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Scannell

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[54] **DUAL HOOK HOIST APPARATUS**

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[73] Assignee: **Renner Manufacturing Company,** Milwaukee, Wis.

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[52] **U.S. Cl.** **212/14,** 212/11, 212/125

[51] **Int. Cl.** **B66c 17/04**

[58] **Field of Search** ..... 212/11, 13, 14, 125; 214/392, 394; 254/144, 189; 294/67 R, 67 D, 67 DA, 81 R, 81 S, 81 F

[56] **References Cited**

UNITED STATES PATENTS

3,111,228	11/1963	Anderson	212/11 X
2,656,196	10/1953	Fellabaum	212/11 X
3,146,903	9/1964	Bjorklund	214/394
3,247,974	4/1966	Dechantsreiter	212/11

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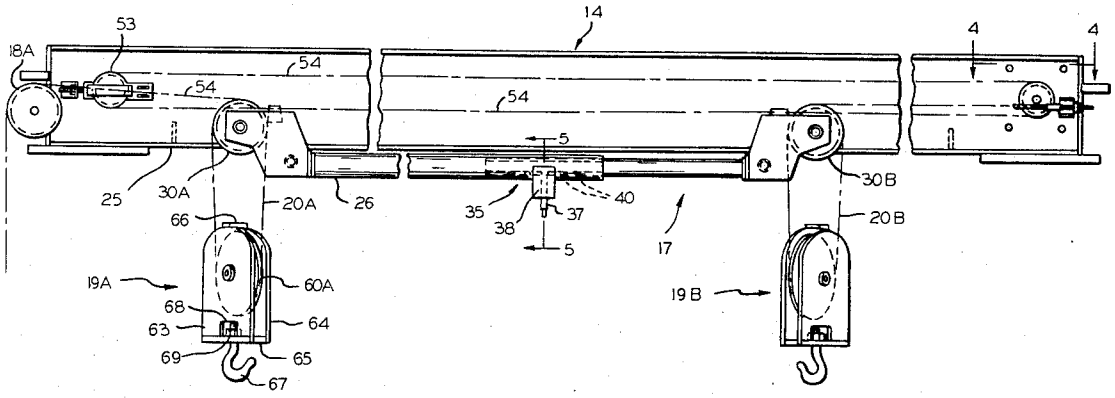
[57] **ABSTRACT**

A dual hook lifting assembly for a straddle type mobile lift and including a trolley which traverses the gantry crossbeam and carries a pair of sheaves for each hook mounted on the trolley's opposite sides. A wire rope having one end fixed and the other end connected to a winch drum, passes around a sheave on the hook block and up over each sheave on the trolley. A second reeve of wire is employed in a similar manner for the second hook.

