United States Patent [19]

Day

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[45] Mar. 25, 1975

[54] **MISSILE LOADER**

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[73] Assignee: **The United States of America as represented by the Secretary of the Navy,** Washington, D.C.

[22] Filed: **Oct. 4, 1973**

[21] Appl. No.: **403,711**

[52] U.S. Cl. **214/394,** 89/1.805

[51] **Int. Cl.** **B60p 3/00**

[58] **Field of Search** ..... 89/1.805; 254/86 R; 244/137; 214/1 D, 38 CA, 38 CC, 86 R, 394, 396

[56] **References Cited**

UNITED STATES PATENTS

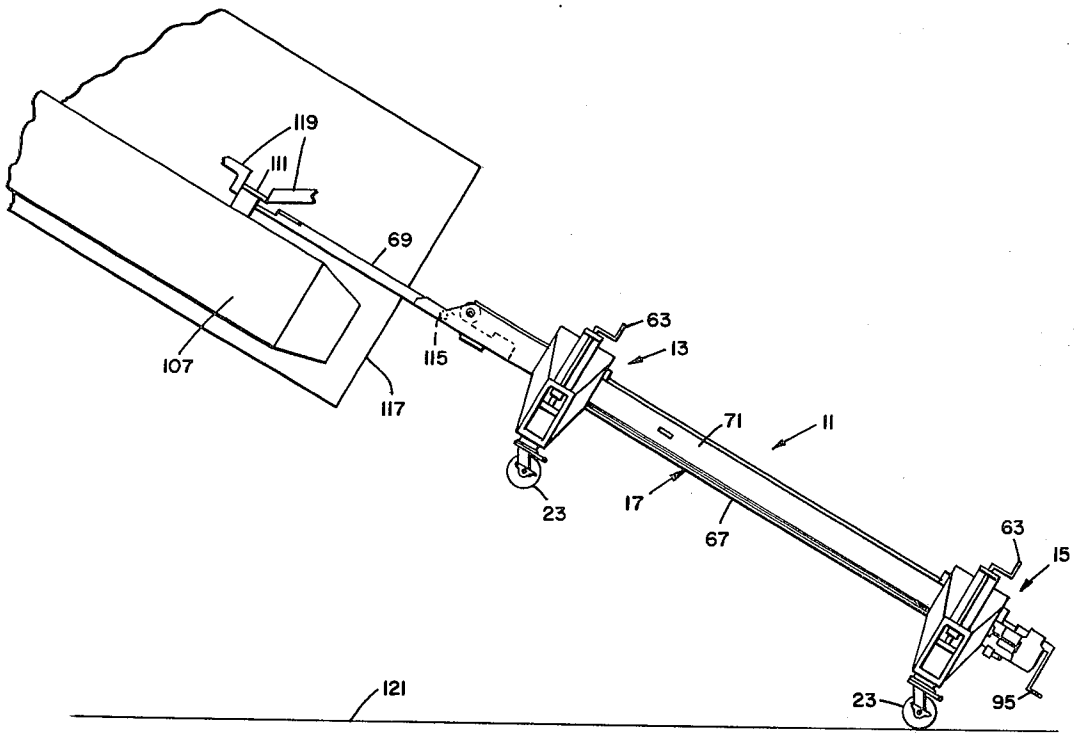
2,987,963	6/1961	Eaton	89/1.805
3,120,316	2/1964	Luchford	214/394
3,259,364	7/1966	Hulverson	254/86 R

Primary Examiner—Robert B. Reeves
Assistant Examiner—Larry H. Martin
Attorney, Agent, or Firm—R. S. Sciascia; Charles D. B. Curry

[57] **ABSTRACT**

A missile loader including two arch assemblies and a beam assembly. The arch assemblies are spaced apart, straddle and pivotally support the beam assembly at the ends. Each arch assembly has a pair of adjustable legs that raise or lower the half of the arch to which each leg is connected. By actuating the adjustable legs the beam assembly is raised or lowered. The beam assembly includes front and rear missile shoe tracks, front and rear missile shoe openings and a shuttle slidably mounted in the rear missile shoe track. The shuttle is longitudinally actuated by a continuous chain drive. In operation, the beam assembly is lowered and captures the front and rear missile shoes in the tracks. The beam is then adjusted by the adjustable legs to properly align the missile with the missile launcher. The shuttle is then actuated to slide the missile along the beam and into the missile launcher.

