Sept. 5, 1961 R. Z. KNAUB ET AL 2,998,753

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Filed June 30, 1955

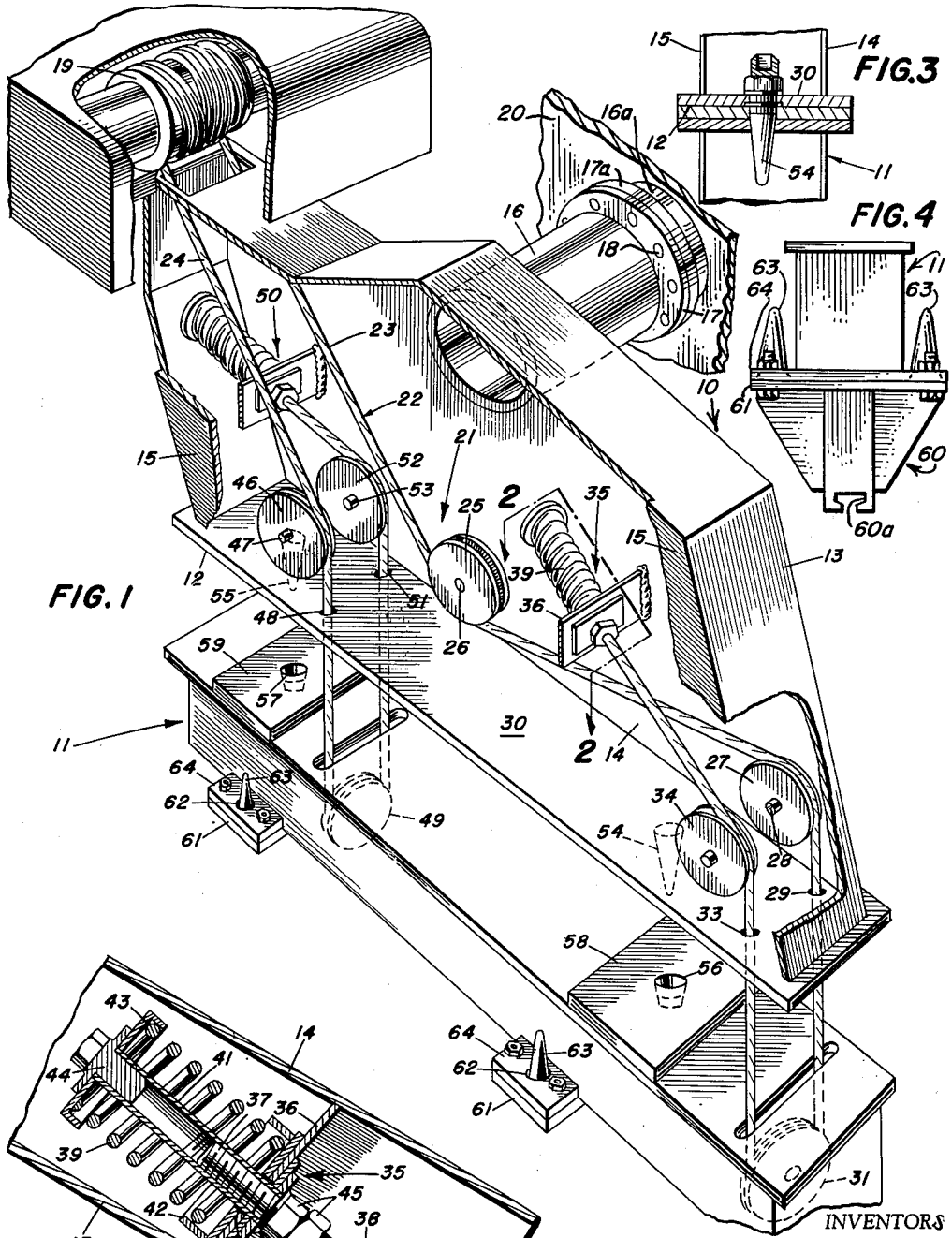

FIG. 1

FIG. 3

FIG. 4

FIG. 2

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United States Patent Office 2,998,753 Patented Sept. 5, 1961

2,998,753

HOIST DEVICE FOR TRAINABLE MISSILE LAUNCHERS

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Filed June 30, 1955, Ser. No. 519,288
2 Claims. (Cl. 89—1.7)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to a hoisting device for missiles and more particularly to a winch hoisting device suitable for use and connectable to a conventional missile launcher including a trainable mount such, for example, as the general type disclosed and claimed in Patent No. 2,428,761 for Support for Rocket Launchers, granted to Lorenzo A. Richards on October 7, 1947. The hoisting device of the present invention supports the missile in accordance with the loading and firing position of the mount.

