Dec. 8, 1970 A. S. CHAPMAN 3,545,837

SIGHTING INTERLOCK

Filed Dec. 9, 1968 3 Sheets-Sheet 1

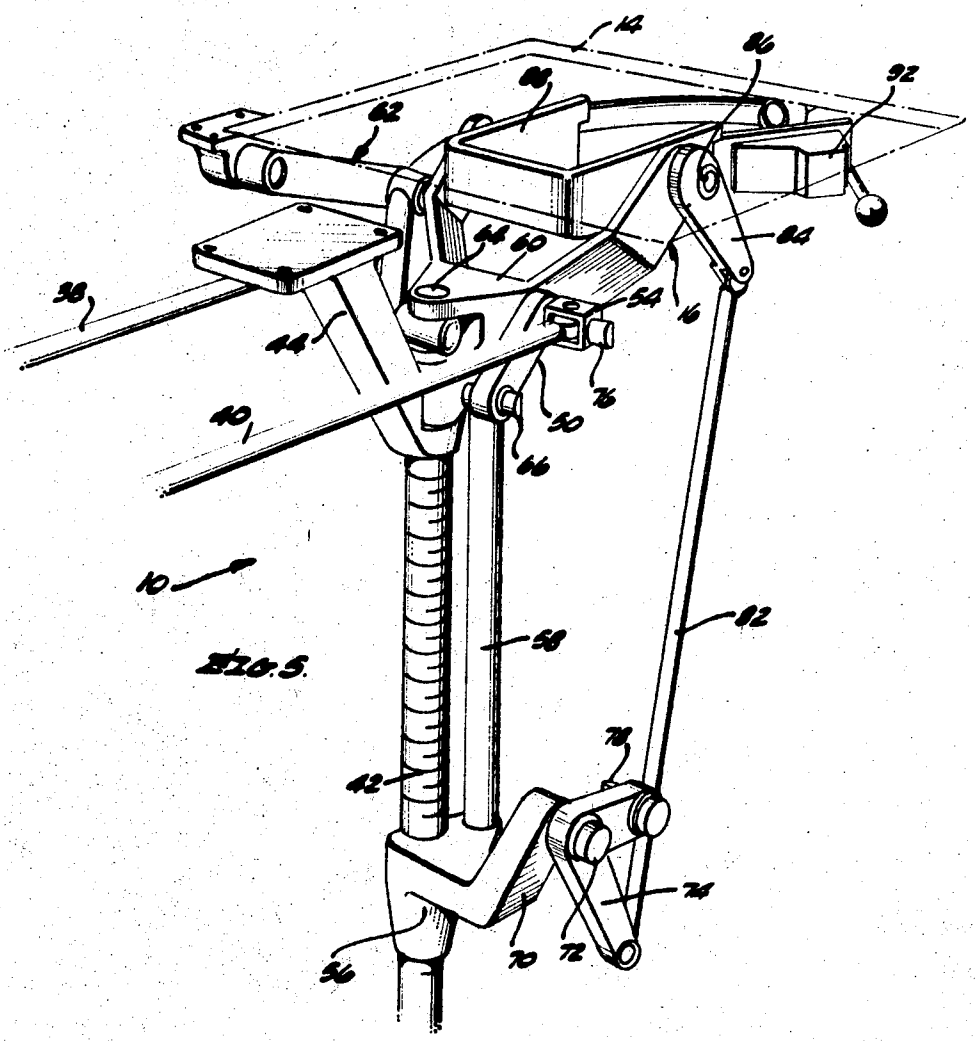


FIG. 5.

