Aug. 25, 1964 W. G. DAYMON, JR 3,146,016

HOISTING APPARATUS

Filed July 30, 1963 2 Sheets-Sheet 1

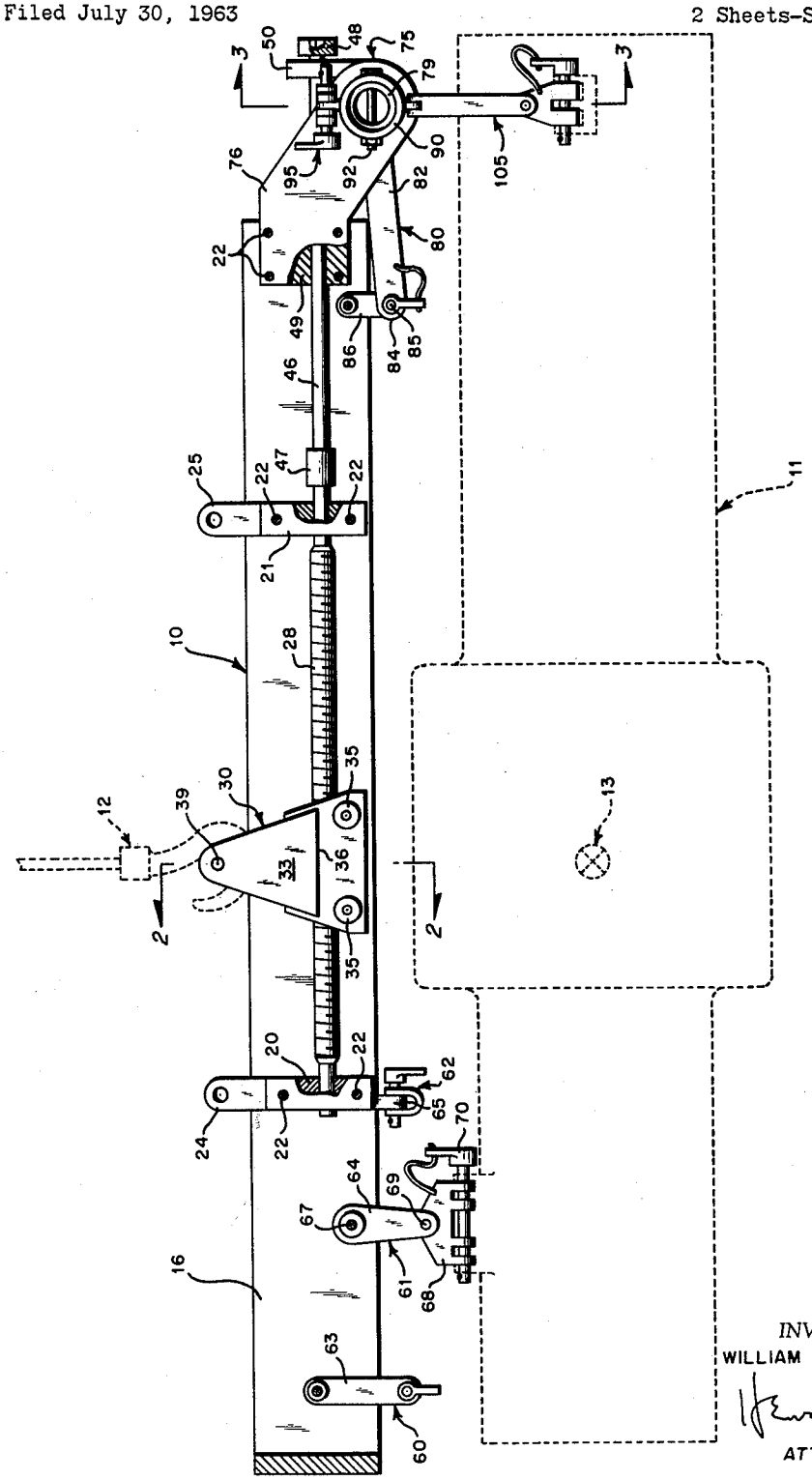


Fig. 1

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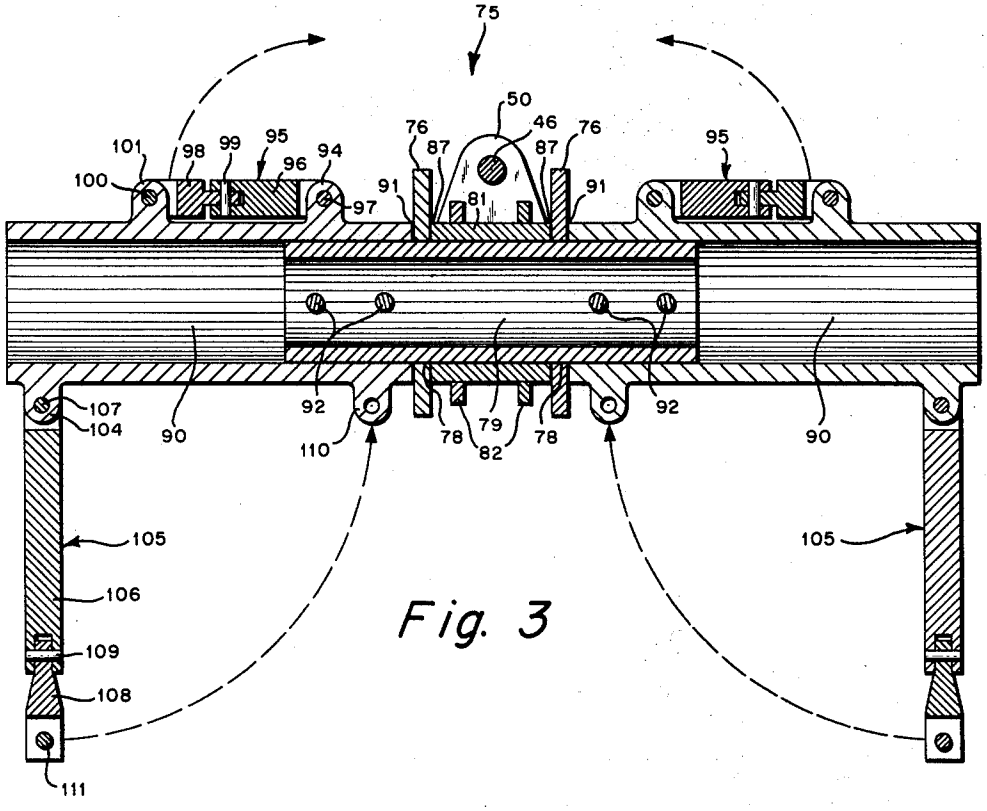


Fig. 3

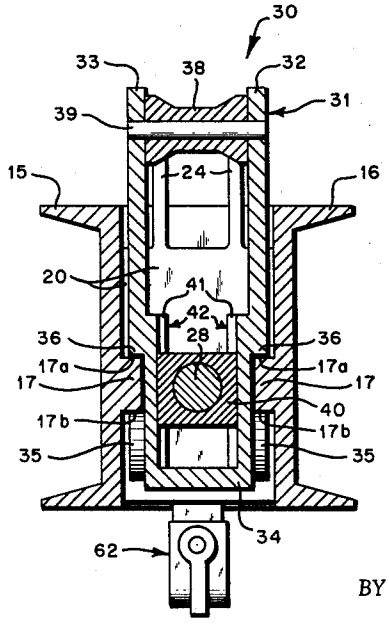


Fig. 2

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HOISTING APPARATUS

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7 Claims. (Cl. 294—67)
(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.

This invention relates to a lifting hoist and more particularly to a universal type hoisting mechanism for jet engines.

Each jet engine series presently utilized by the United States Navy, such as the J–52, the J–57, the J–65, etc. has its own compatible separate and distinct engine hoist which is utilized for lifting and conveying the specific engine in the series. It is readily seen that when utilized aboard aircraft carriers where space is insufficient, these separate jet engine hoists present serious problems of storage. In addition, there are storage problems caused by the many spare parts needed to service each engine hoist.

