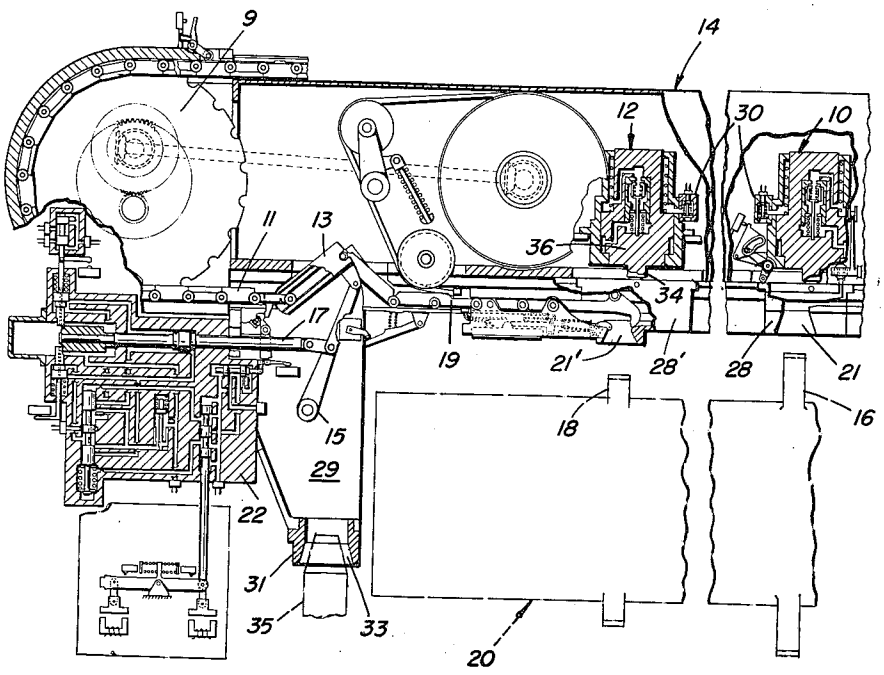
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FLOATING TRACKS

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3 Sheets-Sheet 1

FIG. 1



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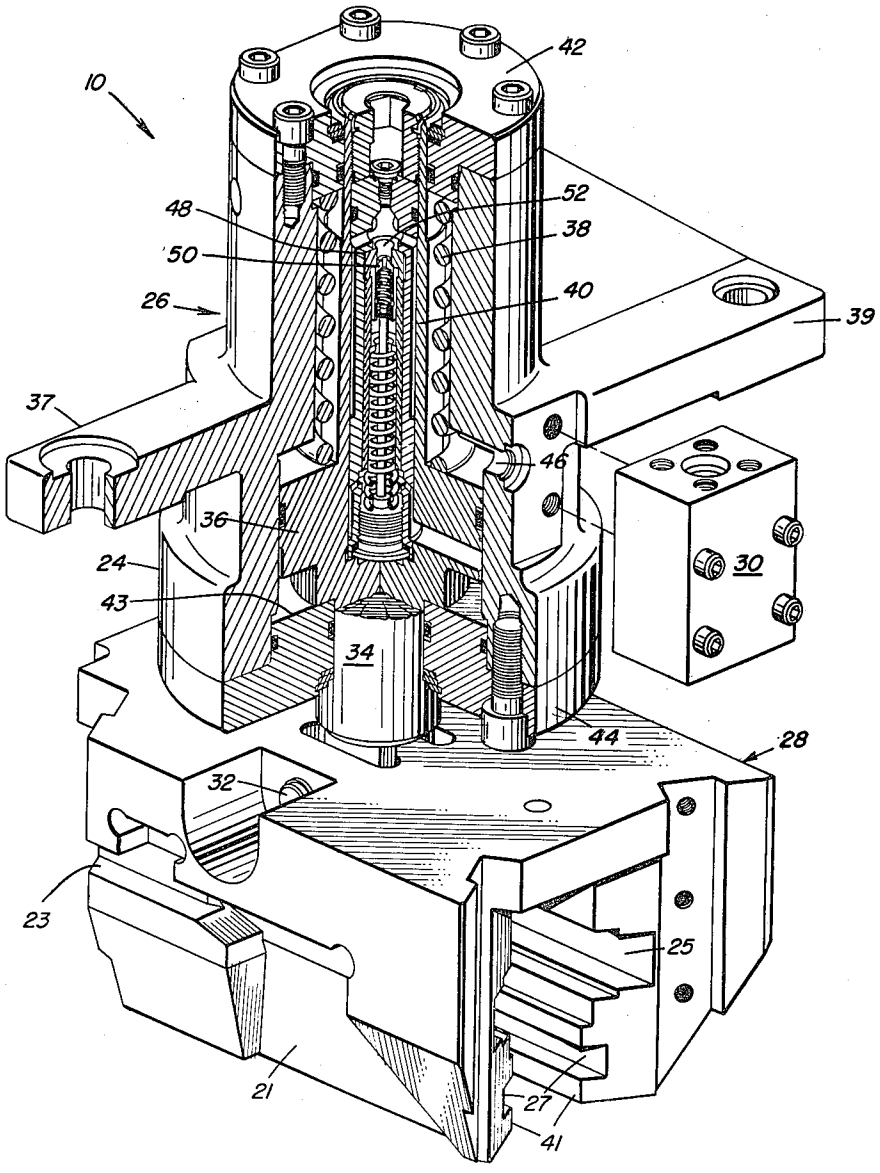
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FIG. 2