3 Claims, 19 Drawing Figures



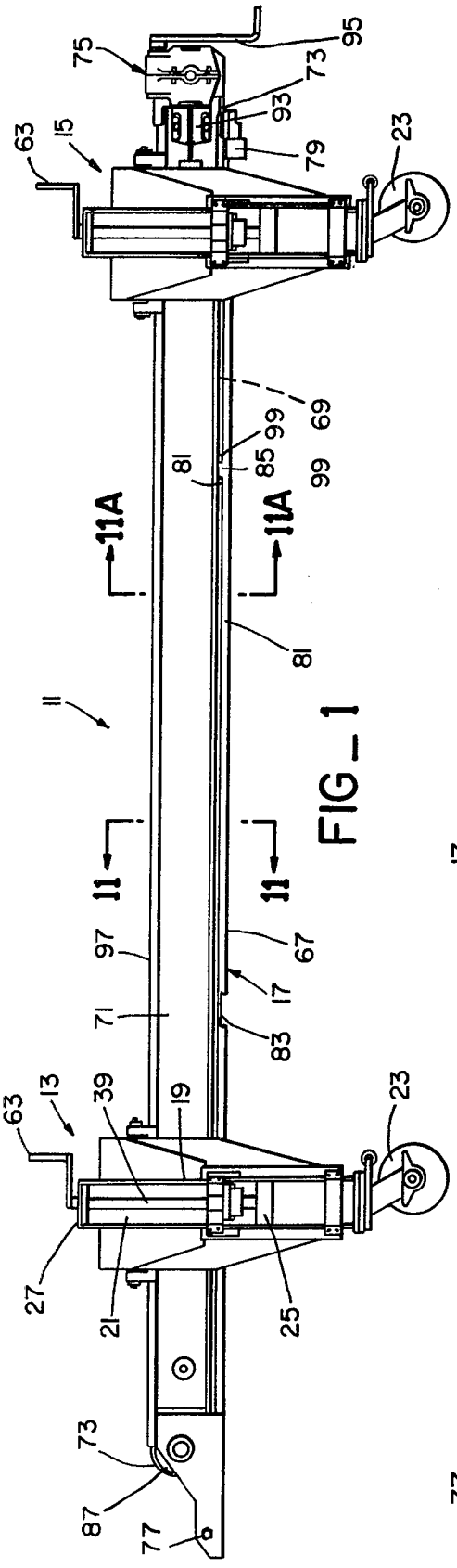


FIG_1

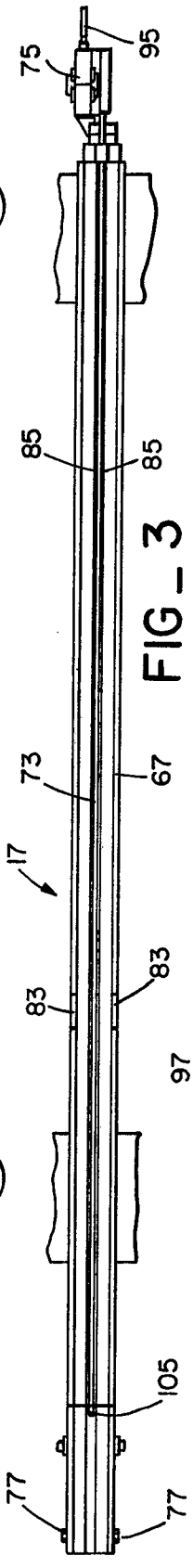


FIG_3

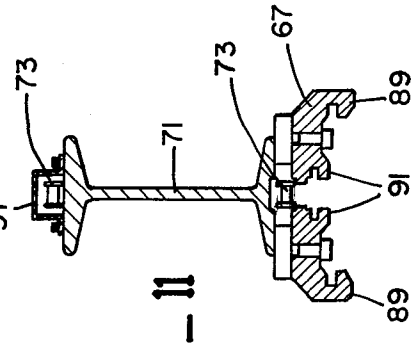


FIG_11