The practice of loading heavy rockets onto missile conventional launching slotted shoes for firing has presented many serious problems, not the least of which is that concerning safe and efficient coupling of the conventional missile lugs in position for firing on the missile launcher shoes. Since the missile lugs of an aerodyne or missile are not placed in any specific relationship to the center of gravity of the over-all missile and booster, it is evident that missiles which may be of several tons weight are unwieldy when an attempt is made to align the missile with the launcher shoes and to firmly connect the shoes to the conventional missile lugs or bearings. For example, the prior art missile loading devices are of a construction which require the missile to be trucked beneath the stationary launcher shoes, and then the missile is hoisted from the dolly or truck to the overhead launching shoes by suitable apparatus. This procedure not only requires a considerable period of time to properly align the missile lugs for connection to the shoes, but also is dangerous since operating personnel are of necessity stationed beneath the missile in hoisted position to fix the missile to the shoes.

The present invention overcomes the aforesaid difficulties encountered in prior art devices by the provision of a hoist device connectable to a trainable launcher and including a missile lifting and supporting structure controlled by a power winch and cable whereupon the missile lifting and supporting structure may be operated to engage the conventional launching rail or shoes on the supporting and lifting structure with the conventional lugs carried by the missile. It will be understood that the aforesaid control means is adapted to move the missile lifting and supporting structure to a position such that the lifting and supporting structure is locked to the housing of the hoist and thus the hoist device and missile will be moved in accordance with the trainable mount. The mating connection between the launching rails or shoes on the supporting and lifting structure and the lugs on the missile are made when the supporting and lifting structure is in its lowermost position whereupon undue hazard to the operators of the device is prevented as the missile can now be loaded onto the rails at a convenient handling station.

An object of the present invention is to provide a winch hoisting device having a beam assembly which also serves as a launching rail support.

Another object is the provision of a hoisting device for guided missiles which is trainable both for loading a missile and for directional firing of the missile.

A further object is to provide a missile hoisting beam which is supported and controlled by a launcher assembly and trainable therewith.

Still another object is the provision of a winch hoisting device for loading missiles from a loading position to an elevated firing position without mechanical transfer of the missile on its support.

Another object is to provide a device for handling heavy missiles such that personnel activity is confined to an area which affords safe manipulation of the missile from an unloaded position to a loaded position on the launcher.

Other objects and many of the attendant advantages of this invention will become readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of a preferred embodiment of the invention with portions partially broken away;

FIG. 2 is a sectional view taken substantially along lines 2—2 of FIG. 1 looking in the direction of the arrows;

FIG. 3 is a detailed showing of a tapered guide pin joining abutting portions of the device in aligned position; and

FIG. 4 is a front view of the missile shoe illustrating its relationship with the lifting beam.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIG. 1 a winch hoisting assembly **10** and lifting and missile supporting beam **11** supported by assembly **10** for vertical movement directly below the underside **12** thereof in a manner to be explained hereinafter. A protective housing **13** is provided for the hoisting assembly **10**, the walls **14**, **15** of which may serve as mountings for various elements of the device. Extending laterally from wall **15** is a tubular member **16** having a terminal circumferential flange **17** provided with apertures **18**. Tubular member **16** is adapted to be rigidly mated by bolts or the like to a corresponding flange **17***a* of a trunnion tube **16***a* on a conventional trainable mount pedestal, such, for example, as disclosed in the afore-mentioned patent and illustrated as element **20**, FIG. 1 of the drawing. By this arrangement the assembly **10** and beam **11** may be trained and elevated to a desired azimuth bearing.

A power winch **19** is carried by the aft uppermost portion of the housing **13** to drive a pulley train generally designated as **21**. A flexible linkage **22** such as a fiber rope, chain, cable, or the like is wound on winch **19** so as to pay out and take-up cable lead **23** and lead **24** by equal amounts simultaneously. Lead **23** is passed through concave-grooved pulley **25** which is freely rotatable on an axle **26** secured to the inner side of wall **14** at the lower mid-portion thereof and extending normal therefrom. Pulley **25** functions to align cable lead **23** with a guide pulley **27** of the same type as pulley **25** and which is mounted for free rotation on axle **28** fixed to the inner side of wall **14** at a lower forward location and extending perpendicular thereto. The cable lead **23** passes over the guide pulley **27** to continue through an aperture **29** provided in the bottom plate **30** of housing **10**. An idler pulley **31** is supported on an axle perpendicular to axles **26** and **28** and in a plane parallel to those in which axles **26** and **28** are located, and is supported for free rotation within the forward portion of beam **11**.

