July 26, 1966 W. PARASKEWIK 3,262,664

UNIVERSAL MISSILE ADAPTER

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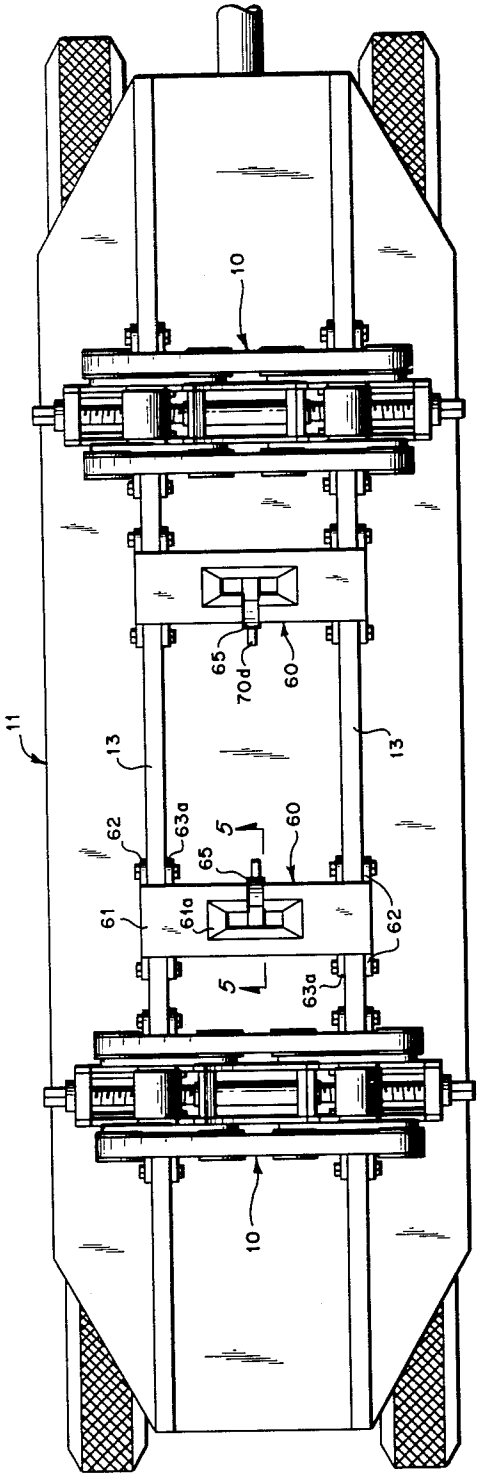