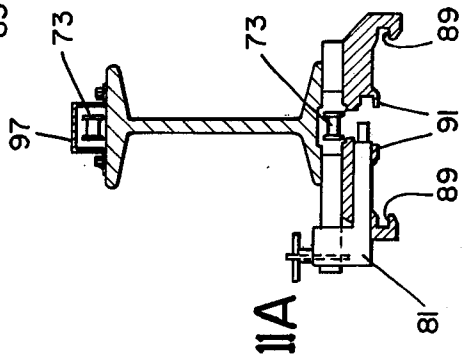


FIG_11A

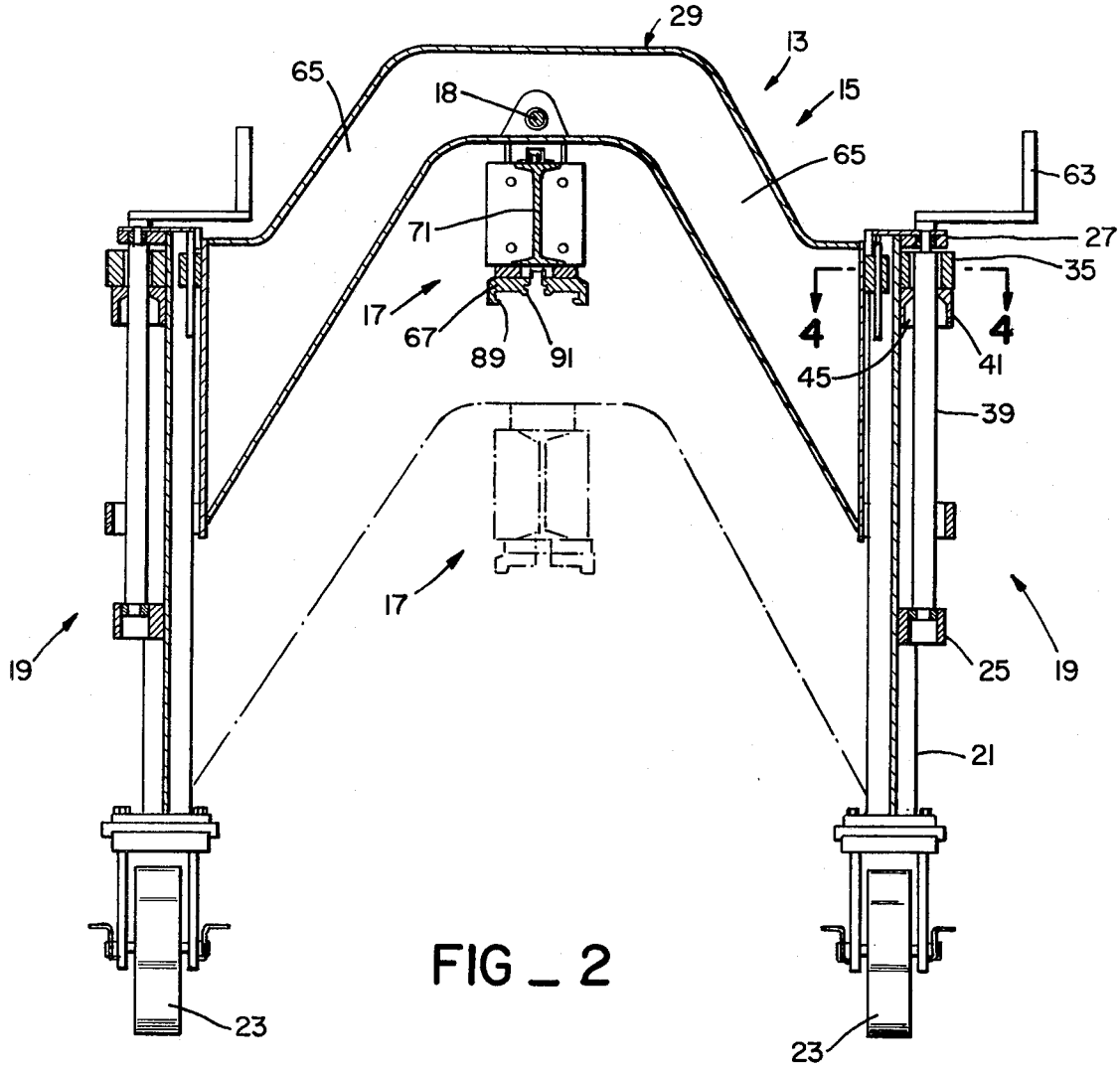


FIG _ 2

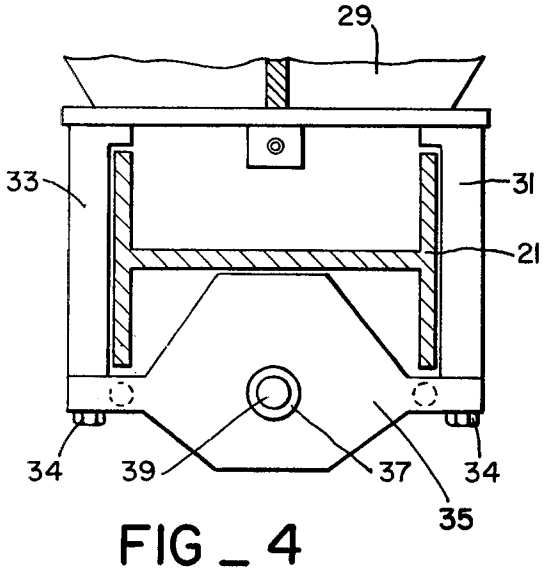


FIG _ 4

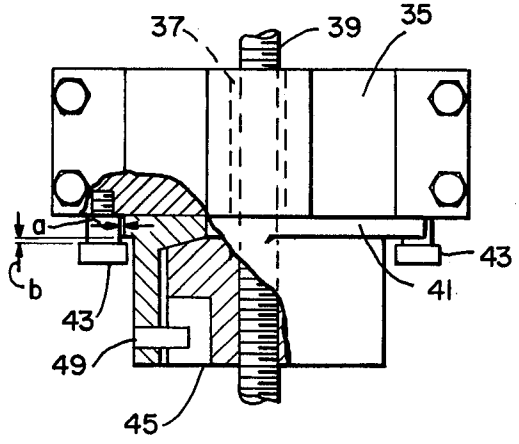


FIG _ 5