13 Claims, 6 Drawing Figures



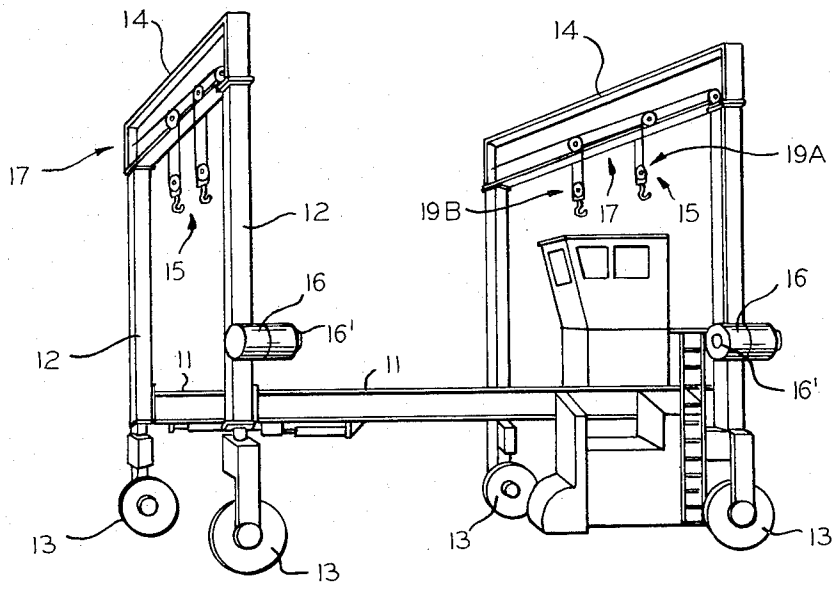

14
14
17
19A
19B
17
15
12
15
16
16
16'
12
11
11
16'
13
13
13
13

FIG.1

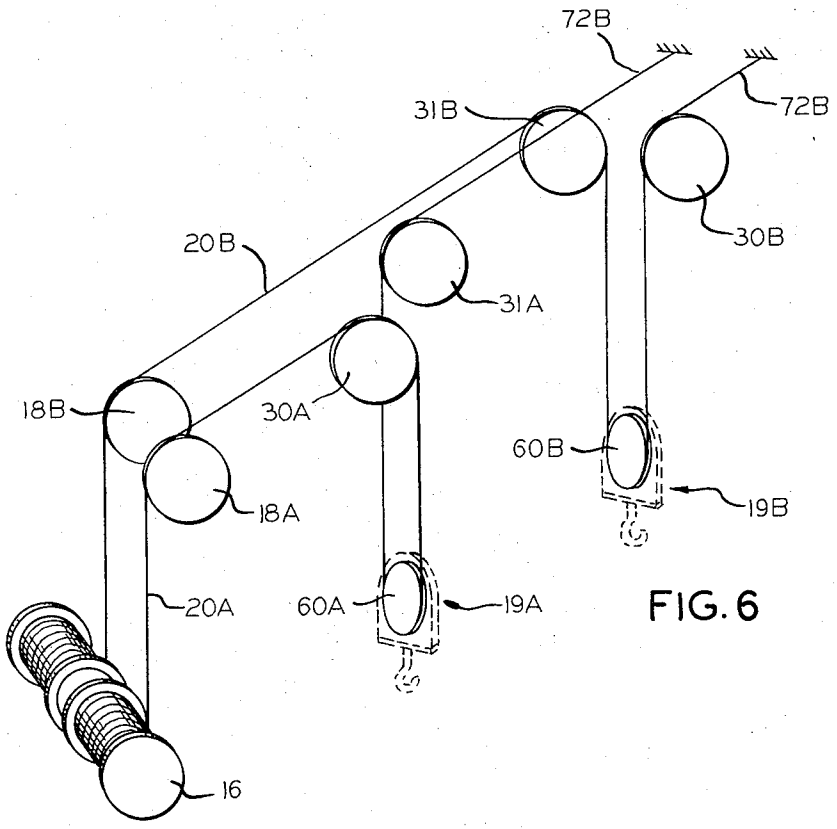

72B
72B
31B
30B
20B
31A
18B
30A
60B
19B
18A
20A
60A
19A
16

FIG. 6

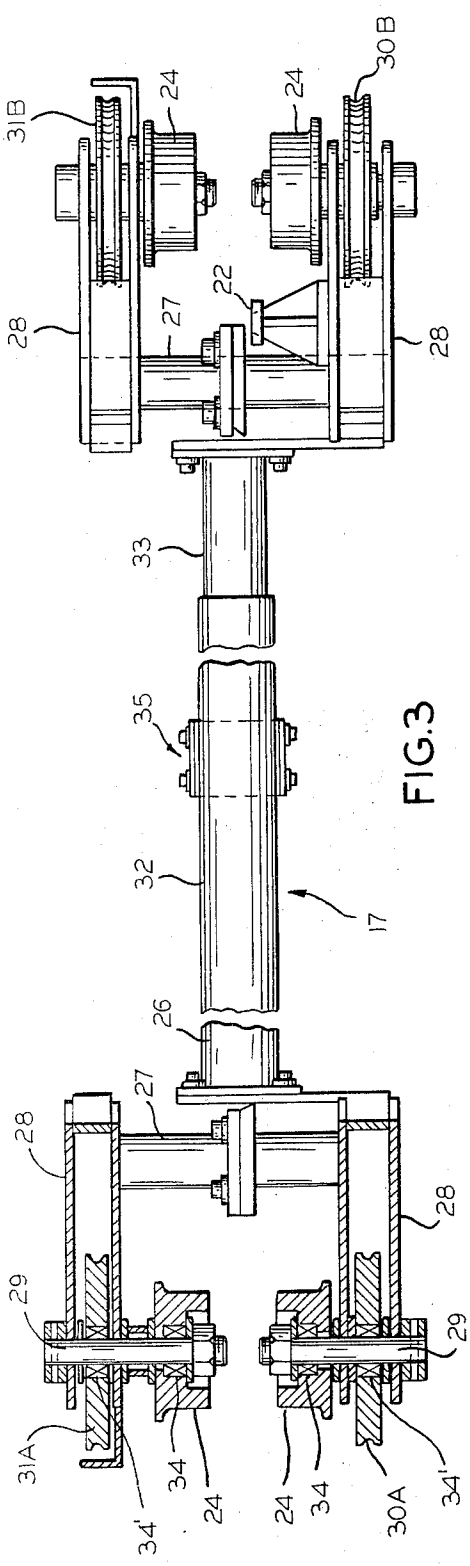

31B
24
24
30B
22
27
28
28
33
35
32
17
26
27
28
28
29
29
31A
34
34'
24
24
34
30A
34'