Engine hoists are utilized aboard aircraft carriers to transport jet engines from a storage area to a dehumidification chamber and to move the engines from this dehumidifying chamber to the aircraft. Some of the conventional engine hoists have been found to be too large to be compatible with the dehumidifying chamber facilities aboard aircraft carriers.

Additionally, the conventional hoisting devices fail to provide means for adjusting the center of gravity of the load with respect to the hoisting hook, cable or the like when the engine hoist is under load. By reason of this deficiency, if an engine is lifted from its support and an unbalanced condition occurs, the engine must be returned to the support and another lifting point selected. This series of steps continues until the proper balance is obtained. It is obvious that this operation is highly inefficient in an area where speed may be essential.

It is an object of the present invention to provide a universal engine hoist for use with a multiple series of jet engines.

It is an additional object of the present invention to provide a universal engine hoist which is compact, has few parts, and which may be easily operated by unskilled personnel.

A still further object of the present invention is to provide a universal engine hoist having a single pickup point which may be adjusted under load to a position directly above the center of gravity of the jet engine being hoisted.

Various other objects and advantages will appear from the following description of an embodiment of the invention and the novel features will be particularly pointed out hereinafter in connection with the appended claims.

FIG. 1 is a side elevation of the hoisting device of the present invention with a hoist rail and other parts omitted for purposes of clarity and wherein the object, such as a jet engine, as well as the cable and hook arrangement is illustrated in phantom section.

FIG. 2 is a vertical sectional view taken on lines 2—2 of FIG. 1; and

FIG. 3 is a vertical sectional view taken along lines 3—3 of FIG. 1.

In the drawings there is shown a hoist device generally noted at 10 engaging and lifting an article such as a jet engine generally indicated at 11 through a cable and hook arrangement 12, the article or jet engine having the center of gravity thereof indicated at 13.

Referring now to FIG. 1 and more particularly to

FIG. 2, the hoisting device 10 is shown as comprising a pair of hoisting rails 15 and 16, hoisting rail 15 being removed from FIG. 1 for purposes of clarity and illustration. Each hoisting rail further includes a trolley rail 17 having upper and lower bearing surfaces 17*a* and 17*b*, respectively, extending a substantial distance along the middle portion of the hoisting rails 15 and 16 and being rigidly secured thereto such as by welding or integral formation.

A pair of bearing blocks 20 and 21 are located one at each end of the trolley rails and are secured by bolts 22 or the like, to hoisting rails 15 and 16. In order to provide for two point pickup, each of the bearing blocks 20 and 21 are formed with lugs 24 and 25, respectively, which are either integrally formed or otherwise secured to the associated bearing block. Rotatably supported within the bearing blocks 20 and 21 is an externally threaded lead screw 28 having a trolley assembly generally noted at 30 threadably engaging the same and relatively longitudinally movable with respect thereto.

Again referring to FIG. 1 and more particularly to FIG. 2, the trolley assembly 30 comprises U-shaped plate member 31 having triangularly shaped side plates 32 and 33 and a base member 34. A pair of roller bearings 35 are rotatably mounted on each of said triangular side plates adjacent the base 34 for engaging the lower bearing surfaces 17*b* of trolley rails 17 whereas the side plates 32 and 33 are formed with shoulder portions 36 for engaging the upper bearing surfaces 17*a* of trolley rails 17. In order to provide a single pickup point for the trolley assembly 30, a roller 38 is rotatably supported about pin 39 which is rigidly secured to each side of side plates 32 and 33 at the uppermost portion or apex thereof.

In order to move the hoisting device 10 relative to the trolley assembly, the lead screw 28 threadably engages a floating nut 40. This floating nut 40 is vertically movable and laterally and longitudinally restrained against movement by its engagement with the side edges 41 of the slots 42 formed within the interior portions of triangular side plates 32 and 33. Only the forward edge portions of the slot 42 are shown by FIG. 2.

