ABSTRACT

A grenade launcher bipod support in which the two legs of the bipod are individually adjustable. The adjustment for each leg includes an internally threaded adjusting sleeve into which upper and lower portions of the legs are threaded so the legs are adjusted in turn-buckle fashion. The upper ends of the legs are pivotally mounted on a connector by gear segments which are in mesh so the legs can only be pivoted simultaneously. A connecting bracket is pivotally connected to the connector and the bracket is in turn pivotally connected to the barrel of the grenade launcher. Means are provided to lock both pivotal connections of the connecting bracket as well as to lock the gear segments so the bipod assembly remains in the position to which it is manually set.

7 Claims, 4 Drawing Figures
FIG. 1

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GRENADE LAUNCHER BIPOD SUPPORT

This invention relates to grenade launchers and particularly to a bipod support arrangement for supporting the barrel of grenade launchers and mortars at a proper angle of elevation.

More specifically, the invention relates to a bipod support arrangement which simplifies setting up the grenade launcher as well as changing the elevational aiming angle of the grenade launcher barrel.

In prior grenade launchers the barrel is supported by a bipod including a pair of legs which maintain the barrel at a desired elevational angle. The legs are usually pivotally connected to an intermediate elevating device secured to the barrel. Customarily, the elevating device takes the form of a screw or spindle which is adjusted to set the angle of elevation of the barrel. The disadvantage of such a construction is that the extent of adjustment of the screw or spindle is usually not adequate to set the barrel to all desired angles of elevation, especially where the terrain is very uneven. This problem cannot be overcome by increasing the length of the adjusting device, since increasing this length requires longer support legs, and using shorter support legs for the bipod limits the distance the legs can be spread apart with the result that there is insufficient lateral support for the grenade launcher.

The object of this invention is a bipod support arrangement for grenade launcher barrels and the like which provides a substantial range of elevational adjustment for the barrel, but without impairing the lateral stability of the grenade launcher in its customary three point support at the two legs and the barrel. In accordance with the invention the bipod includes a pair of legs pivotally connected to an intermediate link which in turn is pivotally connected to the grenade launcher barrel. Each leg is of the telescoping type which can be positively adjusted longitudinally, and the upper ends of the legs are interconnected by gear segments so both legs must be moved simultaneously.

The arrangement of this invention provides the advantage that each of the bipod legs is of substantial length whereas the intermediate or connecting link to which the legs are connected can be relatively short. The advantage of long support legs is that the legs can be spread apart a substantial distance when the grenade launcher is set up, and correspondingly, the lateral stability of the barrel is considerably improved. The advantage of the gear segment arrangement is that after the grenade launcher is initially set up and bedded or fired in, it is virtually impossible to adjust the legs unequally even though the length adjustment of the legs is made individually. Correspondingly, there is little, if any, danger that the azimuthal adjustment of the barrel will be disturbed when the elevational angle of the barrel is adjusted by adjusting the length of the supporting legs. In addition, since there is an adjusting spindle associated with each leg, stresses resulting from firing the grenade launcher are distributed over two spindles, rather than one. While the manner in which and the mechanism by which the length of the legs is adjusted can of course be accomplished in many ways, it is preferred to provide legs with separate upper and lower threaded portions threaded into a sleeve so the length of each leg is adjusted in a manner similar to that of a turnbuckle. The threads on the upper and lower portions of the legs are of course of opposite hand and the sleeve has threads of one hand in its upper portion and of the other hand in its lower portion so rotating the sleeve relative to the leg portions causes the leg to shorten or elongate. The upper and lower leg sections advantageously take the form of hollow sleeves which are guided relative to each other by a guide sleeve that extends a substantial distance through both the upper and lower leg sleeves.

An additional advantage of the gear segment connection between the legs is that this segment assures that both legs will be adjusted to the same angle relative to a vertical plane passing between the legs. Hence, equal lateral support of the barrel is assured. In the preferred arrangement, the gear segments take the form of double arm levers with the respective legs connected to the segments at one side of the pivot points for the segments and the teeth meshing with each other at the other side of the pivot point for the segments. The extent of pivotal movement of the segments, and correspondingly, the support legs connected to the segments, is advantageously limited by stops.