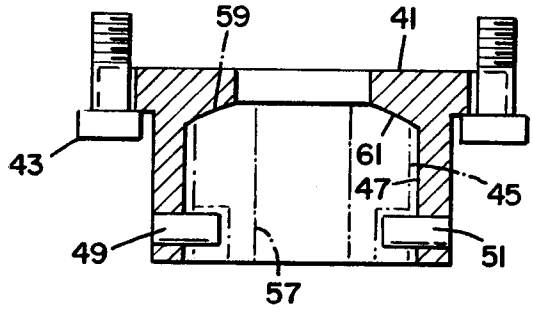


FIG_6

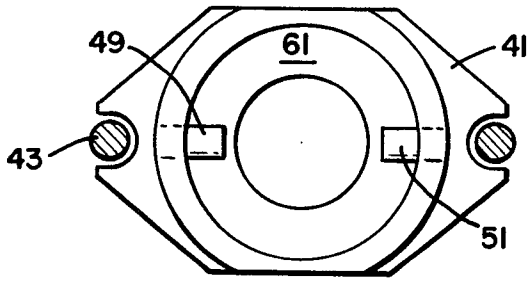


FIG_7

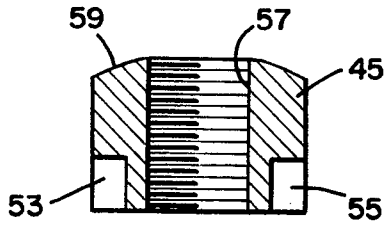


FIG_8

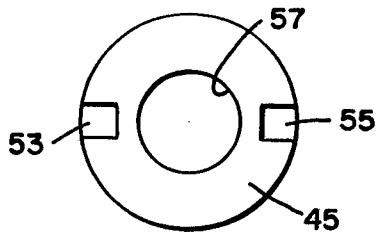