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FIG. 3

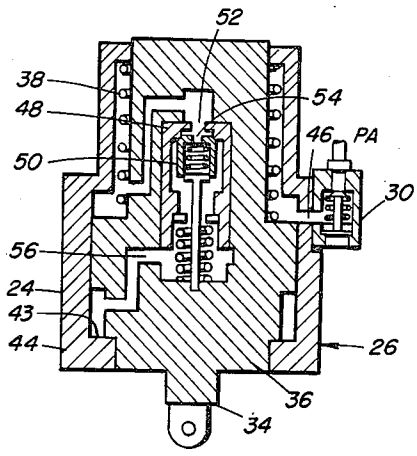


FIG. 4

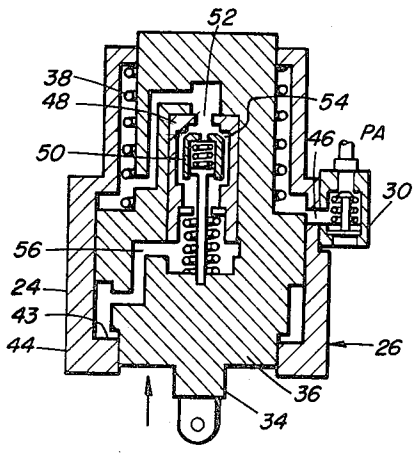
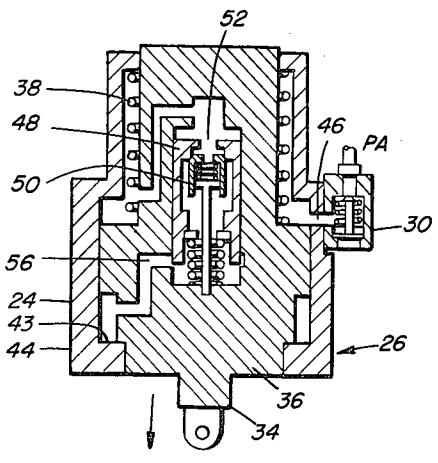


FIG. 5



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3,086,480

FLOATING TRACKS

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7 Claims. (Cl. 104—172)

This invention relates generally to a conveyor system, and more particularly it pertains to an engagement mechanism for receiving the supporting shoes of lug supported articles and smoothly bringing them into alignment with the tracks of a tramway.

In modern armament for use in storing, transporting, and launching guided missile weapons, such weapons are normally stored in a ready service mechanism. Each missile weapon stored thereon consists of a missile having a warhead, and a booster for launching and propelling the missile. While in storage in the ready service mechanism, the missile-booster combination may be supported at its forward, middle, and aft portions by saddles on a tray.

When a missile-booster combination is desired for transfer from the ready-service mechanism to the launcher of the guided missile launching system, the missile-booster combination is lifted by a pair of hoists from the ready-service mechanism. Upper, forward and aft booster shoes on the booster of the missile-booster combination are employed for effectuating transfer of the latter to the launcher. Because of deck deflection which occurs when the ship on which the launching system is installed is underway, shoe alignment with the overhead launcher tramway may occur somewhat imprecisely.