Cable lead **23** is reeved around pulley **31** and is returned through aperture **33** of plate **30** to be given a change of direction by guide pulley **34** to extend to a

terminal 35. Pulley 34 is mounted for free rotation on an axle fixed to wall 15 of assembly 10 in axial alignment with the axle of pulley 27. Terminal 35 consists of an end plate 36 which is securely held by walls 14 and 15 to extend transversely from one wall to the other near the mid-point of assembly 10. An extension bolt 37 is coupled in axial alignment with the end portion of cable lead 23 by a suitable fastening means 38 and extends through central opening 40 provided in end plate 36. Bolt 37 is threadedly received by an internally threaded sleeve 41 which is shown in FIG. 2 on the opposite side of plate 36 from fastening means 38. Sleeve member 41 passes freely through aperture 40 and is constantly urged on the aft side of plate 36 by compression coil spring 39 which circumscribes the sleeve 41. Spring 39 is confined between inverted cup shaped stops 42 and 43 slidably and coaxially carried by sleeve member 41, and cap member 44 which is coupled into the outer end of sleeve member 41 by suitable means to retain stop 43 on sleeve 41. Suitable tensioning of cable lead 23 may be attained by the lineal extent of penetration of bolt 37 into sleeve 41 which extent is adjustable by nuts 45 on bolt 37. By the arrangement of spring 39 with the cable lead 23, shock forces are substantially dampened when a pull is exerted on the cable lead 23.

Lead 24 of cable 22 extends from its winding about winch 19 downwardly to pass over the groove of a guide pulley 46 which is mounted for free rotation on an axle 47 which is substantially normal to and fixedly held by the inner side of wall 15 at lower aft portion of housing 10. Cable lead 24 is continued downwardly from pulley 46 to pass through an aperture 48 in the assembly 10 bottom plate 30 and thence to the groove of an idler pulley 49 located within the after mid-section of beam 11 and in a plane parallel to that plane in which beam pulley 31 is positioned. Cable lead 24 is rove around the lower side of pulley 49 and is returned upwardly through aperture 51 of bottom plate 30 which aperture is laterally in line with aperture 48. Another guide pulley 52, which is mounted on axle 53 held by the inner side of wall 14 coaxial with axle 47 of pulley 46, directs lead 24 thereover to aft terminal 50 of similar construction to that of terminal 35. The linear amount of compression of the spring of terminal 50 is utilized to trip suitable switching means, not shown, which in turn controls the operation of winch 19. Tapered guide pins 54 and 55, shown in detail in FIG. 3, depend perpendicularly from bottom plate 30 in alignment with mating apertures 56 and 57, respectively, recessed in beam 11 through butt plates 58 and 59 which are stationed on the top side of beam 11 in fore and aft locations, the aforesaid pins and apertures being adapted to guide and lock the beam to the bottom wall 30 of the assembly 10, as the beam moves into engagement therewith. The hollow elongated rectangular beam 11 is also provided on its topside with cable receiving slots which expose pulleys 31 and 49 for engagement with cable 22. On the lower side of beam 11 are missile launcher shoes, FIG. 4, numeral 60, attached to flat steel supports 61. To the supports 61 are bolted tapered pins 63 receivable into apertures 62 on the beam plates 64 to which supports 61 are fixedly engaged in assembled condition. The shoes 60 are provided with slots 60*a* adapted to receive the lugs of a missile to be launched from the shoes 60. As more clearly shown on FIG. 1, the pair of mutually spaced supports 61 are each connected to a flange 64 carried by the beam 11 such for example, as by bolts or the like, the supports being provided with a tapered guide pin 63 disposed within and extending through a complementary tapered aperture formed in each flange 64. It will be understood that each support 61 is provided with conventional missile launcher shoes adapted to engage conventional lugs carried by the missile and thus open movement the beam 11 by the aforesaid power winch and cable arrangement the missile is moved therewith when the shoes are in engagement with the lugs. Furthermore, since the hoist is connected to the trainable mount in the aforesaid manner the hoist is moved from a loaded position to a firing position by the mount. Provision may be made, such as bolt receiving holes, in the lower side of beam 11 for connecting a plurality of supports 61 at various points. This provision allows missiles of different weights and lengths to be loaded onto the beam in balanced positions.