FIG.3

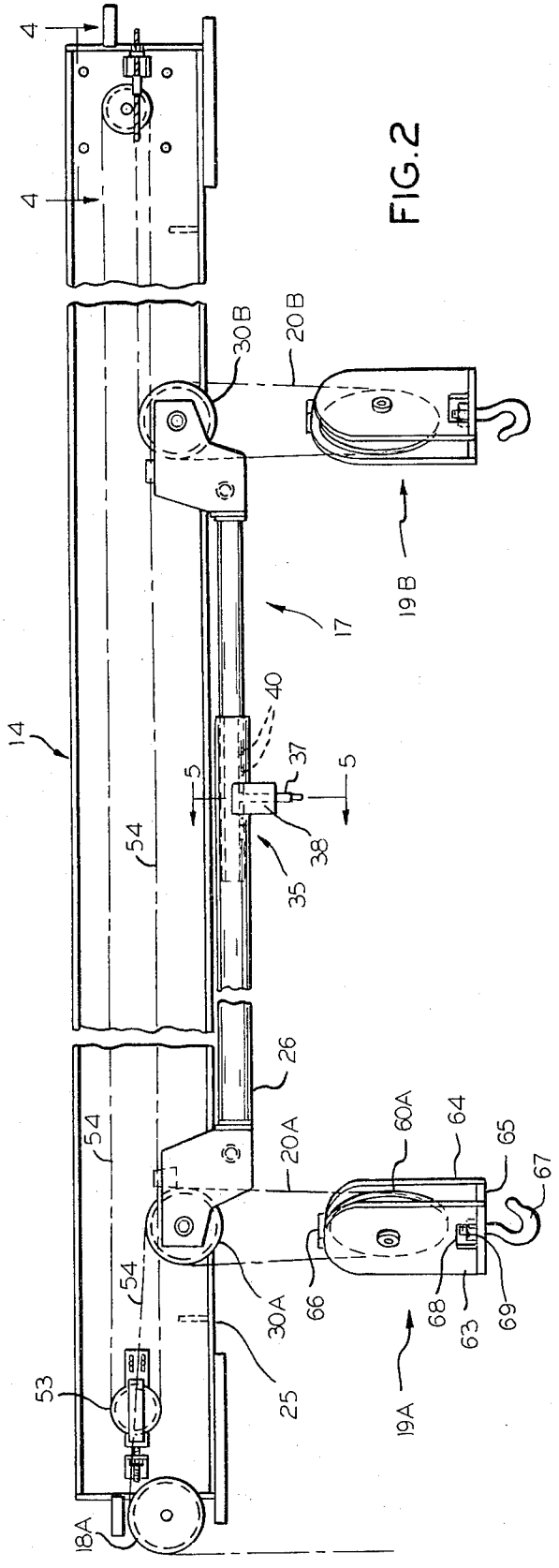

4
4
30B
20B
19B
17
14
40
37
5
5
38
35
54
26
54
20A
60A
64
65
67
54
30A
66
68
63
69
53
25
19A
18A

FIG.2

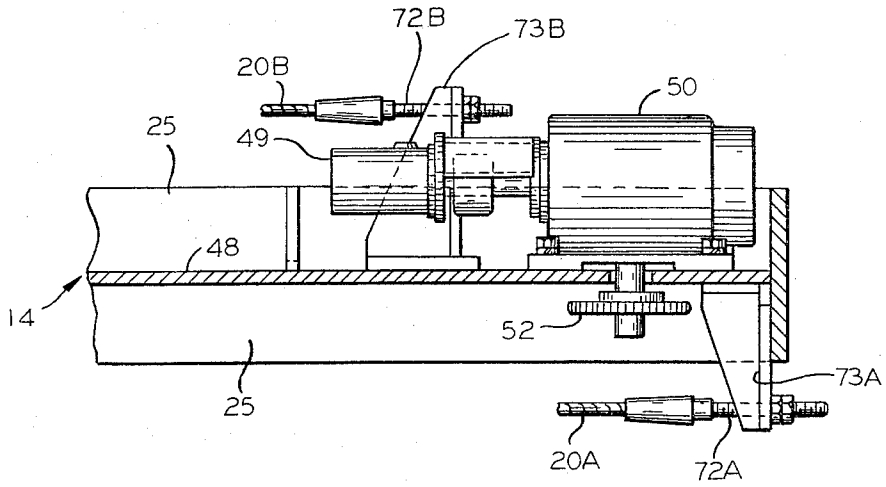

72B
73B
20B
50
25
49
48
14
52
73A
25
20A
72A

FIG. 4

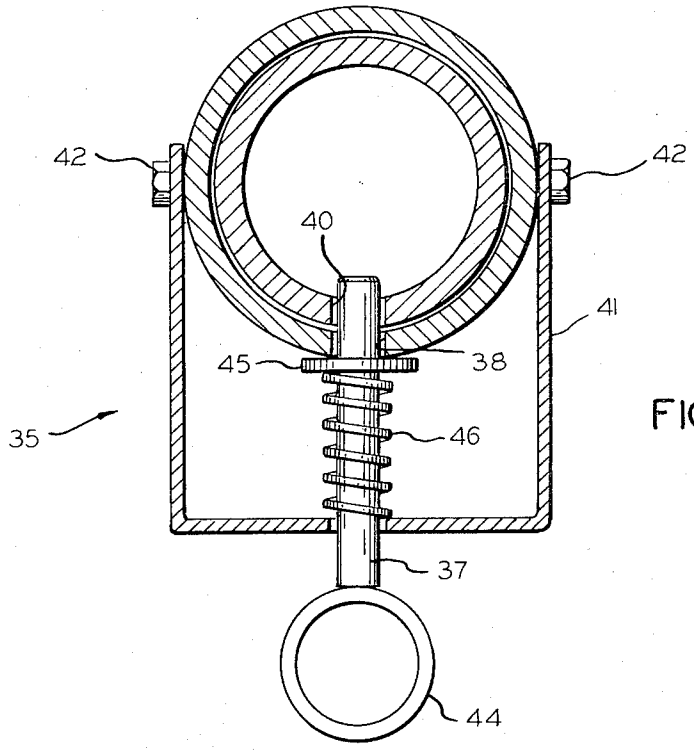

42
42
40
41
45
38
35
46
37
44

FIG. 5

DUAL HOOK HOIST APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to a lifting device for simultaneously operating a pair of hooks and which has particular, but not exclusive application to mobile type lifts.

Mobile type lifts are commonly employed for lifting and moving large bulky objects, such as shipping containers, structural members, modular building sections and the like. Such devices are well known and generally include a pair of inverted U-shaped gantries comprising crossbeams spanning vertical legs which are supported at their lower ends on wheels. The two gantry assemblies are connected together by spaced side members and may include hoists mounted on the crossbeams of each gantry.