FIG_9

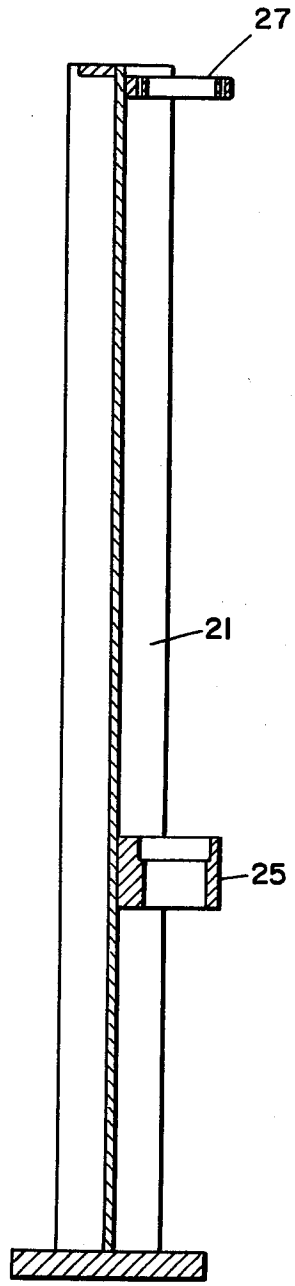


FIG_10

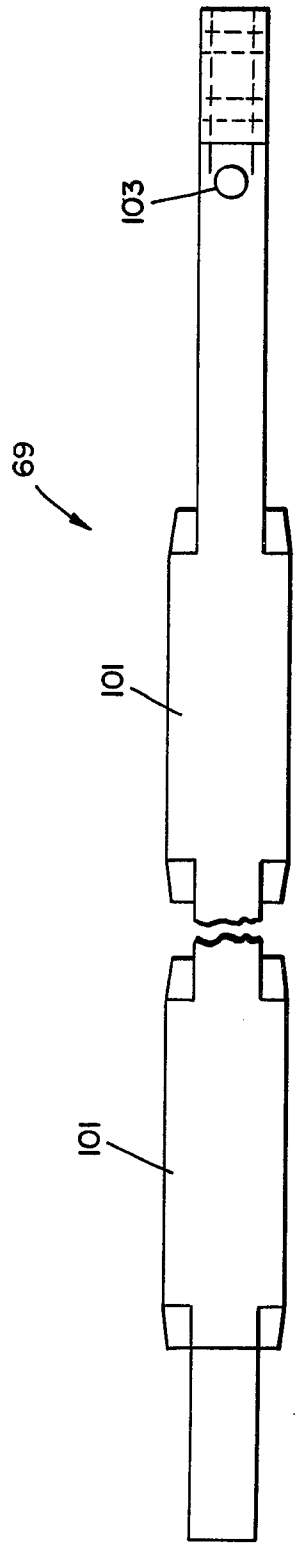


FIG_12

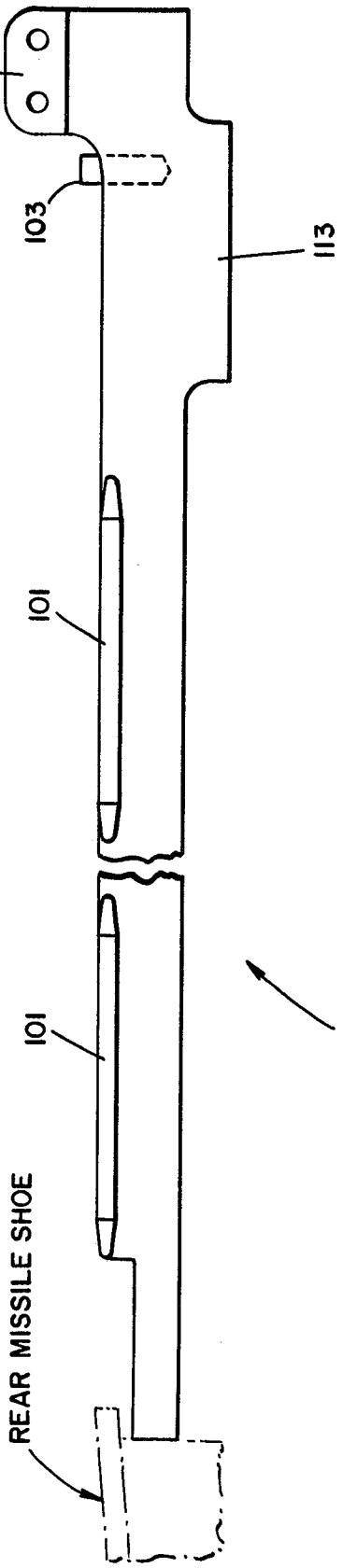
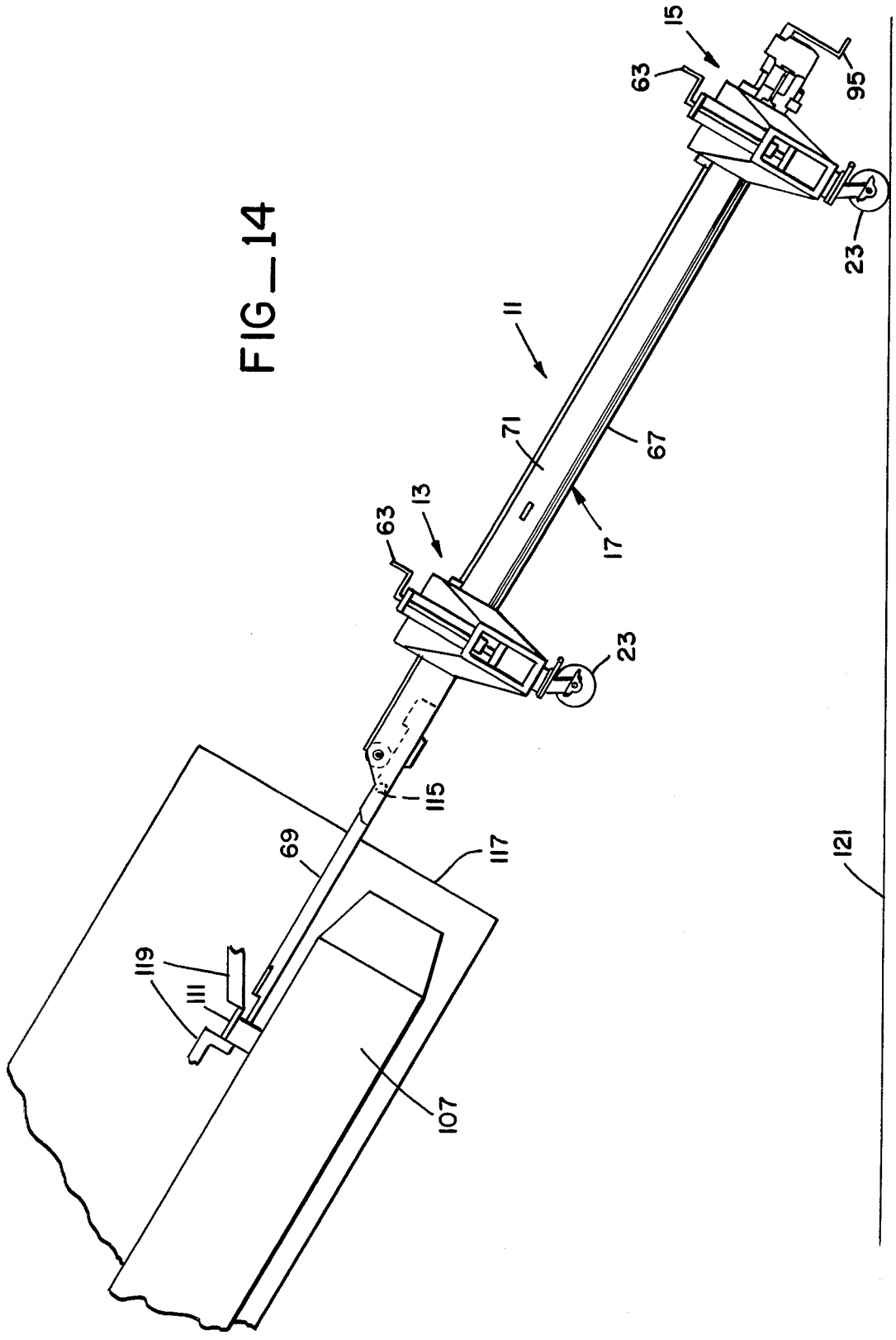