Numerous other features, objects, and advantages of the invention will become apparent with reference to the drawings which show a preferred embodiment, and in which:

FIG. 1 is a diagrammatic side elevational view of a grenade launcher including the bipod arrangement of this invention;
FIG. 2 is a partial view in front elevation of the grenade launcher of FIG. 1;
FIG. 3 is an enlarged view in section taken along line III — III of FIG. 2; and
FIG. 4 is a longitudinal sectional view of a support leg of the bipod showing the details of the leg adjustment arrangement.

While the preferred embodiment of this invention will now be described with reference to the grenade launcher shown in the drawings, it is to be understood that the invention also has utility with other projectile launching devices such as mortars and the like. The grenade launcher shown at FIG. 1 has a projectile launching barrel 2 with a spherical shaped lower end 3. A base plate 4 has a spherical socket 5 to receive a spherical end 3 so barrel 2 is supported on the base for universal pivotal movement.

The upper end of barrel 2 is supported by a bipod assembly 6 via a connecting bracket 7 which is connected to the transversely extending spaced apart lugs 8a of a clamp sleeve 8, by a bolt 9 which pivotally connects bracket 7 to the legs. The usual sight on aiming assembly 10 is also mounted on the sleeve 8. Clamp sleeve 8 is secured to barrel 2.

Bipod assembly 6 includes a first leg assembly 11 and a second leg assembly 12. Connected to the lower ends of the respective leg assemblies 11 and 12 are baseplate feet 13 and 14, respectively. Bipod assembly 6 also includes a connector assembly 15 to which leg assemblies 11 and 12 are connected, the connector assembly having its upper end terminating at a sleeve 15a via which the connector assembly is pivotally connected to connecting bracket 7.

Leg assemblies 11 and 12 are identical. With reference to FIGS. 2 and 4, leg assembly 12 includes a hollow cylindrical or tubular upper leg portion 16 having an enlarged hollow cylindrical end 17 with external threads 17a. Leg assembly 12 also includes a lower hollow cylindrical or tubular leg portion 18 having an en-
larged hollow cylindrical upper end portion 19 with external thread 19a formed on the cylindrical portion. Upper leg portion 16 and lower leg portion 18 extend into an elongated connecting sleeve 20 as shown at FIGS. 2 and 4. The upper portion of the inside of sleeve 20 has internal threads 21 formed therein, which threads are of one hand, for example, left hand threads. The lower portion of sleeve 20 has threads 22 formed therein of the opposite hand from the threads 21 and are, for example, right hand threads. Correspondingly, threads 17a of upper leg portion 16 are left hand threads, and threads 19a of lower leg portion 18 are right hand threads. The upper internal threads of sleeve 20 are separated from the lower internal threads 22 at an enlarged internal diameter 22a of the sleeve at a location midway between the ends of the sleeve.

Upper leg portion 16 and lower leg portion 18 each have the same inside diameter. A thin walled guide-sleeve 23 extends from the lower end of lower leg portion 18 to a location adjacent the upper end of upper leg portion 16, when the leg assembly is in its substantially contracted position, as shown at FIG. 4. Guide sleeve 23 is connected to the lower leg portion 18 against rotation by a pin or rivet 24 which extends into an elongated vertical slot 24a formed in sleeve 23. Advantageously, the upper end of sleeve 23 is a close fit in upper leg portion 16 so the upper and lower leg portions are restrained against rotation relative to each other but can freely move axially when sleeve 20 is rotated. Guide sleeve 23 functions to stiffen the connection between the upper and lower leg portions and the sleeve 20 and maintains these leg portions in alignment with each other even though the thread on cylindrical portions 17 and 19 are relatively short. The upper end of sleeve 20 is provided with a cap 23a containing an annular seal which prevents earth and other debris from entering the internally threaded portion of the sleeve 20. Sleeve 20 is externally knurled to facilitate rotating the sleeve to adjust the length of a leg assembly.