In addition to providing vertical lifting motion, it is desirable that such lift mechanisms be capable of traversing the load laterally without moving the straddle lift vehicle itself. Toward this end one prior art apparatus included a second horizontal beam movably supported beneath the gantry crossbeam and having a laterally movable hook carrying trolley. This limited the usable lift distance attainable on a given gantry because of the space requirement for the movable beam.

Another apparatus for providing traversability plus lifting capacity in prior art gantries includes a movable sheave carrying trolley mounted directly on the gantry crossbeam. To minimize twisting loads about the longitudinal axis of the gantry crossbeam, a reeve of wire rope is normally suspended from each of its opposite sides for sharing the load on the hook which they support. This minimizes the bending moment about the longitudinal axis of the crossbeam but necessitates a minimum of two reeves of wire rope for each hook.

Conventional straddle type mobile lifts are constructed for withstanding large vertical forces resulting from lifting heavy loads, but they have a substantially reduced capability of withstanding horizontal forces, especially those perpendicular to the spaced side members. For this reason when lifting large bulky objects, it is important to hold the load as stable as possible and to prevent the suspended load from swinging which would result in generation of horizontal force components on the lift structure. For added stability, such lifts may have two hooks on each gantry. The hooks may be spaced apart on each gantry and provide a four point connection with the load thus reducing swinging motion of the load. The use of two hooks on each gantry necessarily results in a complex lifting system involving multiple reeves of cable for each hook. Such a system is generally expensive because of the large number of parts and is also inefficient due to the multiplicity of sheaves required.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a new and improved dual hook lifting apparatus.

It is another object of the present invention to provide a dual hook hoisting apparatus for a straddle type mobile lifting device.

Another object of the invention is to provide a dual hook lifting apparatus having means for the selective adjustment of the horizontal spacing between the hooks.

In general terms, the invention comprises a dual hook hoist apparatus having two pairs of laterally spaced sheaves and a pair of wire ropes one of which extends around a sheave on each hook and both sheaves of a different one of the pairs of sheaves. The ends of each rope are coupled to a common drum assembly for simultaneously raising or lowering the two hooks. The sheaves may be mounted on a trolley to permit traversing of the load along the crossbeam of the straddle lift while maintaining the vertical position of the hooks constant.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a straddle type lifting device to which the invention is primarily directed;

FIG. **2** is a side elevational view of the lift mechanism according to a preferred embodiment of the present invention;

FIG. **3** is a top plan view of the trolley portion of the lift mechanism illustrated in FIG. **2**;

FIG. **4** is a view taken along lines **4—4** of FIG. **2**;

FIG. **5** is an enlarged view of the trolley taken along line **5-5** of FIG. **2**; and

FIG. **6** is a schematic diagram of the hoist system according to the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. **1**, the straddle type mobile crane to which the invention is particularly adaptable is shown to include a pair of U-shaped gantries which are connected by spaced side members **11**. Each gantry includes a pair of vertical leg members **12** having support wheels **13** at their lower ends and connected by horizontal cross members **14** at their upper ends. Each gantry also carries a lifting assembly **15** which are identical and accordingly only one will be described for the sake of brevity. The lifting assemblies each includes a winch drum **16**, a trolley **17**, a pair of idler sheaves **18A** and **18B** and a pair of hook blocks **19A** and **19B**.

The winch drum **16** and drive motor **16'** are mounted on one of the vertical gantry legs **12**. The hook blocks **19A** and **19B** are respectively positioned by wire ropes **20A** and **20B** and wound around the winch drum **16**. The ropes **20** may be wound on the drum **16** in a suitable manner such that they are simultaneously wound or unwound.

As seen in FIGS. **2** and **3**, the trolley **17** is mounted for movement on each of the gantry cross members **14** by means of wheels **24** which ride on flanges **25** extending laterally from each side of members **14**. The trolleys **17** each include a frame assembly **26** having a transverse member **27** at each end for supporting a pair of brackets **28** which extend generally parallel to frame assembly **26**. A shaft **29** passes through each bracket **28** and has the trolley wheels **24** and sheaves **30A**, **31A**, **30B** and **31B** respectively rotatably mounted thereon. The trolley wheels **24** are mounted on bearings **34** and rotate independently of their respective sheaves which are individually mounted on their own bearings **34'**. The frame assembly **26** includes telescoping tubes **32** and **33** which carry the cross members **27** at their opposite ends. Tube **32** is hollow for receiving the smaller diameter tube **33**.