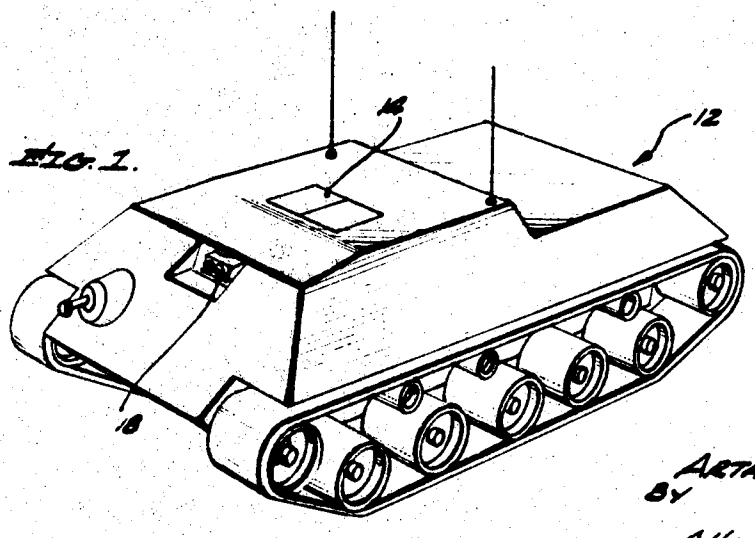


FIG. 1.

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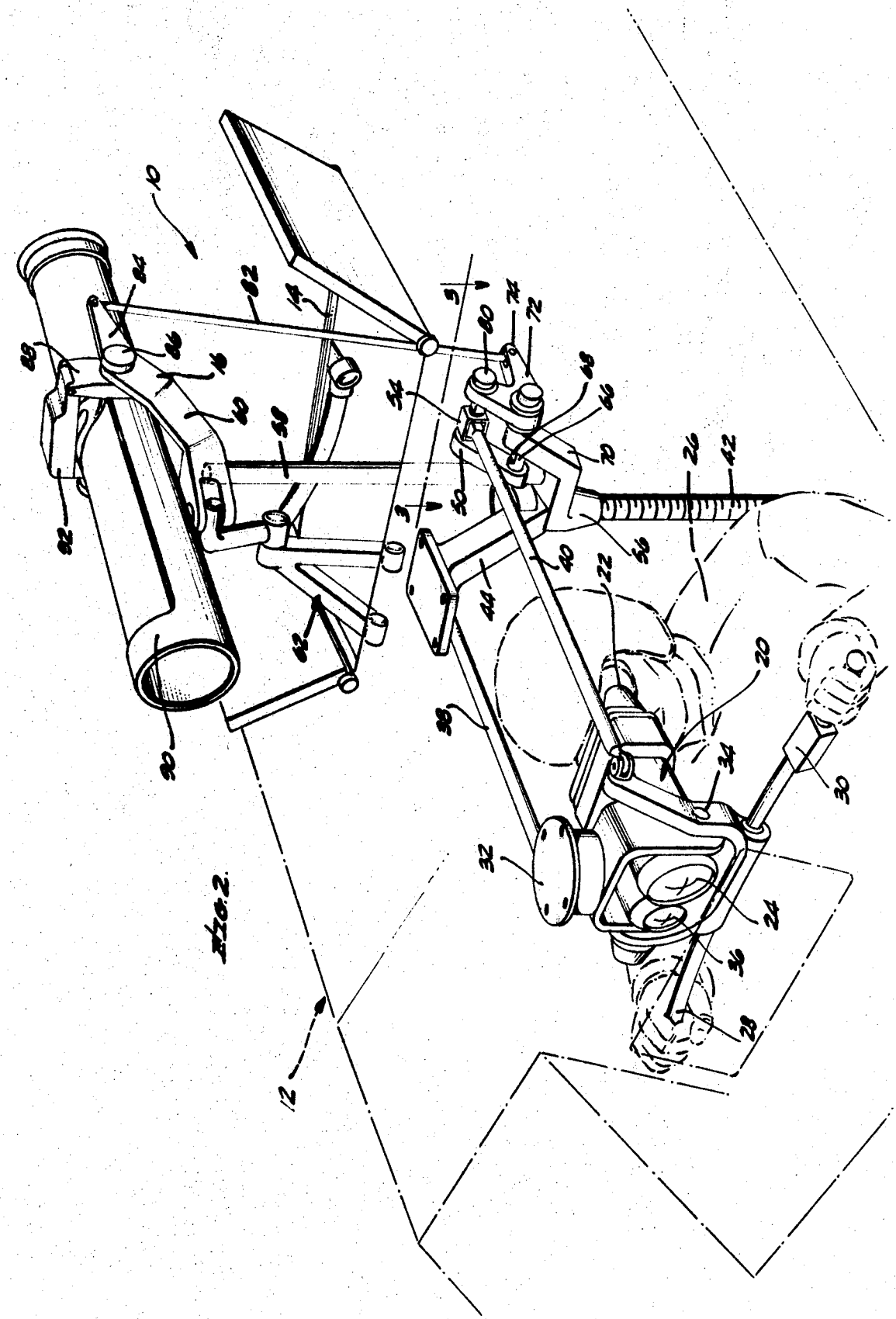


FIG. 2.