Operation of the winch hoist device to load a missile on a mount is accomplished by first causing the beam 11, normally bottomed against assembly 10, and assembly 10 to elevate to 0° horizontally by the trainable mount. That is, the mount through the trunnion arm connection with member 16 of the assembly causes the assembly 10 and beam 11 to rotate about a horizontal axis as one unit to a 0° attitude. The beam 11 is then lowered by paying out of cable 22 from its winding on power winch 19 in alignment with a missile positioned below. The mount is then trained causing simultaneous rotation of beam 11 about a vertical axis and aligned directly over the missile to be attached thereto. Front and rear missile shoes 60 are then bolted into place on the lower side of beam 11 and then the beam is carefully lowered until the shoes are superjacent the missile lugs, not shown. The missile is moved forward to a position just forward of the shoes on the beam, the beam is lowered slightly until the slots of the shoes are in horizontal alignment with the lugs, and the beam is finally moved by hand so that the shoe slots slide into the missile lugs and lock in place. The missile is then in loaded condition on the beam and is ready to be elevated to firing position in subjacent relationship with the support assembly 10. Power winch 19 is energized by suitable control means to wind cable 22 onto the winch thereby uniformly lifting the beam to bottom against the lower plate 30 of assembly 10, the beam being aligned in correct position relative to the assembly by means of taper guide pins 54 and 55. When the spring of terminal 53 is compressed to a predetermined limit by the force exerted on cable 23 as beam 11 is bottomed against the underside of assembly 10, the power supply to winch 19 is terminated by electrical switching activated by mechanical connecting elements in contact with the spring of terminal 53. The beam 11 and the missile attached thereto, together with the support assembly 10, may be trained and elevated by conventional fire control means arranged to command the movements of the mount, a side portion 20 of which is shown in FIG. 4, to which the present device is attached as stated herebefore. No further missile connections or movement is required on the beam to prepare the missile for launching, since the missile is ready for firing when mated on the shoes carried by the beam.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A winch hoisting device connectable to and controllable by a missile launcher of the trainable type for supporting a missile in a loaded and firing position in accordance with the position of the launcher and comprising a housing having a pair of mutually spaced side walls, a bottom and a top wall in spaced relation with respect to each other and connecting said side walls, a tubular member carried by one of said side walls and having an apertured flange integrally formed thereon connectable to the launcher of the trainable type for supporting the device upon the launcher such that the device is controlled by said launcher, a power winch supported by and on one end of said housing, a first pair of pulleys rotatably mounted on said side walls and disposed within said housing, a second pair of pulleys rotat-

ably mounted on said side walls and disposed within the housing in spaced relation with respect to said first pair of pulleys, a guide pulley rotatably mounted on one of said side walls and disposed within the housing substantially centrally between said first and the second pair of pulleys, a movable lifting beam disposed beneath said bottom wall of the housing and having a pair of mutually spaced conical apertures formed therein, a first idle pulley mounted on said beam and cooperating with said first pair of pulleys, a second idle pulley mounted on said beam and cooperating with said second pair of pulleys, a first and second shock dampening device supported within the housing between said side walls, means carried by and secured to said side walls for supporting said first and second shock dampening devices within said housing between the side walls, a flexible cable disposed about said power winch and having a pair of free ends disposed within the housing, one free end of the cable being reeved over said first pair of pulleys and the first idle pulley and secured to said first shock dampening device, the other free end of said cable being reeved over said second pair of pulleys, second idle pulley and said guide pulley and connected to said second shock dampening device, means carried by said first shock dampening device for connecting said one end of the cable thereto, means carried by said second shock dampening device for connecting said other end of the cable thereto, a pair of mutually spaced conical elements carried by said bottom wall engageable in said pair of apertures respectively for guiding and locking the beam to said housing as the beam moves into abutting engagement with said bottom wall through the medium of said power winch, pulleys and the cable, and means carried by said beam engageable with a missile for supporting the missile.

2. A device according to claim 1 wherein said first and second shock dampening devices include a sleeve slidably mounted in said supporting means, a bolt threaded into one end of said sleeve and having an adjustable nut threaded thereon normally in engagement with said supporting means, cable securing means carried by said bolt for securing the cable to the bolt, a cup-shaped stop mounted on said sleeve at one end thereof, an additional cup-shaped stop disposed about said sleeve at the other end thereof, and a spring disposed about said sleeve between said stops for dampening the shock forces as a sudden and severe pull is exerted on the cable.

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