Fig. 1

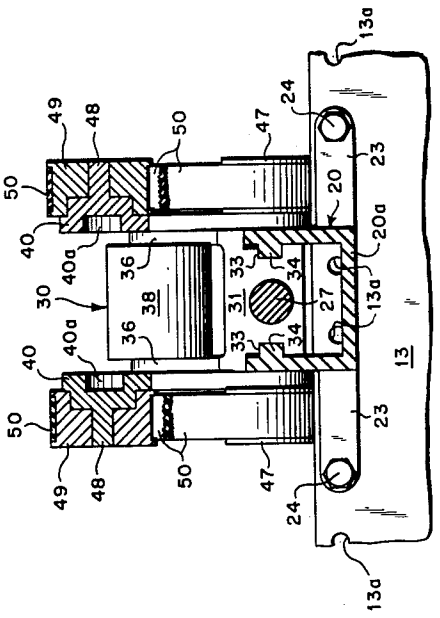


Fig. 4

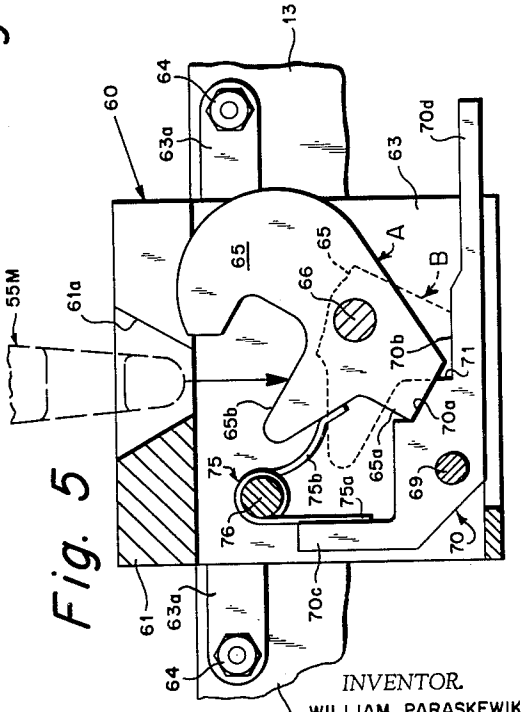


Fig. 5

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Fig. 2

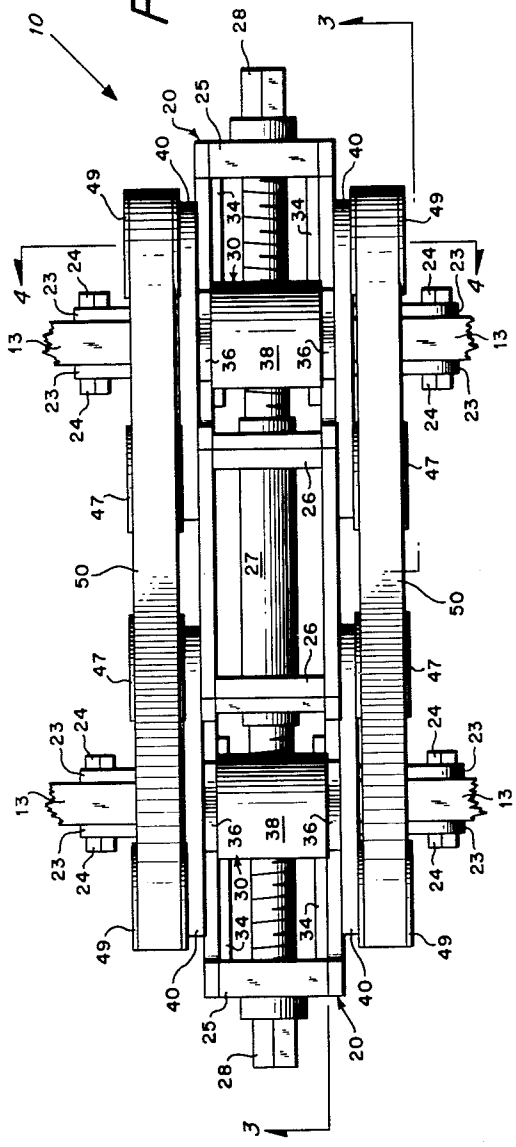
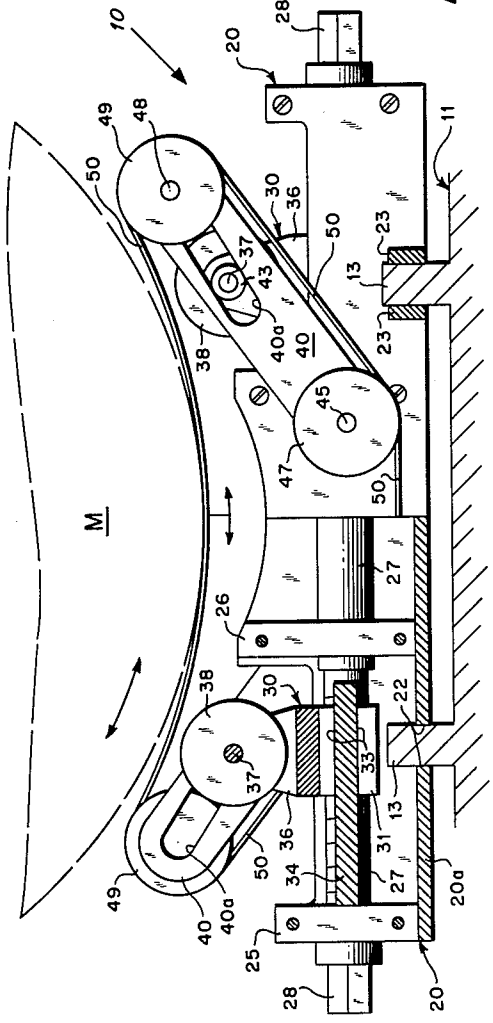


Fig. 3



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UNIVERSAL MISSILE ADAPTER

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5 Claims. (Cl. 248—119)

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 device for transporting heavy loads and more particularly to a handling apparatus for securing various diameter missiles to a wheeled dolly for the subsequent transportation of the missile from one location to another.

Heretofore several types of devices have been employed for performing the function of retaining missile loads, such as guided missiles, torpedoes or the like, upon dollies for the purpose of facilitating the transportation of such missiles. Screw down clamps have been used in some of these devices while in others cable lashings have been employed. These prior art missile-securing assemblies have not been altogether satisfactory in the handling of modern thin-shell weapons since they have caused damage to the shell of the missile even when extreme caution and low speeds were used during transport.