This invention employs short track sections in the launcher rail for receiving forward and aft booster shoes into the rail. These short fore and aft sections of the rail are hingeably maintained and hydraulically controlled for effectuating smooth cooperation with the hoist of the ready-service mechanism and accurate alignment of the fore and aft booster shoes with the tramway.

Accordingly, it is an object of the present invention to provide a mechanism capable of smoothly effectuating the functioning of an automatic hoist and conveyer transfer operation.

Another object is to provide a hydraulically cushioned track section for an article transfer point on a tramway.

A further object of the invention is the provision of a track section hingeably maintained with respect to other track sections and hydraulically controlled for receiving an article to be conveyed and for smoothly aligning the article with respect to the other track section.

Still another object is to provide a track device of a tramway which absorbs the thrust of a hoisted article, laterally receives the support shoes thereof while in a floating state and smoothly brings itself into seated alignment with the tramway track.

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 is a schematic diagram of the positioner area of a tramway type loader incorporating features of this invention;

FIG. 2 is a cutaway perspective of a forward floating track piston and track incorporating features of this invention;

FIG. 3 is a schematic diagram of the floating track piston assembly showing the valves therein in neutral position;

FIG. 4 is a schematic diagram similar to FIG. 3 showing the action of a check valve in the piston; and

FIG. 5 is a schematic diagram similar to FIG. 3 showing the action of a metering valve in the piston.

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 forward floating track assembly **10** and an aft floating track assembly **12** located at the input end of an overhead chain propelled tramway type loader **14**. These floating track assemblies **10** and **12** receive the upper booster shoes **16** and **18** respectively of rocket missile boosters **20** which are raised to the loader **14** by a hoist (not shown). Forward booster shoe **16** has a U-shaped configuration, while aft booster shoe **18** has a T-shaped configuration. Tapered entries **21** and **21'** are respectively provided in both the forward and aft floating track assemblies **10** and **12** to receive the upper shoes **16** and **18** of the booster **20** as it is raised.

The forward floating track as well as the loader rails forward thereof have grooves **23** machined lengthwise on the exterior thereof to provide tracks for the U-shaped forward booster shoe **16**. The forward floating track and the loader rail forward thereof also have grooves **25** and **27** machined lengthwise on the interior thereof, the larger tracks **25** at the middle, inner side of the rails are for the loader chain **11** and the tracks **27** at the lower, inner side of the rail are for the aft booster shoe **18**. The rail segments from the forward floating track to the aft floating track have both the chain tracks **25** and the aft shoe tracks **27**, while all rail segments aft of the aft floating track have only the chain tracks **25**.

As can be best seen in FIG. 1 a centering probe bracket **29** is mounted on the bottom and aft end of the track. This bracket **29** extends vertically downward and contains a steel block **31** having therein a cylindrical recess **33** for engaging the centering probe **35** of the head of the aft shoe hoist as a booster **20** is raised upward into engagement with the loader **14**.

A loader pawl positioner and its control valve block **22** are mounted on the aft side of the centering probe bracket **29**. The end of the pawl positioner piston rod **17** is connected to the middle of a collapsing linkage system that has one end secured to a stationary pivot **15** in the centering probe bracket **29** and the other end secured to a short section of a pivotal chain track **13**. With the pawl positioner piston **17** retracted and the linkage collapsed the pivotal chain track **13** is aligned horizontally with the loader chain **11** in an unbuckled position. Extension of the piston rod **17** straightens the linkage and rotates the pivotal chain track **13** upward to buckle chain **11**.

As the loader chain **11** is held stationary by the chain sprocket **9** the loader pawl system **19** retracts when the chain is buckled and extends when the chain is unbuckled. The buckling movement positions the chain pawl system **19** in the aft shoe floating track to receive and engage the aft booster shoe **18**. The straightening of the pivotal chain track **13** causes a forward motion of the pawl system **19** thereby moving the engaged aft booster shoe **18** and the missile-booster combination forward so that the top booster shoes **16** and **18** are engaged in their respective shoe tracks **23** and **27** of floating track assemblies **10** and **12**.