Lead screw 28 is coupled to rod 46 through coupling 47, the rod having a drive socket 48 at the end thereof for engagement with a driving tool, not shown, which in turn moves the hoisting device 10 and associated load relative to the cable and hook arrangement 12.

As can be clearly seen in FIG. 1, the rod 47 is adequately supported in additional bearing blocks 49 and 50.

For the purpose of engaging and lifting the various jet engines utilized, the forward end of the hoisting device 10 is provided with a series of hoisting links 60, 61 and 62, each particularly designed and suited for the fittings on various jet engine series, hoisting link 61 shown engaging one particular type of fore end fitting of the jet engine 11. Each of the hoisting links 60, 61 and 62 comprises a pair of link arms 63, 64 and 65, respectively, pivotally connected about an axis transverse to the longitudinal axis of the hoisting rails for the purpose of enabling stowage of the hoisting links 60, 61 and 62 within the body of the hoisting rails 15 and 16, and also to insure that the hoisting link is always maintained under direct tensile forces notwithstanding the orientation of the hoisting device 10 and the associated load 11. Although FIG. 1 illustrates all links in the operative position, it is understood that the hoisting link to be utilized is removed from the stowed position whereas the remaining hoisting links are retained in the stowed position.

Referring now to hoisting link 61, for example, the link arms 64 are pivotally connected to and between the hoisting rails 15 and 16 by pivot pin 67. The other end of the link arms 64 has an articulated adapter 68 pivotally

retained and secured between the pair of link arms 64 by pivot pin 69. The adapter 68 is illustrated as engaging lugs on the load 11 and is held fast thereto by means of a ball detent pin indicated at 70 which engages the lugs and adapter 68 is a conventional manner.

It is understood, of course, that although the three hoisting links 60, 61 and 62 are shown that to accommodate a greater variety of jet engines, additional hoisting links with appropriate adapters could be provided.

Referring now to FIGS. 1 and 3, the aft end engine pickup adapters are mounted on a rotatable support indicated generally at 75 on the aft end of the hoisting device 10, the rotatable support 75 comprising a pair of bracket members 76 secured by bolts or the like at one end thereof to the inside of the hoisting rails 15 and 16 and having the bearing block 49 serving as a lateral brace at the brackets 76 connection to the hoisting rails whereas the bearing block 50 provides the pair of bracket members 76 lateral support at its other end by reason of its rigid connection with the end portions of the bracket 76. At the outer end thereof the pair of brackets 76 are formed with apertures 78 for rotatably receiving and acting as bearings for an interior cylindrical member 79. An aft end hoisting link generally noted at 80 is pivotally and rotatably connected about the interior cylinder 79 and comprises a collar 81 which surrounds the interior cylindrical member 79 and a pair of link arms 82 which are integrally secured to the collar at one end thereof and includes an adapter 84 at the other end for engagement with the appropriate fitting on a particular series of jet engines. As illustrated in FIG. 1, the link arms 82 and adapter 84 are shown in the stowed position with ball detent pin 85 engaging a stowage link 86. Therefore, it is readily seen that if hoisting link 80 were selected for engagement with the appropriate jet engine lug, the quick release pin 85 would be removed and the hoisting link pivoted downwardly about the cylinder 78 to the operative position. It is noted that the aft end hoisting link 80 is precluded from all movement except rotary motion about the cylinder 79 by reason of the transverse abutting of the side edge 87 of the collar 81 with the interior sides of the bracket member 76.

The rotatable support 75 further comprises a pair of exterior cylinders generally noted at 90 each telescopically fitted about the ends of the interior cylinder 79 and having edge portions 91 abutting the outer surface of the bracket members 76. In order that the exterior cylinders 90 and interior cylinder 79 are rotatable as a unit about the bearing formed by aperture 78 in the bracket 76, the exterior cylinders 90 and interior cylinder 79 are rigidly secured to each other as by bolts 92 or the like.