The need for a satisfactory clamping device which will hold a missile without slippage while the missile is being transported from a storage point to a subsequent location has been emphasized by the growing complexity of modern missiles, as well as the sensitivity or explosive nature of the various components employed therein. Consequently, missiles of the present day types must be transported and handled without even slight damage thereto if malfunctions are to be avoided. At the same time, however, missiles must be handled efficiently and with rapidity and the handling personnel must not be placed at a disadvantage in performing their duty of efficient handling by being required to either exercise extreme caution while handling the missiles or to transport the same at extremely low speeds.

Most present day missiles are designed with suspension lugs which are longitudinally spaced at 14 inch or 30 inch intervals. It is through these lugs that the missile is removably secured, through hooks or the like, to a carrier aircraft. Furthermore, the lugs are employed in the handling of the missile as the same proceeds through the logistic flow cycle. In a previous proposal, it was found desirable to utilize the suspension lugs in lieu of the screw down clamps and cable lashings to retain the missile upon the transportation vehicle. The missile was placed on the vehicle with the suspension lugs in an upwardly facing position and an attempt was then made to rotate the missile on its cradling structure for purposes of moving the suspension lugs adjacent to fastening means located at the bottom of the cradle. Rotation of the missile was found to be extremely difficult because of the weight thereof, and more particularly because of the many appendages formed on the missile: these appendages, for example, are used to secure the guiding and stabilizing wings and fins.

With the foregoing in mind the present invention provides a cradle or handling adapter which may be integrally or removably fastened to a wheeled supporting structure. The adapter of the present invention cradles the missile, anchors the same to permit transportation thereof, and provides unconstrained 360° rotation for purposes of moving the missile's suspension lugs to any desired position, such as downward for latching the missile, and upward for allowing simple removal of the missile from the cradle by a collateral handling device.

It is an object of the present invention to provide a cooperating cradle and clamping device for a transporting vehicle whereby a load may be secured to the cradle in a positive manner eliminating all possibility of slippage or looseness.

Another object of the present invention is to provide a cooperating cradle and clamping structure which will retain a load without damage to the surface thereof and without employment of additional clamps or securing means.

A further object is to provide a clamping device for retaining a load on a transportation vehicle, the device being capable of actuation in a rapid and positive manner.

Still another object of the present invention is to provide a combination cradle and latching means which permits a load, such as a missile, to sustain high G load without damage thereto when in the latched condition.

A still further object of the present invention is to provide a cradle which permits a load to be easily rotated 360° when situated thereon.

Other objects and many of the attendant advantages of this invention will be 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 shows a plan view of an embodiment of the present invention;

FIG. 2 illustrates a more detailed plan view of the handling adapter or cradle of the present invention;

FIG. 3 shows a section of the device taken on the line 3—3 of FIG. 2 looking in the direction of the arrows;

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 2; and

FIG. 5 is a view taken on the line 5—5 of FIG. 1.

In the illustrated embodiment of the invention and with particular reference to FIG. 1 it will be observed that a pair of cradles or handling adapters, generally designated by reference numerals **10**, are secured to a supporting structure such as the wheeled dolly **11** in a manner to be described more fully below. Since the adapters **10** are identical in all respects, only one adapter of the pair will be specifically described below. As best illustrated in FIGS. 1 and 4, the supporting structure **11** includes a pair of upwardly extending longitudinal rails **13** perforated along the longitudinal length thereof at **13***a* for selectively positioning both the cradles **10** and a cooperating pair of latching mechanisms generally designated by reference numerals **60**. The cradles **10** and latching mechanisms **60** are particularly arranged to support a cylindrical load such as a missile M longitudinally of the length of the supporting structure **11** and at the same time prevent the load from shifting in any direction relative to the cradle.

Reference is now made to FIGS. 2, 3 and 4 for a more detailed description of the cradle assembly **10**. The cradle comprises a U-shaped channel member or frame **20** positioned transversely of the rails **13** with a pair of slots **22** formed in the base **20***a* thereof for receiving the rails **13** of the supporting structure **11**. The channel member **20** is additionally formed with transversely extending arms **23**, seen more clearly in FIG. 4, each having apertures at the ends thereof for alignment with the perforations **13***a* of the rails **13**. Appropriate fasteners **24** pass through the apertures in the arms **23** and rails **13** to thereby anchor the cradle **10** to the wheeled supporting structure **11**.

As viewed in FIGS. 2 and 3, the frame **20** includes an outer pair of bearing blocks **25** and an inner pair of bearing blocks **26** appropriately secured to the sidewalls of frame **20** for rotatably receiving a shaft **27** there-

through. Shaft **27** is reversely threaded along the length thereof between each outer bearing block **25** and inner bearing block **26** and includes tool receiving portions **28** at the ends thereof.