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FIG. 3.

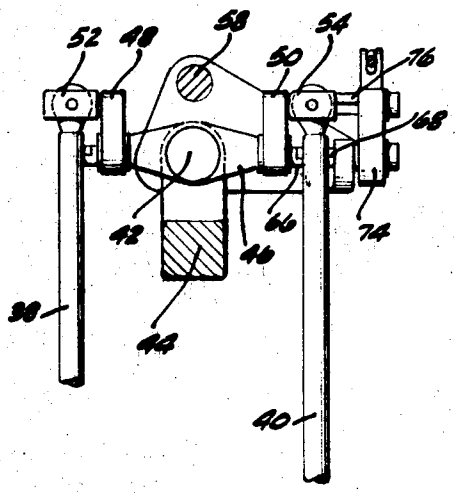
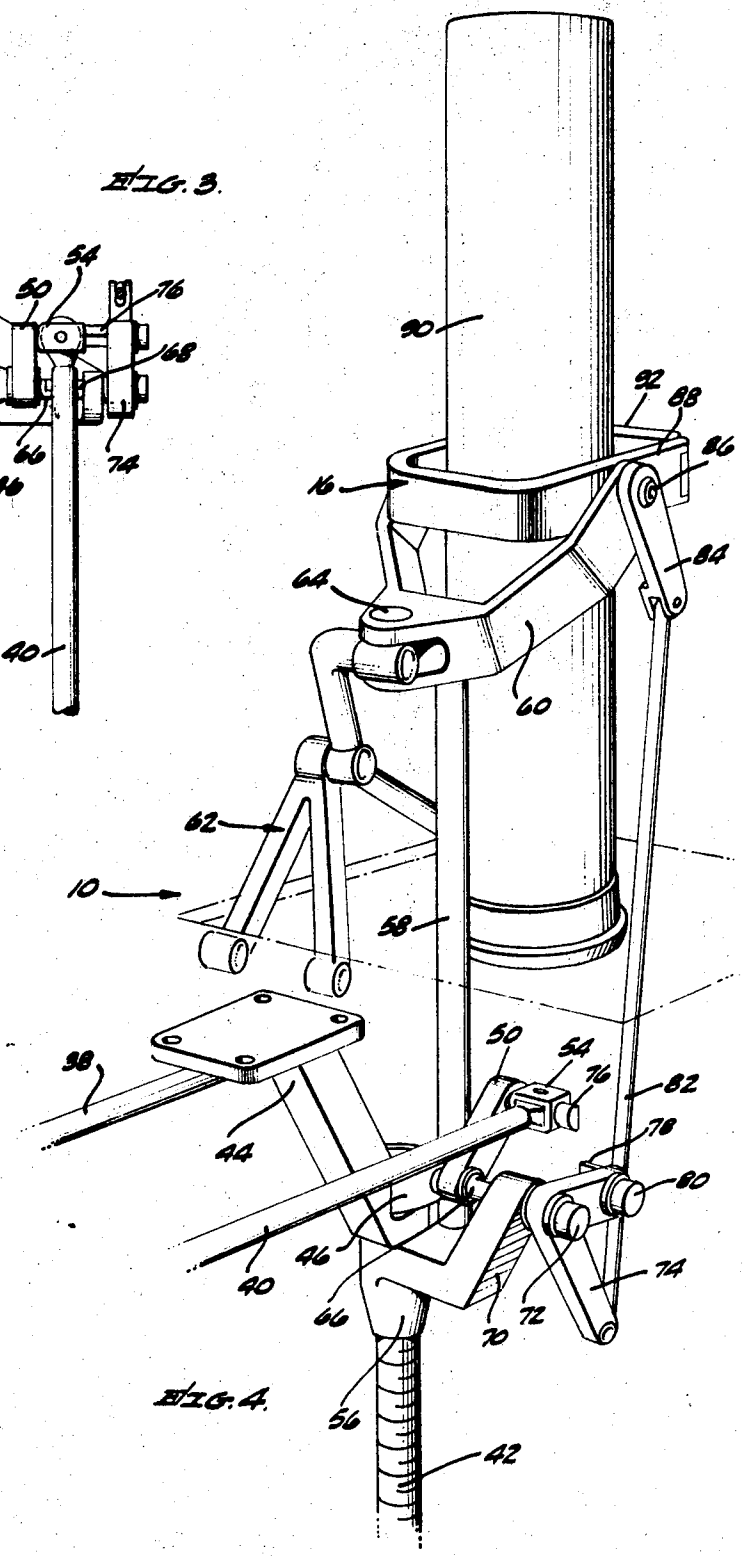