In view of the similarity of each of the exterior cylinders 90 only one will herein be described. Referring particularly to FIGS. 1 and 3, an external boss member 94 is provided on the exterior surface of the outer or exterior cylindrical member 90 and has pivotally connected thereto an aft end hoisting link generally indicated at 95. Line 95 comprises a link arm 96 pivotally connected to the boss member 94 through pivot pin 97 and includes an adapter 98 also pivotally connected by means of pivot pin 99 through the link arm 96, the adapter being suitably designed for engagement with the lifting lug on a particular jet engine series. The aft end hoisting link 95 is illustrated in the stowed position held by quick release ball detent pin 100 in a retaining lug 101 also provided on cylindrical member 90. It is seen that the exterior cylinder 90 may be rotated 180° to place the hoisting link 95 in a lowermost position whereupon it may be released for operation in the direction of arrows shown.

Referring again to FIGS. 1 and 3, a boss member 104 formed on cylindrical member 90 has an additional aft end hoisting link generally noted at 105 pivotally secured thereto and comprises a link arm 106 being pivotally connected to the boss 104 by pivot pin 107 and further including an adapter 108 of such design to engage for a hoisting

lug on a particular series of jet engines for hoisting the same, the adapter 108 being additionally pivotedly connected to the link arm 96 by pivot pin 109. A stowage lug 110 is provided on the exterior surface of the exterior cylinder 90 for retaining the hoisting link 105 in the stowage position by use of quick release ball detent pin 111. It is seen that the bosses 94 and 104 are 180° remote from each other and it is understood that additional hoisting links may be provided about the exterior cylinder 90 at various angular positions in order to engage lugs provided on still different jet engines series.

In operation, if hoisting link 95 has the appropriate adapter thereon for lifting the load, hoisting link 105 is pivoted in the direction of the arrow shown to the stowage position and is locked in place on the stowage lug 110. Then exterior cylinder 90 is rotated 180° to provide hoisting link 95 in the lowermost position whereupon its locking pin is removed and link 95 permitted to pivot to the operative position.

Referring to FIG. 1, when the single pickup point is utilized, as is illustrated by the cable and hook arrangement 12 engaging the pin 39, the pickup point should be located at the approximate center of gravity location of the engine configuration being lifted. By reason of the present invention, when the engine is lifted and is free of its supports, the engine can be leveled by adjusting the pickup point over the exact center of gravity of the engine by properly manipulating the drive socket 48, which in turn causes lead screw 28 to translate with respect to nut 40 to thereby position the hoisting device 10 and the associated load 11 secured thereto.

Obviously many modification 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 universal hoisting apparatus for jet engines or the like, comprising:

a pair of spaced, parallel and longitudinally extending channel members having their outer webs in interfacing relationship,

said interfacing webs having longitudinally extending rail means formed thereon intermediate the length of said channel members, said rail means including upper and lower bearing faces,

bearing means adjacent the ends of said rail members interconnected to said channel members,

a longitudinally extending lead screw rotatably secured in said bearing means and having one end extending beyond said means,

drive socket means extending from beyond the confines of said channel means secured to said extending end of said lead screw for providing a drive connection for said lead screw,

a U-shaped trolley assembly having triangular side faces interposed between said interfacing web members intermediate said bearing blocks, said side faces having shoulder means for engaging said upper bearing faces of said rail means,

roller bearing means rotatably secured to said trolley means engaging said lower bearing faces of said rail means,

said U-shaped trolley assembly having a vertical slot formed in the interfacing surfaces of said triangular plates,

fastening means vertically slidable and horizontally restrained by said slots threadably engaging said lead screw,

and roller means rotatably secured to said triangular plates for engagement with a hoisting means whereby said hoisting apparatus may be moved relative to the hoisting means when said hoisting apparatus is under load.