Positioned between each outer bearing block **25** and inner block **26** and threadably engaged by shaft **27** is a traveling block or traveler generally indicated at **30**. Each block **30** includes a base portion **31** for receiving the reversely threaded portions of shaft **27**, the base being further constructed with guide slots **33** for engaging corresponding guide rails **34** formed on the sidewalls of channel member **20**. Each traveler **30** includes upwardly extending ears **36** having an aperture extending therethrough for rotatably supporting a pin **37** in a bearing-like manner. Pin **37** projects from and may be formed integrally with a load abutting roller member **38**, the roller portion thereof being constructed of soft rubber or like material of such characteristics that injury to the missile M is precluded. As viewed more clearly in FIG. 3, pins **37** extend outwardly beyond the ears **36** of each block **30** and extend into oblong slots **40***a* formed in link arms **40**. Bearing assemblies **43** are appropriately fitted to these extensions of pins **37** and abut against the edges of the slots **40***a* to facilitate movement of each pin relative to the link arms **40** upon sliding movement of block **30** in response to rotation of shaft **27**.

Pivot pins **45** integrally secured or otherwise formed with channel member **20**, pivotally connect the lower ends of the link arms **40** to the frame **20** and a lower wheel **47** is additionally supported for rotation on each pivot pin **45**. As viewed in FIG. 4 the upper end of each of the link arms includes an outwardly projecting spindle portion **48** rotatably receiving an upper wheel **49**. An endless belt **50** is applied about the lower and upper wheels **47** and **49**, respectively, to provide a soft flexible support for the missile M which extends transversely thereof. By reason of the belt and wheel arrangements the missile M may be rotated with facility to bring hoisting lugs **55M** formed on the missile M into engagement with the latching mechanism **60** shown in FIGS. 1 and 5.

Latching mechanism **60** includes a top plate **61** extending transversely of the rails **13** and an access opening **61***a* formed therein. Plate **61** includes downwardly depending flanges **62** at the extremities thereof and an additional pair of downwardly depending plates **63** extending adjacent the inside of the rails **13**. Flanges **62** and plates **63** are formed with apertures corresponding to the spacing of the apertures **13***a* in rail **13** and a fastener **64** passes through these apertures to anchor the latching mechanism at the proper location along the rails **13**. The position of the latching mechanism will be determined by the lug spacing on the missile M.

A lug engaging hook **65** including base portion **65***a* and hook camming surface **65***b* is pivotally connected intermediate the depending plates **63** to a shaft **66** secured to the sideplates **63** and the hook **65** is freely pivotal between the solid line or unlatched position A and the dotted line or latched position B. In order to maintain the hook **65** in the latched position B, a releasable hook-retaining mechanism **70** is pivoted adjacent hook **65** to a shaft **69** journaled in sideplates **63**. Retainer **70** includes a retainer camming surface **70***a* for camming engagement with the base **65***a* of hook **65**, a shoulder portion **70***b* for engaging the base of the hook, and a flange **70***c*. A coiled spring mechanism **75** is secured to pin **76** which in turn is anchored to the sidewalls **63** and includes a one end **75***a* thereof engaging the flange **70***c* of retainer **70** and urging the same to pivot in a counterclockwise direction. The other end **75***b* of spring **75** engages the hook **65** and urges the same toward the unlatched position A.

The latching mechanism operates in a manner now to be described. Prior to the introduction of the lug **55M** into the access opening **61***a* of plate **61**, the spring elements **75***a* and **75***b* urge the retaining mechanism **70** and the lug engaging hook **65** to the respective solid line position A. Upon introduction of the lug **55M** within opening **61***a* and the engagement thereof with the hook camming surface **65***b*, the hook **65** rotates in a counterclockwise direction about pivot pin **66** toward the dotted line position B. This rotative movement causes the base **65***a* of the hook **65** to engage the retainer camming surface **70***a* and to rotate the same in a clockwise direction against the action of spring elements **75***a*. When the base portion **65***a* passes the camming surface **70***a*, that is, assumes the dotted line position B, the spring element **75***a* urges the retainer **70** to the illustrated position wherein shoulder **70***b* engages the base **65***a* of the hook thereby precluding any movement thereof toward the unlatched position A. In order to unlatch the lug **55M**, the retainer **70** is pivoted in a clockwise direction about shaft **69** by an application of a force at an outer extremity thereof, for example at **70***d*.