Deck deflections of the ship on which the guided missile launching system is mounted is capable of causing misalignment of the shoes with the shoe track of the loader **14**. Therefore, as the booster **20** is raised the booster shoes **16** and **18** enter recesses **21** and **21'** respectively, contact the upper lips of grooves **23** and **27** respectively and move the short track sections **28** and **28'** out of alignment with fixed loader **14** until a loader pawl system **19**

receives the aft booster shoe **18** from the hoist and moves the booster shoes **16** and **18** into tracks **23** and **27** respectively of the floating track assemblies **10** and **12**. When the hoist is then lowered, the track sections **28** of the floating tracks **10** and **12** are returned to their former alignment with the fixed loader **14**.

As best seen in FIG. 2, floating track assemblies **10** and **12** each consist of a flanged housing **24**, a floating track piston assembly **26**, a short track section **28**, and a check valve **30** fixed to the side of the housing **24**. The housing **24** is secured by its flanges **37** and **39** to the previously mentioned loader **14**.

As best seen in FIG. 2, the track section **28** is hingeably attached by means of a horizontal pin **32** to the piston rod **34** which extends downwardly from the piston assembly **26** of each floating track assembly **10** and **12**. The tapered entry **21** in the forward track assembly illustrated in FIG. 2 has, of course, a similar but opposite counterpart on the opposite side of track section **28**. As shown in FIG. 1, the recess **21** for the aft booster shoe **18** would occur in flanges **41** which form the lower lip of the aft shoe track **27**. Except for this track contour difference for accommodating fore and aft booster shoes **16** and **18** which have different configurations, and the fore and aft floating track assemblies **10** and **12** are identical in construction and operation. Only the forward floating track assembly **10** will, therefore, be described more fully.

Within the housing **24**, the piston assembly **26** consists of a spring loaded differential area piston **36** mechanically and hydraulically operated, as best shown in FIGS. 2 to 5. A compression coil spring **38** is positioned exterior to and around a hollow shaft **40** which is in turn secured to and extends above piston **36**. This spring **38** is retained by an annular cover **42** so as to thrust against the piston **36** urging it against surface **43** of retainer **44** at the lower end of housing **24**.

Pressure is supplied from the external hydraulic system through check valve **30** which is secured over a fluid supply port **46**. This fluid pressure acts against both the upper and lower sides of piston **36** and since the upper side of piston **36** is of larger effective area than the lower side it tends to remain extended downwardly. The hydraulic system also employs a pair of valves for controlling the hydraulic movement of piston **36**. These valves are a spring loaded metering valves **48** and a spring loaded check valve **50** which are concentrically mounted within the hollow shaft **40** of piston **36**.

The operating cycle of the piston assembly **26** can be best seen by reference to FIGS. 3 to 5. At the start of an operating cycle the piston assembly **26** is in a neutral position as schematically depicted in FIG. 3. When, however, a hoist shoves a booster shoe **16** into the recess **21** of floating track **28**, the piston **36** is forced upwardly by its piston rod **34**. Since this action causes a decrease in volume above piston **36** the hydraulic fluid above piston **36** flows through an orifice **52**, as best seen in FIG. 4, and check valve **50** is moved in a downward direction. Hydraulic fluid flows through the resulting orifice **54** to the base of a metering valve **48** and through an orifice **56** to the small area lower side of piston **36**. Excess fluid above piston **36** is allowed to escape through the check valve **30** and is absorbed by the external hydraulic system attached to the accumulator (PA).

When the hoist with a booster **20** is up and latched, the pressure within the piston assembly **26** stabilizes again and the valve **50** is reseated as in FIG. 3 by spring pressure. The spring **38** above piston **36** and the greater force on the upper side thereof keeps a downward force on the piston rod **34** and upon the booster shoe **16** within the floating track section **28**.

When the pawl system **19** in response to the straightening of the pivotal chain track **13** slides the booster shoe **16** forward into the groove **23** of track section **28** the hoist is lowered. Then piston **36** moves smoothly downward as shown in FIG. 5 into contact with surface **43** of retainer **44**. The floating track section **28** is now aligned with the rails of loader **14**.