FIG. 4.



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SIGHTING INTERLOCK

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Int. Cl. G02b 21/24, 23/16
U.S. Cl. 350—83 2 Claims

ABSTRACT OF THE DISCLOSURE

An optical sight is mechanically coupled to a missile launching device for both azimuthal and elevational guidance of the launching device for optical tracking. Disconnectable latches in the mechanical connection permit disconnection of the launching device from the optical tracking device after launch to permit reloading or retraction of the launching device while continuing tracking of the target and/or missile with the optical device.

BACKGROUND

A present form of missile includes a missile launching tube containing a missile, and an optical sight. The sight has a visual section which is directed at the target by manual control of a gunner, and has an infrared device which tracks the missile after it is launched. The missile launching tube must be fairly aligned with the axis of the sighting device so that when the missile is launched it enters the field of view of the infrared tracking portion of the sight. Of course the sight is arranged for both elevational and azimuthal deflection in accordance with the gunner's command so that the target can be kept in view. In order to accomplish directing of the launch tube so that the missile when launched moves into view of the infrared device, the launch tube is both azimuthally and elevationally connected to the sight. Such interconnection can either be mechanical or through servo drive. However, such interconnection has previously required that the launch tube remain coupled throughout the missile flight, for any disturbance of the launch tube would necessarily cause disturbance of the sight. Thus, the launching equipment could neither be retracted for safety nor reloaded for a further missile launching until the missile had reached its target.

SUMMARY

In order to aid in the understanding of this invention, it can be stated in essentially summary form that it is directed to a sighting interlock. An optical sight is coupled to the mounting of a launching device to direct the launching device prior to the launch of a missile. Disconnect means is provided so that the mounting can be oriented in a direction other than that dictated by the sight, after the missile is launched.

Accordingly, it is an object of this invention to provide a sighting interlock which provides interlock between a sight and launching device mounting means, and permits disconnection therebetween. It is a further object to provide an interlock between a sight and a launching device mounting means which permits the sight to guide the mounting means prior to and during launch of a missile from a launching device and permits subsequent disconnection therebetween to permit the launching device mounting means to be oriented independently of the sight after missile launch. It is still another object to provide both elevational and azimuthal sighting interconnections between the sight and a launching device to permit the sight to direct the launching device, together with disconnect means so that the launching device may be differently oriented than the sight after launch. It is

still another object to provide mechanical interconnection between a sight and launching device, and to provide mechancial disconnection means therefor. It is another object to provide mechanical interlock between the sight and a launching device to provide both azimuthal and elevational direction of the launching device in accordance with sight direction, and to provide a disconnect therebetween so that the launching device can be oriented differently than the sighting device after launch has occurred. It is stillanother object to provide a sighting device which azimuthally and elevationally directs a launching device, and to permit disconnection therebetween so that the launching device can be reloaded or retracted without interferring with the direction of the sighting device. Other objects and advantages of this invention will become apparent from a study of the following portion of the specification, the claims and the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a vehicle, particularly a military tank, incorporating the sight and its interlock of this invention.

FIG. 2 is an enlarged partial view showing the manner in which the sight and its interlock is incorporated in a vehicle, showing the vehicle in dotted lines and showing the device being sighted in the raised, active position.

FIG. 3 is a section taken generally along the lines 3—3 of FIG. 2 showing the interlocks in engaged condition.

FIG. 4 is a partial view similar to FIG. 2, showing the sighted device in a position suitable for retraction and with the sighting interlock disengaged.

FIG. 5 is a view similar to FIG. 4 showing the sighted device retracted.