2. A universal hoisting device for hoisting a plurality

of types of loads, each type having separate and distinct hoisting lug arrangements formed thereon, comprising:

a longitudinally extending structural support member having means pivotally connected thereto for engagement with the hoisting lugs on the load,

bracket means secured to said structural support member rotatably housing an interior cylindrical member

a collar journaled about said interior cylindrical member having means secured thereto for engaging the hoisting lugs on the load,

a pair of external cylindrical members each telescopically surrounding an end of said interior cylindrical mtember and being rigidly secured to said interior member for rotation therewith,

each of said exterior cylindrical members having adapter means pivotally connected thereto for engagement with the hoisting lugs on the load, and being pivotal between a stowed and operative position,

and said external cylindrical members having stowage lugs extending from the outer surface thereof for engaging said adapter means to retain the same in the stowed position.

3. A universal hoisting device for hoisting a plurality of types of loads, each type having separate and distinct hoisting lug arrangements formed thereon, comprising:

a longitudinally extending structural support member having means pivotally connected thereto for engagement with the hoisting lugs on the load,

bracket means secured to said structural support member having apertures therein forming a bearing, said apertures being in coaxial alignment and transverse to the longitudinal axis of said channel members,

an interior cylindrical member rotatably journaled within said bearings,

a collar rotatable about said interior cylindrical member having means secured thereto for engaging the hoisting lugs on the load,

a pair of external cylindrical members each telescopically surrounding an end of said interior cylindrical member and being rigidly secured to said interior member for rotation therewith,

each of said exterior cylindrical members having adapter means pivotally connected thereto for engagement with the hoisting lugs on the load, and being pivotal between a stowed and operative position,

and said external cylindrical members having stowage lugs extending from the outer surface thereof for engaging said adapter means to retain the same in the stowed position.

4. A universal hoisting device for hoisting a plurality of types of loads, each type having separate and distinct hoisting lug arrangements formed thereon, comprising:

a pair of longitudinally extending structural beam members having a plurality of link arms pivotally connected at one end thereof and movable between a stowed and an operative position,

lug adapter means pivotally secured to said link arms for engagement with the hoisting lugs on the load,

bracket means secured to said structural beam member having apertures therein forming a bearing, said apertures being in coaxial alignment and transverse to the longitudinal axis of said channel members,

an interior cylindrical member rotatably journaled within said bearing,

a collar journaled about and rotatable about said interior cylindrical member intermediate said bracket means, said collar having a pair of link arms integrally secured thereto at one end thereof and having load lug adapter means pivotally connected at the other end thereof, said link arms being pivotal between a stowed and operative position,

a pair of external cylindrical members each telescopically surrounding an end of said interior cylindrical

member and being rigidly secured to said interior member for rotation therewith,

each of said exterior cylindrical members having external lugs pivotally connecting a link arm thereto, said link arm having a load lug adapter pivotally secured thereto, said link arms being pivotal between a stowed and operative position,

said external cylindrical member having stowage lugs extending from the outer surface thereof for engaging said load lug adapter means when said link arm is in the stowed position.

5. A universal hoisting device for hoisting a plurality of series of jet engines, each series having a separate and distinct hoisting lug arrangement formed thereon comprising:

a pair of parallel, laterally spaced channel members having interfacing outside webs,

a plurality of longitudinally spaced link arms pivotally connected at one end thereof between and adjacent one end of said channel members and movable between a stowed and an operative position, each of said link arms having lug adapter means pivotally secured at the other end of said link arms, each of said adapters being constructed for engagement with the lugs on a selected jet engine series,

a pair of brackets each secured at one end to the interfacing webs of said channel member at the other end of said channel members and extending outwardly beyond the confines thereof,

said brackets having apertures therein forming a bearing at the other ends thereof, said apertures being in coaxial alignment and transverse to the longitudinal axis of said channel members,

an interior cylindrical member rotatably journaled within said bearings,

a collar journaled about and rotatable about said interior cylindrical member intermediate said brackets, said collar having a pair of parallel laterally spaced link arms integrally secured thereto at one end thereof and having engine lug adapter means pivotally connected at the other end thereof,

said link arm being pivotal between a stowed and operative position,

a pair of external cylindrical members each telescopically surrounding an end of said interior cylindrical member and having one end thereof abutting said brackets and being rigidly secured to said interior cylinder for rotation therewith,

each of said exterior cylindrical members having external lugs pivotally connecting a link arm thereto, each of said link arms having an engine lug adapter pivotally secured at the other end thereof, said link arms being pivotal between a stowed and operative position,

said external cylindrical members having stowage lugs extending from the outer surfaces thereof for engaging said adapter means when said link arm is in the stowed position.