The length of the trolley **17** may be adjusted by means of a releasable coupling assembly **35** having a pin **37** which is selectively insertable into a hole **38**

formed in tube **32** and any one of a plurality of apertures **40** formed in tube **33.** As seen more particularly in FIG. **5,** the coupling assembly **35** includes a generally U-shaped bracket **41** attached to tube **32** adjacent hole **38** by suitable means, such as screws **42.** The pin **37** has a ring **44** at its lower end, and a flange **45** between the tube **32** and the interior surface of bracket **41.** A spring **46** surrounds pin **37** and biases the same upwardly through holes **38** and **40.** If it is desired to change the length of trolley **17,** ring **44** may be pulled down thereby disengaging the pin from the tubes so that the span between the wheel brackets may be modified. This allows the span to be adjusted for various width loads to keep the cables as vertical as possible and thereby decrease cable tension and structural stresses in the trolley.

The cross members **14** may be generally I-shaped in vertical cross section and have a central web **48** and flanges **25.** As seen in FIGS. **2** and **4,** the trolley **17** straddles the center web **48** of cross member **14** and wheels **24** ride on flanges **25.** A reversible drive motor **49** coupled with suitable reduction gearing **50** drives a first sprocket **52** disposed on one end of beam **14.** A second sprocket **53** is disposed at the opposite end of the beam and is coupled to sprocket **52** by a continuous chain drive **54.** One link at each end of the chain **54** is affixed to the trolley bracket **22.** In this manner, operation of motor **49** moves the trolley along member **14.** The motor **49** may be of any type well known in the art and may be either electrically or hydraulically driven, for example.

The hook blocks **19A** and **19B** are shown in FIG. **2** to be identical and accordingly only hook block **19A** will be described in detail. Hook block **19A** consists of a sheave **60A** rotatably mounted between parallel plates **63** and **64** which are held in a fixed parallel relationship by a bottom plate **65** and top cross member **66.** A lift hook **67** is affixed to the bottom plate **65** and may be mounted for rotation about a vertical axis by means of a threaded hook shank **68** and nut **69.**

The hoist drive system will now be explained by first referring to FIG. **6** which schematically illustrates the lifting assembly **15.** As indicated above, the winch drum **16** has two strands of wire rope **20A** and **20B,** wound around it and extending up and reeved over idler sheaves **18A** and **18B** which are journaled on the end of cross member **14.** Tracing wire rope **20A,** it is seen to be reeved over sheave **30A** which is located on one side of the trolley **17,** pass downwardly through sheave **60A** carried by a hook block **19A,** continue upwardly and over sheave **31A** located on the opposite side of the trolley **17** and at the same end of the trolley as sheave **30.** As seen in FIG. **4,** the ends **72A** and **72B** of the rope are respectively dead ended to the cross member **14** by brackets **73A** and **73B.** It will be appreciated that since sheaves **18A 30A** and **31A** rotate about fixed axes and since one end of rope **20A** is fixed at point **72A,** the rotation of drum **16** will increase or decrease the unwound length of rope **20A** thereby causing a raising or lowering of the hook block assembly **19A.** Rope **20B** follows a path similar to that of rope **20A** and is reeved through sheaves **30B** and **31B** at the opposite end of the trolley from sheaves **30A** and **31A.** Thus, the rotation of the winch drum **16** will result in a simultaneous vertical movement of the two hook blocks **19A** and **19B.** Since sheaves **30A** and **31A** and **30B** and **31B** rotate about shafts which are fixed to the trolley assembly, it will also be appreciated that as the trolley is traversed along the beam, for example in the direction of the arrow, both sheaves **30A** and **30B** will translate in the same direction and at the same rate so taht the hook **19A** will remain at the same relative elevation. In this manner, the load can be traversed without vertical movement of the load.