FIG_13

FIG_14



LOADER LOWERED OVER MISSILE SHOES

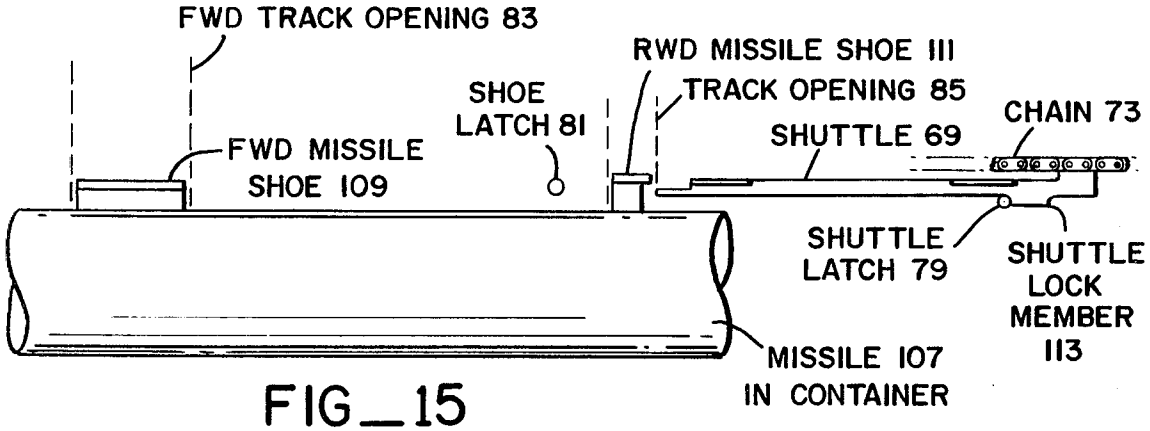


FIG_15

LOADER CAPTURES MISSILE SHOES

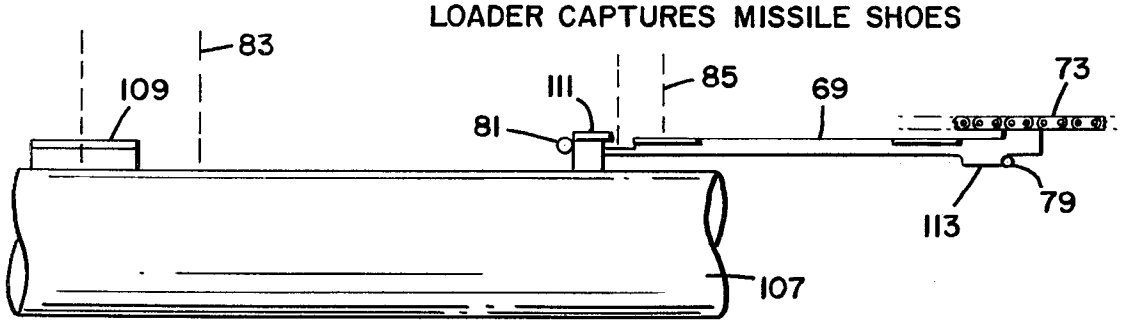


FIG_16

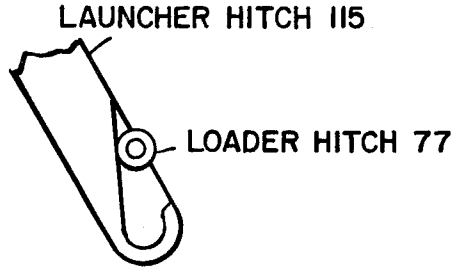


FIG_17

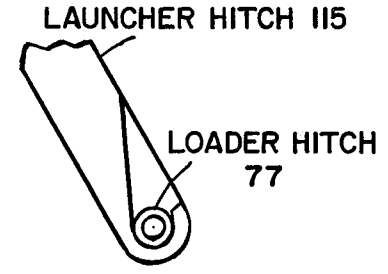


FIG_18

MISSILE LOADER

BACKGROUND OF THE INVENTION

1. Field of the Invention.

The present invention relates to a missile loader and more particularly to a missle loader that straddles, captures, carries and slides the missile into a missile launcher.

2. Description of the Prior Art.

Prior missile loaders have had very little flexibility in adjusting to uneven ship decks and have been of cantilever or cradle type construction. The present invention is adjustable to accomodate for uneven decks and is of a suspended beam type construction.

SUMMARY OF THE INVENTION

Briefly, the present invention comprises a missile loader including two arch assemblies and a beam assembly. The arch assemblies are spaced apart, straddle and pivotally support the beam assembly at the ends. Each arch assembly has a pair of adjustable legs that raise or lower the half of the arch to which each leg is connected. By actuating the adjustable legs the beam assembly is raised or lowered. The beam assembly includes front and rear missile shoe tracks, front and rear missile shoe openings and a shuttle slidably mounted in the rear missile shoe track. The shuttle is longitudinally actuated by a continuous chain drive. In operation, the beam assembly is lowered and captures the front and rear missile shoes in the tracks. The beam is then adjusted by the adjustable legs to properly align the missile with the missile launcher. The shuttle is then actuated to slide the missile along the beam and into the missile launcher.

