of the segments **25***a* and **25***b* is provided which is permitted by the fact that the spring **25** is not completely circuitous but terminates at ends which together provide one of the erector tube cradling segments of the spring **25***c*. The screw **27** passes through an aperture **28** in channel **26** and is threaded into tube **16**. The head **27***a* of the screw is a tight fit in the aperture **10***a*. As a result of this arrangement, the tube **16** may rock about the head **27***a* in the tube aperture **10***a* while at the same time it is maintained substantially exactly concentric with tube **10** by means of the serpentine spring **25**. It may be observed that while it is not essential that the channel **26** be provided, it is preferred in order to insure accurate axial positioning of the spring **25** at all places about the periphery of the tube **16**.

As above noted, simplification is an extremely important aspect of the present invention. It has been found, that when employing the relatively simple construction of this invention with rifles, that inexpensive rifles such as ordinarily chambered for the .22 caliber rifle bullet provide an important area of use. Such cartridges have a relatively curved or non-flat trajectory which is relatively constant in view of the accuracy of modern ballistic manufacture. Accordingly, the adjustment screw **20** is provided, in the present invention, with a thread providing a vertical elevational movement of the erector system throughout the normal effective range of such a weapon, for example, 200 yards, in one full turn of the screw. In the arrangement illustrated, a bezel **22** is rotatably mounted about fixed mounting cap **24** and is adjustably secured thereto by means of a set screw **23**. Accordingly, when the telescope is mounted upon the rifle, an initial setting of the telescope to zero in at 25 yards will subsequently provide automatic registry of the telescope for proper bullet impact at various ranges merely by directly setting the elevation screw **20** with the indicia marker **20***a* opposite the indicated range. It will be apparent, similarly, that an approximate range may be determined, after the rifle has been properly sighted in, as above observed, by observing the point of impact of the bullet following an adjustment for a predetermined estimated range.

In actual practice, it has been found that a .22 long rifle cartridge of standard manufacture will drop, due to the forces of gravity, a vertical distance of approximately eight inches over a travel of 100 yards. By considering the 25 yard point as a zero point, with the rifle shooting at a slight angle upwardly so that the bore thereof coincides with the optical telescope axis at this point, it is possible to provide a total erector tube angle adjustment capable of providing a reticle movement of the said eight inches at 100 yards. This movement may be accomplished by substantially less than one turn of the screw and, hence, satisfactorily accomplished in a direct reading manner, as illustrated. It will be understood that the ballistic direct-reading adjustment for the telescope may readily be employed with all manners of cartridges and this may simply be accomplished by substituting variously calibrated bezels **22**. Manifestly, as higher powered cartridges are employed with a relatively flatter trajectory, a substantially greater yardage may be encompassed upon the periphery of the bezel **22** since one turn of the screw **20** will under these circumstances cover a range substantially greater than 100 or 200 yards. With this arrangement, the rifle telescope may be sold matched to a specific rifle or marketed with a wide variety of bezels **22** for attachments to various rifles and specific ballistic loads.

It has been found, accordingly, that the construction of the present invention provides an essentially rigid, extremely inexpensive erector lens mounting system capable of simple adjustment in a substantially shock-proof manner. The simplicity of the system has lent itself to extremely inexpensive manufacture while providing a substantially improved rifle telescope.

I am, of course, aware that variations may be made in the structure above illustrated without departing from the scope of the novel concepts of the present invention. For example, the range markings may be fixed to the screw **20** and the pointer adjustably mounted on the tube **10**. Alternatively, the movable ring may be adjustably mounted on the screw **20**. It will be further apparent that the shape of spring **19** may vary, that the tube **16** may be pivoted at the forward end and adjusted at the eyepiece end for elevation and windage, and/or that a spring portion **25***b* may be secured to the erector tube **16** by a second screw separate from a screw **27** securing portion **25***a* to tube **10** with or without channel **26**. It is, accordingly, my intent that the scope of the invention be limited solely by that of the hereinafter appended claims.

I claim as my invention:

1. In combination in a telescopic sight for firearms having a sight tube member carrying longitudinally speced objective and ocular optical elements and an image-erecting optical system disposed therebetween, support structure for the erecting system comprising an erector tube of smaller diameter in said sight tube member and extending in clearance relation longitudinally thereof, pivot means mounting one end of said erector tube in said sight tube member, means vertically and horizontally adjusting said erector tube at the other end thereof, and means axially positioning said erector tube relative to said sight tube member:

said pivot means comprising a serpentine spring of substantial width substantially encircling said erector tube and having alternating cradle and shoulder segment portions;

said shoulder segment portions being on a diameter to thrust tightly frictionally toward an internal perimeter of the sight tube member;

said cradle segment portions being on a diameter to thrust tightly frictionally toward an outside perimeter of the erector tube;

said erector tube being held by the respective opposite thrusting of the shoulder segment portions and the cradle segment portions respectively toward the sighting tube member and the erector tube firmly substantially concentric relative to the sight tube member in an extremely strong and yet highly flexible mounting capable of providing universal pivotal adjustment motion of the erector tube over relatively narrow angles of deflection without introducing vibration of looseness, and means retaining said spring in axial orientation relative to said tubes and tube member.

2. A telescopic sight according to claim 1, said means axially positioning said erector tube within said sight tube member engaging with said spring.

3. A telescopic sight according to claim 1, comprising means positioning said spring in axially fixed position relative to said erector tube, and said means axially positioning said erector tube within said sight tube member engaging the erector tube at one point on its pivoted end portion.

4. A telescopic sight according to claim 3, said axially positioning means comprising a pin passing generally radially through said sight tube member and into said erector tube.

5. A telescopic sight according to claim 3, said axially positioning means comprising a pin passing generally radially through said sight tube member and said spring and into said erector tube along a line at an angle substantially bisecting the angle between the vertically and horizontally adjusting mean.

6. A telescopic sight according to claim 1, said means retaining said spring including said means axially positioning said erector tube relative to said sight tube member and comprising an annular U-channel secured to one of said sight tubes and axially confining said spring, and means securing a point on the spring to the other of said tubes.

7. A telescopic sight according to clean 1, said means for vertically adjusting the erector tube comprising a screw threadly mounted on said sight tube member and

operatively connected to the erector tube for vertical adjustment thereof, a bezel ring mounted on said sight tube member for rotation on said sight tube member about the axis of said screw, means for adjustably fixing the position of said bezel relative to said sight tube member, and cooperating indicia means on said bezel and said screw directly indicating range.

8. A telescopic sight according to claim 1, said shoulder and cradle segment portions each being three in number equally spaced circumferentially about the tube axes.

9. A telescopic sight according to claim 1, said spring being discontinuous at one of said cradle segment portions and having respective ends spaced apart and providing said one portion.

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DAVID SCHONBERG, Primary Examiner

T. H. KUSMER, Assistant Examiner

U.S. Cl. X.R.

350—10, 45, 54; 356—247

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,484,148 Dated December 16, 1969

Inventor(s) Hitoshi Gotoh

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 25, "simple" should read --simply--. Column 3, line 29, after "ends" insert --25c--; line 31, erase "25c". Column 4, line 73 "of" should read --or--. Column 5, line 19, "mean" should read --means--; line 27, "clean" should read --claim--; line 29, "threadly" should read --threadedly--.

SIGNED AND
SEALED
JUL 28 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents

FORM PO-1050 (10-69)