DESCRIPTION

As is seen in FIG. 1, vehicle **12** on which the sighting interlock **10** of this invention is mounted, is a military tank. As the description proceeds, it becomes clear that while the sighting interlock is particularly useful on a military tank, it is also useful on any type of support for the sighting interlock, because the sighting interlock provides the function of disconnection of the sighted missile launching portion from the sight so that the missile launching portion can be withdrawn and/or loaded during the tracking of a previously launched missile. Accordingly, vehicle **12** only serves as a support for the sight and missile launching structure. Vehicle **12** has an opening **14** therein in the form of a hatch opening through which the missile launching portion **16** can extend when it is in a firing position. Furthermore, vehicle **12** has a sighting opening **18** therein through which the target can be viewed by sight **20**.

Sight **20**, as is seen in FIG. 2, has an optical sight structure having an eye piece **22** and objective lens **24** through which the target can be optically seen by gunner **26**. Gunner **26** manually engages handles **28** and **30** for azimuthal rotation of the sighting axis on azimuth bearing **32**. Bearing **32** is mounted upon the vehicle structure to permit azimuthal rotation of sight **20**. By motion of handles **28** and **30**, gunner **26** accomplishes elevational changes in the line of sight by rotation on shaft **34**. If desired, suitable gearing can interconnect handle rotation with rotation of sight **20** about shaft **34** so that the gunner can elevationally follow the target with his optical line of sight by handle rotation. If desired, any conventional manner of image intensification for night use can be employed in the optical sight.

Additionally, sight **20** includes infrared sighting device **36**. The sighting device is designed for a missile which can be controlled in flight. The missile has a flare or engine exhaust at its rear end so that it may be tracked in flight. The infrared sighting device **36** follows the missile and

corrects its course so that it remains substantially upon the optical line of sight from the point of launch to the target as determined by the gunner in his positioning of sight **20**. In order for the missile to fly into the viewing area of infrared device **36**, it is necessary that the missile launching portion **16** be aligned fairly accurately with the line of sight of sight **20** at the time of launch.

To accomplish this, missile launching portion **16** is mounted so it follows both the azimuthal and elevational changes in the line of sight as determined by the direction of pointing of sight **20**. Connecting rods **38** and **40** are secured to the sight **20** so that their motion indicates azimuthal and elevational motion of the line of sight of sight **20**.

Jack screw **42** is rotatably mounted in the bottom of the vehicle, and at its bottom end is arranged to be rotated. The screw may be rotated either by means of a crank, or by powered means, but powered means is preferable. Thus, jack screw **42** is motor driven so that either the gunner **26** or his loader can rotate the jack screw. The upper end of the jack screw is rotatably mounted in bracket **44** which is mounted by a flanged foot against the under side of the roof of the vehicle, or other convenient mounting place.

Driving yoke **46**, as is best seen in FIG. 3, is rotatably mounted on the top of jack screw **42** above bracket **44**. Links **48** and **50** are pivotally mounted upon driving yoke **46** on a transverse axis which lies through the axis of jack screw **42**. Connecting rods **38** and **40** are respectively connected to the upper ends of links **48** and **50** by means of universal joints **52** and **54**. Thus, driving yoke **46** rotates upon the axis of jack screw **42** in accordance with azimuthal motion of sight **20**, and links **48** and **50** rotate upon their transverse rotatable axis on driving yoke **46** in accordance with elevational motion of sight **20**.

Support bracket **56** is threaded on the inside to engage upon the threads on jack screw **42** so that it moves up and down upon the jack screw upon rotation of the jack screw. It is shown in a lowered position in FIG. 5 and in a raised position in FIGS. 2 and 4. This structure thus is a raising means for raising the associated structure from one position to another. Support shaft **58** is secured in support bracket **56** to the rear of jack screw **42** and extends upward. The upper end of support shaft **58** is secured in yoke **60** which is a part of the system which comprises the missile launching portion **16**.

Support linkage **62** is a group of links and levers which are pivotally and slidably mounted with respect to each other and with respect to vehicle **12** so that at their upper end they provide pivot point **64** which is laterally rigid with respect to the vehicle and which is in axial alignment with the axis of jack screw **42**. Thus, yoke **60** is pivotable on the vertical axis of jack screw **42**. Since support shaft **58** is secured to both support bracket **56** and yoke **60**, rotation of support bracket **56** about the axis of lead screw **42** causes rotation of yoke **60** about that axis.