Describing now the operation of the adapter **10** in combination and cooperation with the latching mechanism **60**, reference is now made to FIGS. 2, 3 and 4. In the initial position, that is prior to the introduction of the missile M on the conveying vehicle, the traveling blocks **30** and associated rollers **38** are positioned adjacent the outer bearing blocks **25**. It should be noted that rotation of the shaft **27** at either end thereof will cause the traveling blocks **30** to move in opposite directions in view of the reverse threading of the shaft. In this position the rollers **38** and the upper wheels **49** are in substantial alignment and the endless belt **50** is in its least slackened condition. The missile M is unloaded from a preliminary carrying vehicle and hoisted from the preliminary carrier to the cradles **10** of supporting structure **11**. This missile M is placed transversely of the cradles **10** and rest on the two pairs of belts **50**. It should be noted that the missile in this position does not engage any rollers or other restraining surfaces. Due to the hoisting of the missle, the lugs **55M** extend upwardly in a direction opposite to the location of the latching mechanism **60**. By reason of the cradle arrangement of the present invention the missile M may be rotated by hand to bring the lugs **55M** adjacent the latching mechanism location. The rotation of the missile is accomplished with facility since the belt moves over the wheels **47** and **49**, is flexible, and offers no resistance to any appendages, such as fittings or projections that may extend from the missile. When the lug **55M** is adjacent the latching mechanism **60**, the shaft **27** is rotated in a direction to cause the traveling blocks **30** to move inwardly. Due to the engagement of pin **37** and roller bearing assembly **43** with the sides of the oblong slot **40***a*, inward movement of the block **30** causes link arm **40** to pivot upwardly about pivot pin **45**. Oblong slot **40***a* is angularly related to the central axis of link arm **40** extending between pivot pins **45** and **48** and, thereby, maintains the wheels **49** by contacting the missile M as the sliding block **30** moves inwardly. That is, the configuration of oblong slot **40***a* is such that a greater slack is permited in the belt **50** without wheels **49** engaging the missile. It is readily seen in FIG. 3 that inward movement of the traveling block **30** causes the pivoting of link arm **40** and slackening of belt **50** which thereby permits the missile and associated lugs **55M** to move downwardly toward engagement with latching mechanism **60**. Wheels **49** do not engage the missile at this time which factor allows the final rotative adjustment of the missile and associated lug into the access opening **61***a*. Continued inward movement of traveling block **30** further slackens the belt **50**, thereby causing lug **55M** to initiate the latching mechanism **60** in a manner described above. When the hook **65** and retainer **70** are in the latched position, shaft **27** is further rotated to continue the inward movement of traveling block **30**. This movement causes the soft rubber roller **38** to engage the missile and urge the same upwardly against the retaining hook **65**. At this time, the belt **50** partially envelops the missile M and thereby provides side support thereto.

In order to remove the missile M from the cradle **10**, the retainer **70** is depressed as described above with reference to the discussion of the latching mechanism **60**. If necessary, the traveling block **30** is then moved inwardly, by rotation of shaft **27**, to lift suspension lug **55M** from opening **61***a*. The missile M is now freely rotatable with belt **50** and the lugs **55M** are easily upwardly positioned to allow simple removal of the missile from the cradle by a collateral handling device.

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 device for supporting, positioning and transporting a cylindrical ordnance missile having securing means associated therewith comprising:

a wheeled supporting structure;

fastening means adjustably positioned on said supporting structure for engaging the securing means;

a cradle including a frame adjustably positioned on said supporting structure for supporting and positioning the missile;

belt means mounted on said frame, said belt means providing the sole support for the missile and having continuous movement transverse of the length of the missile, whereby the missile can be rotated about the longitudinal axis thereof without incurring any substantial resistance thereto for positioning the securing means with respect to said fastening means; and

means mounted on said frame for moving said belt means between an unslackened and a slackened condition to thereby raise and lower the position of the securing means on the missile with respect to said fastening means.

2. The combination as defined in claim **1** wherein said fastening means includes:

hook means pivotal between a latched and unlatched position, said hook means being moved to the latching position by the securing means.

3. The combination as defined in claim **2** wherein said belt moving means includes roller means for engaging the missile after the missile has been engaged by said fastening means for urging the missile away from the said fastening means.

4. The combination as defined in claim **3** further including:

a pair of arms on each side of said frame having one end thereof pivotally connected to said frame;

wheel means rotatably secured to each end of said arms for receiving said belt means thereabout;

said belt moving means operatively engaging said arms and moving said belt means positioned thereabout between a slackened and unslackened condition.

5. A device as defined in claim **4**, and including:

a threaded shaft journaled in said frame,

said belt moving means threadably secured to said shaft for movement in response to rotation thereof.

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