6. A universal hoisting device for hoisting a plurality of types of loads, each type having separate and distinct hoisting arrangements formed thereon, comprising:

a longitudinally extending structural support member, said member having longitudinally extending rail means formed thereon, said rail means including upper and lower bearing faces,

bearing means interconnected to said support member,

a longitudinally extending screw means rotatably secured in said bearings means, and having a drive means at one end for receiving an external drive source for rotating said screw means,

a trolley assembly operatively associated with said support member having shoulder means thereon for engaging said upper bearing faces of said rail means and roller bearings means thereon for engaging said lower bearing faces of said rail means,

said trolley assembly having vertically slidable and horizontally restrained fastening means therein for threadably engaging said screw means,

pickup means secured to said trolley assembly for engagement with a hoisting means whereby said hoisting apparatus may be moved relative to the hoisting means when said hoisting apparatus is under load,

said longitudinally extending structural support member having means pivotally connected thereto for engagement with the hoisting lugs on the load,

bracket means secured to said structural support member having apertures therein forming a bearing, said apertures being in coaxial alignment and transverse to the longitudinal axis of said channel members,

an interior cylindrical member rotatably journaled within said bearing,

a collar rotatable about said interior cylindrical member having means secured thereto for engaging the hoisting lugs on the load,

a pair of external cylindrical members each telescopically surrounding an end of said interior cylindrical member and being rigidly secured to said interior member for rotation therewith,

each of said exterior cylindrical members having adapter means pivotally connected thereto for engagement with the hoisting lugs on the load, and being pivotal between a stowed and operative position,

and said external cylindrical members having stowage lugs extending from the outer surface thereof for engaging said adapter means to retain the same in the stowed position.

7. A universal hoisting device for hoisting a plurality of types of loads, each type having separate and distinct hoisting lug arrangements formed thereon, comprising:

a pair of longitudinally extending structural beam members, said beam members having longitudinally extending rail means formed thereon, said rail means including upper and lower bearing faces,

bearing means interconnected to said beam members,

a longitudinally extending screw means rotatably secured in said bearing means, and having a drive means at one end for receiving an external drive source for rotating said screw means,

a trolley assembly interposed between said beam members having shoulder means thereon for engaging said upper bearing faces of said rail means and roller

bearing means for engaging said lower bearing faces of said rail means,

said trolley assembly having vertically slidable and horizontally restrained fastening means therein for threadably engaging said screw means,

pickup means secured to said trolley assembly for engagement with a hoisting means whereby said hoisting apparatus may be moved relative to the hoisting means when said hoisting apparatus is under load,

said pair of longitudinally extending structural beam members having a plurality of link arms pivotally connected at one end thereof and movable between a stowed and an operative position,

lug adapter means pivotally secured to said link arms for engagement with the hoisting lugs on the load,

bracket means secured to said structural beam member having apertures therein forming a bearing, said apertures being in coaxial alignment and transverse to the longitudinal axis of said channel members,

an interior cylindrical member rotatably journaled within said bearing,

a collar journaled about and rotatable about said interior cylindrical member intermediate said bracket means, said collar having a pair of link arms integrally secured thereto at one end thereof and having load lug adapter means pivotally connected at the other end thereof, said link arms being pivotal between a stowed and operative position,

a pair of external cylindrical members each telescopically surrounding an end of said interior cylindrical member and being rigidly secured to said interior member for rotation therewith,

each of said exterior cylindrical members having external lugs pivotally connecting a link arm thereto, said link arm having a load lug adapter pivotally secured thereto, said link arms being pivotal between a stowed and operative position,

said external cylindrical member having stowage lugs extending from the outer surface thereof for engaging said load lug adapter means when said link arm is in the stowed position.

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