With reference to FIGS. 2 and 3, the upper portion 16 of leg assembly 11 is connected to gear segment 25 by lower leg portion 18 of the upper leg. Upper leg portion 16 of leg assembly 11 is connected to a gear segment 26. Gear segments 25 and 26 have spur teeth 27 and 28, respectively, which mesh with each other. Gear segments 25 and 26 are mounted for rotation on connector assembly 15 at pivot connections 29 and 30, respectively. It will be observed with reference to FIG. 2 that gear segment 25 has an outer end portion 25a at the opposite side of pivot connection 29 from teeth 27 and that gear segment 26 has an outer end portion 26a on the opposite of pivot connection 30 from teeth 28. The upper end of upper leg portion 16 of leg assembly 11 is secured to outer portion 26a of gear segment 26 in the manner shown at FIG. 2 by a nut which is threaded onto the threaded upper tip of the leg portion. Leg assembly 11 is similarly secured to outer portion 25a of gear segment 25. By virtue of the gear segments, leg assemblies 11 and 12 can only pivot simultaneously.

With reference to FIGS. 2 and 3, connector 15 includes a pair of parallel front and rear plates 30a and 31a which are connected to a neck portion 32a of connector assembly 15. Secured to the upper end of the neck portion 32a is the sleeve 15a via which the connector assembly is pivotally connected to connecting bracket 7. Gear segments 25 and 26 are mounted for rotation between the plates 30a and 31a. As shown at FIG. 3, for the gear segment 25, the segment has a thickness at a hub portion 33a which is approximately equal to the distance between the plates 30a and 31a. The pivot connection 29 for gear segment 25 includes a bushing 31 which extends through the plate 31a and into the bore of the hub 33a of gear segment 25. Bushing 31 has an enlarged head, and the length of the body of the bushing from the inside surface of the head is slightly less than the relaxed distance between plates 30a and 31a. Extending through the bushing is a bolt 32 with an enlarged head, which bolt is threaded into a nut 33. When head 34a of the bolt is turned in a tightening direction, plates 30a and 31a are moved slightly toward each other to clamp against hub 33a of the gear segment and thereby lock the gear segment against rotation. The extent of pivotal movement of gear segments 25 and 26 is limited by a pair of stop tabs 34. As shown at FIG. 3, stop tab 34 is bent inwardly from plate 30a toward plate 31a and extends into the path of travel of gear segment 25 so the extent to which the leg assemblies can be spread apart is limited by engagement of the end of the gear segment with the tab.

Connecting bracket 7 includes a pair of connecting arms which are secured to an elongated tubular casing 36 at their lower ends and to a sleeve 37 at their upper ends. The arrangement is such that casing 36 is parallel with sleeve 37. Extending through the sleeve 36 is an axle pin or bolt 35 which also extends through the sleeve 15a pivotally connects connector assembly 15 to connector bracket 7. The upper end of the neck 32a of the connector bracket is secured to sleeve 15a and extends through a downwardly opening slot in casing 36 of sufficient circumferential extent to provide for pivotal movement. Sleeve 15a is secured to the bolt 35. When knob or nut 39 is tightened, the friction between the end of the bolt and the inside face of the knob on casing 36 locks the bolt and correspondingly the sleeve 15a against rotation. Casing 36 can also house the azimuthal adjustment mechanism for the barrel 2.

The sleeve 37 at the upper end of the legs of connecting assembly 7 extends between the lugs 8 of the clamp sleeve 8. Sleeve 37 is pivotally connected to the lugs by a bolt 9 which extends through the sleeve and the aligned openings in the lugs. Lugs 8a are relatively thin and hence, are inherently somewhat flexible. Hence, tightening knob 40 which is threaded onto an end of shaft 9 compresses the lugs into frictional engagement with the ends of sleeve 37 to lock the sleeve 37 and correspondingly the connecting bracket 7 against pivotal movement relative to barrel 2.

OPERATION

Operation and use of the grenade launcher provided with the improved bipod assembly 6 of this invention will now be explained. When the grenade launcher is being transported or carried, the leg assemblies 11 and 12 are pivoted inwardly toward each other and toward the barrel so the legs are generally parallel with the barrel 2. To set up the grenade launcher for firing, it is merely necessary to spread the leg assemblies 11 and 12 to the position of FIG. 2, which position is automatically predetermined by the stop tabs 34 which limit the extent to which the legs can be spread apart. By virtue of the action of gear segments 25 and 26, both legs are spread apart to extend at the same angle relative to a vertical plane including barrel 2 (assuming of course
that the barrel is in its centered aximuthal position), whether or not stop tabs 34 are engaged. Normally, however, the legs will be spread apart until the segments 25 and 26 do engage the stop tabs 34 of connector assembly 15. The leg assemblies are locked in this position by tightening the nut 34a to lock the gear segments against pivotal movement. Feet 13 and 14 are then embedded in the earth as shown at FIG. 2, and base 4 is similarly bedded. The aiming device 10 is then used to determine the proper angle of elevation of the barrel and the barrel is then set to the proper elevational angle by rotating the sleeves 20 of each leg assembly. During the adjustment of the length of the leg assemblies pivotal movement between the barrel and the leg assemblies occurs at shaft 35 and bolt 9. As soon as the proper angle of elevation of the barrel is obtained, knobs 39 and 40 are tightened to lock the assembly in position.