It will be apparent from the description that each hook block **19A** and **19B** has a strand of wire rope extending upward to the trolley assembly with one strand reeved through a sheave **30A** or **30B** on one side of the trolley and the other strand reeved through a sheave **31A** or **31B** on the other side. Thus, when a load is imposed upon either lift hook **19A** or **19B,** it will impose substantially equal downward forces on either side of the trolley producing a minimum of torsional force upon the beam cross member **14.**

The description of the present invention described herein above is intended to be illustrative only. Those skilled in the art will appreciate that the invention need not be limited to straddle type mobile lifts, but could be easily adapted for lifting apparatus located in stationary installations. Accordingly, the scope of the invention is to be gathered only from an interpretation of the appended claims.

I claim:

1. Lifting apparatus including:

support means,

carrier means mounted for translational movement in a substantially horizontal path on said support means,

first and second pairs of sheave means rotatably mounted in spaced relation on said carrier means, said first and second pairs of sheave means being space along said path,

drum means rotatably mounted on said support means,

first and second spaced apart, independently supported lifting means each having a sheave means rotatably mounted thereon, said first and second lifting means being spaced along said path and each being substantially below said first and second pair of sheave means, respectively, and

first and second rope means each having one end fixed to said support means and its other end coupled to said drum means, one of said rope means also extending over each of the sheave means of said first pair and around the sheave means of said first lifting means and said second rope means extending over each of the sheave means of said second pair and around the sheave means of said second lifting means.

2. The apparatus set forth in claim **1** wherein the sheave means of said first pair are rotatably mounted about a common, substantially horizontal first axis and the sheave means of said second pair are rotatably mounted about a common substantially horizontal second axis spaced from said first axis, each of said sheave means of said first and second pairs being mounted on opposite sides of said carrier means.

3. The apparatus set forth in claim **1** wherein said path extends between the fixed end of each of said first and second rope means and said drum means, said drum means being rotatable about an axis lying in a plane substantially normal to said path.

4. The apparatus set forth in claim **1** wherein said carrier means includes a first portion for supporting

said first pair of sheave means and a second portion for supporting said second pair of sheave means and adjustable coupling means for coupling said first and second portions for selectively varying the distance between said first and second pair of sheave means.

5. The apparatus set forth in claim **1** and including a third pair of sheaves rotatably mounted on said support means between said carrier means and said drum means, each of said first and second rope means extending over one of the sheaves of said third pair.

6. The apparatus set forth in claim **5** wherein said path extends between the fixed end of each of said first and second rope means and said drum means, said drum means being rotatable about an axis lying in a plane substantially normal to said path.

7. The apparatus set forth in claim **6** wherein said carrier means includes a first portion for supporting said first pair of sheave means and a second portion for supporting said second pair of sheave means and adjustable coupling means for coupling said first and second portions for selectively varying the distance between said first and second pair of sheave means.

8. The apparatus set forth in claim **1** wherein said support means comprises a straddle type mobile crane including a pair of spaced gantries having side members,

at least one cross member extending between said gantry side members and being affixed thereto,

said carrier means being mounted on one of said cross members.

9. The apparatus set forth in claim **8** and including a third pair of sheaves rotatably mounted on one of said cross member and side members and between said carrier means and said drum means, each of said first and second rope means extending over one of the sheaves of said third pair.

10. The apparatus set forth in claim **9** wherein the sheaves of each of said first and second pairs of sheave means are mounted for rotation about substantially horizontal axes, each of the sheave means of said first and second pairs being independently rotatably mounted on opposite sides of said carrier means.

11. The apparatus set forth in claim **10** wherein said path extends between the fixed end of each of said first and second rope means and said drum means, said drum means being rotatable about an axis lying in a plane substantially normal to said path.

12. The apparatus set forth in claim **11** wherein said carrier means includes a first portion for supporting said first pair of sheave means and a second portion for supporting said second pair of sheave means and adjustable coupling means for coupling said first and second portions for selectively varying the distance between said first and second pair of sheave means.

13. The apparatus set forth in claim **12** and including a second carrier means mounted on the second cross member of said second gantry, said second carrier means including two pairs of sheave means, drum means, and first and second lifting means all arranged identically to those associated with said first carrier means and cross member.

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