Interconnection between driving yoke **46** and support bracket **56** about the axis of jack screw **42** is accomplished by pin **66** interengaging with latch pin **68**. Pin **66** is the pivot pin upon which link **50** is pivoted at its lower end, and the outer end of pin **66** carries a flat thereon. Additionally, latch pin **68** is axially slidably movable in arm **70** of support bracket **56**. One or preferably, both of these pins are equipped with permanent magnets so they are locked together when in the face to face position. Solenoid **72** is arranged so that upon actuation of the solenoid latch pin **68** is withdrawn from interengagement with pin **66** so that driving yoke **46** and support bracket **56** are free to relatively rotate upon the axis of jack screw **42**. However, when pin **66** and latch pin **68** are interengaged the permanent magnets on one or both of them cause locking together so that driving yoke **46** and support bracket **56** rotate together on the axis of the jack screw to rotate yoke **60** on this axis in accordance with azimuthal motion of sight **20**.

Bellcrank **74** is pivotally mounted on arm **70** on the axis of solenoid **72**. This axis is also axially aligned with the pivot points at the lower ends of links **48** and **50** when latch pin **68** is engaged with pin **66**. Universal joint **54** carries pin **76** on the outer end thereof, and this pin interengages with latch pin **78** on one arm of the bellcrank. When energized, solenoid **80** retracts latch pin **78** to disconnect latch pin **78** from pin **76**. However, when they are in the engaged position, bellcrank **74** is locked to rotate with link **50**. When they are disengaged, the bellcrank is free to move from the position shown in FIG. 2 to the position shown in FIG. 4.

Connecting rod **82** is pivotally mounted on the other arm of bellcrank **74** and extends upward to pivot in the outer end of crank **84**. Crank **84**, in turn, is pivotally mounted upon pivot pin **86** which passes through one arm of yoke **60**, and is secured in one side of U-shaped bracket **88**. The other side of U-shaped bracket **88** is pivoted coaxially with pivot pin **86** in the other arm of yoke **60**. Thus, upon rotation of link **50** on its axis, when latch pin **78** is engaged with pin **76**, crank **84** and bracket **88** also rotate. In view of the identical link lengths in the various pairs of crank arms, angular rotation of bracket **88** in the elevational direction is the same as that of sight **20**.

Missile firing tube **90** is of the type that serves as a storage and transportation container for the missile, and thus is disposable after missile firing. Accordingly, firing tube **90** is strapped into bracket **88** by quick disconnect clamp **92** which also serves to make any necessary electrical connections. However, if desired, the missile firing tube **90** may be of permanent nature and may be secured semipermanently in bracket **88**. Furthermore, any type of gun can be placed in bracket **88** providing there is capability in sight **20** for making allowances for trajectory drop and windage if the projectile is not steerable in flight.

In operation, firing tube **90**, with its missile container therein, is positioned in bracket **88** in the elevated and ready position shown in FIG. 2. Sighting is performed by gunner **26** with azimuth directing of firing tube **90** accomplished by azimuthal swinging of sight **20** about its azimuth bearing **32**. These azimuthal changes are transmitted through connecting rods **38** and **40** to rotate driving yoke **46** on its axis. Through pin **66** and latch pin **68** this causes rotation of arm **70** and the rotational torque thereof is transmitted by support shaft **58** upward to rotate yoke **60** and bracket **88** carried thereby on the axis of pivot pin **64**, which is the same axis as the axis of rotation of driving yoke **46** and support bracket **56**.

Elevational sighting by rotation of handles **28** and **30** causes rotation of sight **20** in an elevational direction on axis **34**. This rotates links **48** and **50**, and with engagement of latch pin **78** with pin **76** causes rotation of crank arm **74**. Through connecting rod **82**, rotation of bellcrank **74** causes rotation of crank **84** and bracket **88** to thus cause elevational changes in direction of firing tube **90**. The pointing accuracy of firing tube **90** with respect to the line of sight of sight **20** is sufficient so that when a missile is launched, the infrared sighting device **36** sees the missile in its field of view and can track its direction. During missile flight, such corrections as are necessary are signalled to the missile to maintain its path substantially along the line of sight dictated by the line of sight through the optical device.