It will be appreciated that where the terrain is uneven, leg assembly 11 for example, may be adjusted to a length considerably shorter than the legs of leg assembly 12, for example where the foot 13 is embedded in an elevated mound. However, after the legs are spread and bedded, the user of the launcher will find that elongating one leg assembly will tend to lift the other leg assembly and correspondingly, he will adjust the two leg assemblies simultaneously to the proper length to firmly support the upper end of the barrel both vertically and laterally.

While a preferred embodiment of the bipod and support arrangement for a grenade launcher has been shown and described in detail, it is to be understood that numerous changes can be made without departing from the scope of this invention as defined herein and in the appended claims.

What is claimed is:

1. A grenade launcher bipod support arrangement comprising
   first and second support legs, each of said legs including
   a connecting thread means to positively adjust the length
   of each leg;
   a connecting bracket pivotedly connected to the barrel
   of the launcher for movement about a first general
   horizontal axis;
   a connector pivotally connected to said connecting
   bracket for pivotal movement about a second axis
   parallel to said first axis;
   means pivotally connecting said first and second legs
   to said connector for pivotal movement in a direction
   generally parallel to said first and second axes;
   and
   gear means interconnecting said legs for simultaneous
   pivotal movement to maintain each of said legs at the same
   angle relative to said axis.

2. A grenade launcher support according to claim 1 wherein
   said support further includes first selectively operable
   lock means to lock said connector against pivotal
   movement at one of said axes; and
   second selectively operable lock means to lock said
   legs against pivotal movement.

3. A grenade launcher support according to claim 2 wherein
   said first lock means includes
   a manually manipulable lock nut; and
   said second lock means includes
   a second manually manipulable lock nut.

4. A grenade launcher support arrangement according to claim 1 wherein
   said gear means interconnecting said legs for simultaneously
   pivotal movement includes
   a first gear secured to the upper end of said first
   leg, and
   a second gear secured to the upper end of said second
   leg and in mesh with said first gear.

5. A grenade launcher support according to claim 4 wherein
   said first gear is a segment mounted for pivotal
   movement about a first axis;
   said second gear is a segment mounted for pivotal
   movement about a second axis spaced from said first axis;
   said gear segments having gear teeth in mesh at a location
   between said axes; and
   said first and second legs being secured respectively to said first and second gear segments at locations on the opposite side of said pivots from said gear teeth.

6. A grenade launcher bipod support arrangement comprising
   a first and second support legs, each including separate
   hollow upper and lower leg portions, said upper leg portion being externally threaded with threads of one hand and said lower leg portion being externally threaded with threads of the other hand, a guide sleeve extending into said upper and lower leg portions, said guide sleeve having a diameter to be a close sliding fit in at least one of said leg portions, means connecting said guide sleeve to the other of said leg portions, and a coupling sleeve adjustably connecting said upper and lower leg portions and having internal threads of said one hand formed in its upper portion and internal threads of said other hand formed in its lower portion, whereby rotating said sleeve relative to said leg portions adjusts the length of a leg;
   b. a connector connected to the barrel of the launcher for movement relative to the barrel;
   c. first means pivotally connecting the upper portions of said legs to said connector; and
   d. second means interconnecting said legs for simultaneously pivotal movement.

7. A grenade launcher bipod support arrangement comprising
   a. first and second support legs, each of said legs including means to adjust the length of the leg;
   b. intermediate connecting means pivotally connected to the barrel of the launcher for movement about a first axis;
   c. a connector pivotally connected to said intermediate connecting means for movement about a second axis parallel to said first axis;
   d. first means pivotally connecting the upper portions of said legs to said connector; and
   e. second means interconnecting said legs for simultaneously pivotal movement.

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