STATEMENT OF THE OBJECTS OF THE INVENTION

An object of the present invention is to provide a loading device that can be adjusted to accomodate for an uneven surface upon which it is positioned.

Another object of the present invention is to provide a suspended beam type loading device.

Still another object of the present invention is to provide a missile loading device that is used to lift a missile from a shipping container, transport the missile to a missile launcher, connect to the missile launcher and slide the suspended missile into the missile launcher.

A still further object of the present invention is to provide a missile launcher that is easily assembled and disassembled for storage and portability.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic drawing of the side elevation of the missile loader of the present invention;

FIG. 2 is a front elevation of the missile loader of FIG. 1;

FIG. 3 is a bottom view of the beam assembly of FIG. 1;

FIG. 4 is a view taken at section 4—4 of FIG. 2;

FIG. 5 is a side elevation, partly in section, of the FIG. 4 view;

FIG. 6 is a sectional side elevation of the travelling nut support shown in FIGS. 4 and 5.

FIG. 7 is an end view of the travelling nut support of FIG. 6;

FIG. 8 is a sectional side elevation of the travelling nut shown in FIGS. 4 and 5;

FIG. 9 is an end view of the travelling nut of FIG. 8;

FIG. 10 is a side view of the arch assembly leg;

FIGS. 11 and 11A are cross-sections of the beam assembly taken at section 11—11 and 11A—11A of FIG. 1;

FIG. 12 is a bottom view of the shuttle of FIG. 1;

FIG. 13 is a side elevation of the shuttle of FIGS. 1 and 12;

FIG. 14 is a schematic diagram of the missile loader of the present invention being connected to the missile launcher;

FIG. 15 is a schematic diagram of the relationship of the missile loader and the missile prior to missile capture;

FIG. 16 is a schematic diagram of the relationship of the missile loader and the missile after capture of the missile;

FIG. 17 is a schematic diagram of the initial position of the missile loader hitch and the missile launcher hitch; and

FIG. 18 is a schematic diagram of the locked position of the missile loader hitch and the missile launcher hitch.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 is illustrated the side elevation of the missile loader 11 of the present invention. Missile loader 11 consists of three basic assemblies that are easily disassembled for portability and storage. These three assemblies are two interchangeable arch assemblies 13 and 15, as best depicted in FIG. 2, and beam assembly 17, as best depicted in FIGS. 1 and 3. From FIGS. 1 and 2 it can be seen that the arch assemblies 13 and 15 straddle and pivotally support the beam assembly 17 by pivots 18. As hereinafter explained in detail, the beam assembly 17 is movable in the vertical direction for lifting a missile or the like and the arches 13 and 15 are caster mounted to transport the missile in the horizontal direction.

Referring to FIGS. 2, 3 and 10 each arch assembly 13 and 15 includes a pair of legs 19 and an arch 29. Each leg 19 includes an I beam 21, casters and associated supports 23, screw support member 25 and bearing support 27. As best depicted in FIGS. 2 and 4, arch 29 has attached thereto, by welding or the like, leg guide members 31 and 33. Attached to the ends of leg guide members 31 and 33 by bolts 34, for example, is arch support 35. Arch support 35 has an opening 37 through which screw 39 passes. As best shown in FIGS. 5, 6 and 7, travelling nut support 41 is loosely supported by shoulder bolts 43. Clearances *a* and *b*, as shown in FIG. 5, are provided wherein clearance *a* allows travelling nut support 41 to move laterally and clearance *b* prevents clamping of the travelling nut support 41 to arch support 35. As best depicted in FIGS. 5, 6, 8 and 9, travelling nut 45 is retained in the center opening 47 of travelling nut support 41 by pins 49 and 51. Travelling nut 45 has slots 53 and 55 which respectively receive pins 49 and 51. Travelling nut 45 also has a center threaded opening 57 that receives threaded screw 39.

It should be particularly noted that travelling nut **45** has a spherical upper surface **59** which permits rotatable contact with the spherical surface **61** of opening **47** of travelling nut support **41.**

A handle **63** is attached to the upper end of screw **39.** Upon rotation of the handle travelling nut **45** will be either raised or lowered and thereby raise or lower the arch leg **65** to which it is connected. Clearance a of FIG. **5** allows I beam **21,** of FIG. **4** to slide with respect to leg guide members **31** and **33.** In addition, spherical surface **61** aids in this adjustment.