After launch of the missile, there is no need to maintain the missile launching portion **16** in the raised, vulnerable and nonreloadable position. Thus, immediately after missile launch, solenoid **72** and **80** are actuated to cause both azimuthal and elevational unlatching. The natural center of gravity of the structure rotating about pivot pin **86** is such as to bring the rear end of the firing tube downward, as is shown in FIG. 4, which in turn causes latch pin **78** to swing away from pin **76**. Thereupon, the motor driving jack screw **42** is actuated to

screw support bracket **56** downwardly from the position of FIG. 4 to the position of FIG. 5. Support linkage **62** pivots so that the entire structure up to bracket **88** is withdrawn below the top of the vehicle, through opening **14**. At this point, clamp **92** is open and disposable firing tube **90** is tossed upward and out of the opening. The bracket **88** is ready to accept a new missile firing tube containing a missile. If refiring is desired, another such missile firing tube is loaded and the clamp closed. The motor rotating jack screw **42** is energized and the structure elevates to the position shown in FIG. 2. Thereupon, the loader swings the bracket **88** so that bellcrank **74** rotates and the latches are interengaged to hold the bracket **88** in the position shown in FIG. 2. Latch pin **68** engages with pin **66** by manual rotation of support bracket **56**. Thereupon, the new missile is ready for firing. Thus, the missile launching portion can be disconnected and withdrawn, with the hatches closed on opening **14** or reloaded, while the previous missile is in flight.

It is understood that the term missile used with respect to this invention implies any kind of structure which is propelled through the air, either by propulsion means on the missile or by explosive charges in a gun tube from which the missile is projected. Thus, the invention is directed to a structure for initial direction of missile sight, irrespective of future control thereover after it is in flight.

This invention having been described in its preferred embodiment, it is clear that it is susceptible to numerous modifications and embodiments within the ability of those skilled in the art and without the exercise of the inventive faculty. Accordingly, the scope of this invention is defined by the scope of the following claims.

What is claimed is:

1. A missile launcher sighting mechanism mounted upon a frame, said mechanism comprising a sighting device rotatably mounted on said frame for rotation about elevational and azimuthal axes at right angles to each other;

a raising means mounted on said frame, said raising means comprising a jackscrew rotatable with respect to said frame on an axis substantially parallel to the azimuthal axis of rotation of said sighting device;

a driving yoke rotatably mounted upon the axis of said jackscrew, first and second links rotatably mounted on said driving yoke on an axis parallel to the elevational axis of said sighting device, connecting rods connecting said sighting device and said links so that said links move in correspondence with elevational and azimuthal motion of the sighting device;

a support bracket connected to said jackscrew to be raised and lowered by rotation of said jackscrew, a support shaft secured to said support bracket and extending upwardly, a support yoke secured to the top of said support shaft so that said support yoke rotates on an azimuthal axis with said support bracket, missile-launching means pivotally mounted on said support yoke on an elevational axis;

latching means between said connecting rods and said support bracket so that, when said support bracket is in its raised position and said latching means is connected, said support bracket rotates on its azimuthal axis with said driving yoke;

a link rotatably mounted on said support bracket for rotation about an elevational axis, latching means on said link for latching engagement with one of said connecting rods, an interconnecting rod engaged between said link and said missile-launching means so that, when said interconnecting device is engaged, said missile-launching device rotates on an elevational axis with rotation of said sighting device on an elevational axis.

2. A missile-sighting mechanism, including a sighting device mounted on a frame for rotation about elevational and azimuthal axes;

raising means mounted on said frame, a support bracket mounted on said raising means for raising and lowering motion with respect to said frame by operation of said raising means;

a yoke mounted on said support bracket for rotation about an azimuthal axis with said support bracket;

missile-launching means mounted on said yoke for rotation on said yoke about an elevational axis;

means interconnected between said sighting device, said support bracket and said missile-launching means including a latch for rotating said support bracket and said missile-launching means on an azimuthal axis with rotation of said sighting device on an azimuthal axis and for rotating said missile-launching means about its elevational axis with rotation of said sighting device about its elevational axis when said support bracket is in its raised position and said latch is latched;

said latch being disconnected when said support bracket is in its lowered position so that said sighting device can move independently of said missile-launching means.

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U.S. Cl. X.R.

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