The downward motion of piston **36** is restrained by the restriction of hydraulic fluid flow through the orifice **54** of check valve **50** as shown in FIG. 5 and hydraulic fluid is then replaced above piston **36** from below piston **36** and through check valve **30** in preparation for another cycle of operation. The specific function of metering valve **48** is to limit the velocity of piston **36** in an upward direction in the event of shock loading after the rail is loaded. Thus, as is illustrated by the action of metering valve **48** in FIG. 5, the sudden build-up of hydraulic pressure in the event of shock loading causes metering valve **48** to move downward relative to piston **36** restricting orifice **56** which in turn restricts the passage of hydraulic fluid and limits the velocity of the piston **36**.

Obviously many modifications and variations of the present invention are possible in 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 and desired to be secured by Letters Patent of the United States is:

1. An alignment system for aligning an article having handling means thereon with a track system comprising track means for receiving the handling means of said article, hydraulic control means resiliently supporting said track means for absorbing handling shocks and aligning said handling means with said track system, and means for hingeably connecting said hydraulic control means with said track means whereby when said track means in receiving said handling means are misaligned with said track system said hydraulic control means realigns said track means with said track system.

2. An alignment system as claimed in claim 1 wherein said hydraulic control means comprises, a cylinder, piston means having large upper surfaces for hydraulic control and small lower surfaces for hydraulic control movably retained within said cylinder and defining therewith a lower volume below said piston means and an upper volume above said piston means; biasing means for urging said piston means downward; a first valve means for first porting hydraulic fluid from said upper surfaces to said lower surfaces when said lower volume is increased as the upper volume is decreased in response to upward movement of said piston means, and second for metering hydraulic fluid from said lower volume to said upper volume in response to downward movement of said piston means; and second valve means for metering hydraulic fluid to limit the velocity of said piston means in the event of shock loading whereby said track means are smoothly and accurately aligned with said track system.

3. An alignment system as claimed in claim 2 wherein said first and second valve means are spring biased against said piston means.

4. An alignment system as claimed in claim 3 wherein said means for hingeably connecting said hydraulic control means to said track means comprises a piston rod connected to said piston means, pin means extending transversely of and through said track means and through said piston rod means.

5. An alignment system as claimed in claim 4 wherein said track system comprises a conveyor rail having a first track for a first of said handling means, a second track for a second of said handling means, and a third track for a chain which engages said second handling means for conveyance on said track system.

6. An alignment system as claimed in claim 5 wherein said track means comprises a first short track section for engaging said first handling means and having said first, second, and third tracks therein; and a second short track section for engaging said second handling means and having said second and third tracks therein for allowing said second handling means to move toward said first track section thereby moving said article along said track system.

7. A conveyor track system for conveying a weapon having first and second handling attachments thereon along said track system comprising a first short track section for engaging the first weapon handling attachment, said first track section having a first track therein for movement therein of said first weapon handling attachment, a second track for movement therein of a second weapon handling attachment, and a third track for movement therein of a chain which engages for weapon movement said second weapon handling attachment; a first hydraulic control means supporting said first track section and having a first piston having a large upper surface area and a small lower surface area, first spring means for downwardly biasing said first piston, a first check valve being spring biased against said first piston for porting hydraulic fluid from said upper surface area to said lower surface area of said first piston when said first piston is driven upwardly and for metering said fluid from said lower surface to said upper surface when said piston is driven downwardly, and a first metering valve being spring biased against said first piston for metering said fluid to limit the velocity of said first piston in the event of shock loading; a first piston rod integrally attached to said first piston; a first pin extending transversely of said first short track section through said first piston rod and said first short track section; a second short track section for engaging the second weapon handling attachment having said second and third tracks for weapon movement

therein; a second hydraulic means supporting said second track section and having a second piston having a large upper surface area and a small lower surface area, second spring means for downwardly biasing said second piston, a second check valve being spring biased against said second piston for porting hydraulic fluid from said upper surface area to said lower surface area of said second piston when said second piston moves upwardly and for metering said fluid from said lower surface area to said upper surface area when said second piston moves downwardly, and a second metering valve spring biased against said second piston for metering said fluid to limit the velocity of said second piston in the event of shock loading; a second piston rod integrally connected to said second piston; and a second pin extending transversely of said second short track section through a tongue and groove hinge of said second piston rod and said second short track section whereby said weapon first and second handling attachments are received and misalign said first and second short track sections and said first and second hydraulic control means act to smoothly and accurately re-align said short track sections with the remainder of said track system.

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