Referring to FIGS. **1, 2, 3, 11** and **11A** the beam assembly **17** includes a track **67,** a shuttle **69,** I beam **71,** continuous chain **73,** chain drive mechanism **75,** launcher hitches **77,** shuttle latch **79,** shoe latch **81,** forward track opening **83,** rearward track opening **85** and forward chain sprocket **87.** Track **67** extends nearly the entire length of the beam assembly **17** and includes front missile shoe track **89** and rear missile shoe track **91** as best depicted in FIGS. **2, 11** and **11A.** Forward track opening **83** is formed by cutting an opening in the front missile shoe track **89** and rearward track opening **85** is formed by cutting an opening in the rear missile shoe track **91.** The continuous chain **73** passes over forward chain sprocket **87** and over a drive sprocket, not shown, in drive mechanism **75.** The drive mechanism includes a chain tension adjusting mechanism **93** that fixes the longitudinal position of the chain drive mechanism **75.** A handle **95** is provided to drive the chain drive mechanism. Chain cover **97** is provided to protect the chain.

As best depicted in FIGS. **12** and **13,** the chain is operatively connected to shuttle **69** by support dog **98** to drive shuttle **69** longitudinally along rear missile shoe track **91.** As best depicted in FIGS. **1, 12** and **13** the shuttle **69** is an elongated member that extends from a point **99** (FIG. **1**), that is slightly rearward of rearward track opening **85,** to the rear end of the track and has elongated shoes **101** that slide within rear missile shoes track **91.** The elongated shoes **101** are longer than opening **85** so that they will not fall through the opening **85** when it passes over the opening during forward and rearward travel. The shuttle **69** may be moved forward along the track and extends out past the end of the beam assembly as best illustrated in FIG. **14.** The shuttle **69** is stopped when shuttle pin **103** (FIGS. **12** and **13**) contacts stop **105** (FIG. **3**) that is formed in the forward track segment.

The operation of the missile loader will now be explained in conjunction with FIGS. **14, 15, 16, 17, 18** and **19.** In FIG. **15** the missile loader **11** is brought over missile **107** such that track openings **83** and **85** are respectively aligned with forward missile shoe **109** and rearward missile shoe **111.** The beam assembly **17** is then lowered to rest on the missile shoes **109** and **111.** While in this position the shuttle is in the most rearward position wherein shuttle latch **79** is positioned in front of shuttle lock member **113** to keep the shuttle behind track opening **85.** The shoe latch **81** is in the latched position (FIGS. **11A** and **15**). The missile capture operation is illustrated in FIG. **16** wherein the shuttle latch **79** of FIG. **15** is removed, the shuttle is moved forward by chain **73** against the missile shoe **111** which moves the missile loader **11** rearward until shoe latch **81** contacts missile shoe **111.** Then the shuttle latch pin **79** is positioned behind shuttle lock member **113** which captures the missile shoes in tracks **89** and **91.**

The missile is then raised out of the missile container by raising beam assembly **17** by rotating handles **63.** The missile loader **11** is then moved on its casters to the vicinity of the missile launcher. The vertical position of the beam assembly **17** is adjusted (by handle **63**) and the lateral position of the beam assembly **17** is adjusted (on the loader casters) such that loader hitches **77** come into contact with launcher hitches **115** as shown in FIG. **17.** The missile launcher **117** is then raised (see FIG. **14**) such that the launcher hitches **115** engage the loader hitches **77** as shown in FIG. **18.** The launcher **117** is then depressed to align the launcher tracks with the loader tracks. Then the shuttle is moved forward by chain drive mechanism **75** until the missile is positioned within the missile launcher **117** as shown in FIG. **14.** When the missile is locked in place, by latches **119,** the shuttle is moved rearward and the launcher is then elevated to let the front casters be within a few inches of the deck **121.** Then the beam assembly **17** is raised to disengage the hitches **77** and **115.** The missile loader is then removed and the launcher is returned to the horizontal position. The missile may be removed by employing a sequence that is essentially the reverse of that described for loading.

What is claimed is:

1. A loading device comprising:
a. a first arch assembly;
b. a second arch assembly;
c. a beam assembly;
d. said first and second arch assemblies being spaced apart and about parallel;
e. one end of said beam assembly being operatively connected to the upper interior section of said first arch assembly;
f. the other end of said beam assembly being operatively connected to the upper interior section of said second arch assembly;
g. means for raising and lowering said beam assembly;
h. said beam assembly including a beam and a track means extending the length of said beam;
i. sliding means for moving an element positioned on said track means along the length of said track;
j. said track includes first and second tracks;
k. said first track including an opening to receive the forward missile shoe of a missile; and
l. said second track including an opening to receive the rearward missile shoe of a missile.

2. The device of claim **1** wherein:
a. said sliding means comprises an elongated shuttle mounted on said second track;
b. drive means for driving said shuttle in the forward direction on said second track; and
c. lock means for locking said shuttle rearward or forward of said opening in said second track.

3. The device of claim **2** wherein:
a. said drive means includes a first sprocket rotatably mounted on the forward end of said beam assembly, a second sprocket mounted on the rearward end of said beam assembly, a continuous chain operatively connected to said first and second sprockets, means for attaching a part of said chain to said shuttle and means for driving said second sprocket.

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