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CRANE WITH DOUBLE TAG LINE

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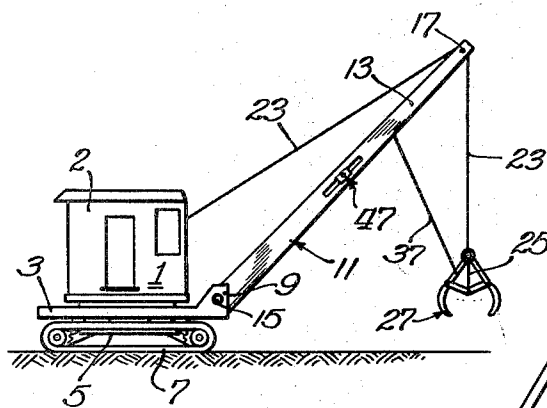


Fig. 1.

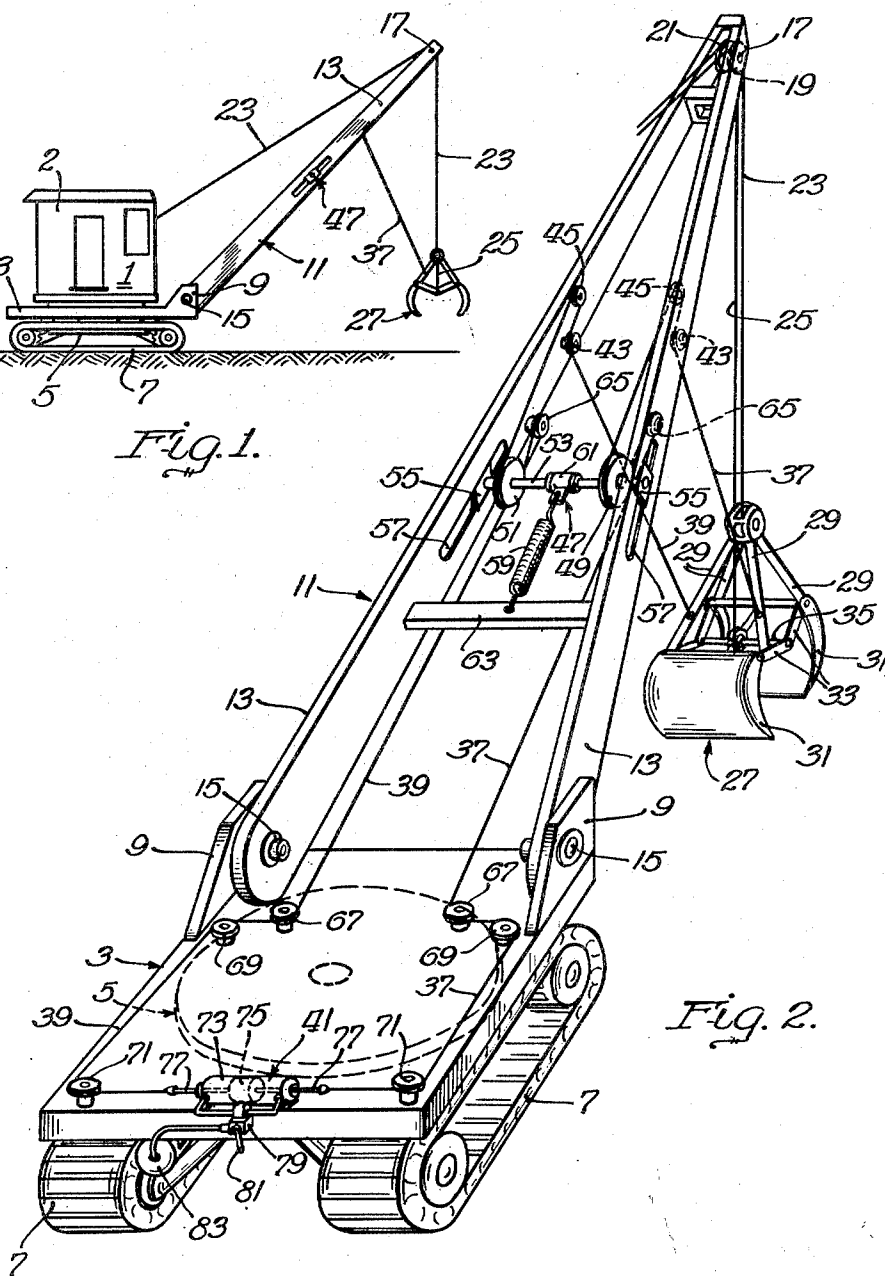


Fig. 2.

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1

2,709,526

CRANE WITH DOUBLE TAG LINE

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The present invention relates generally to cranes and similar load lifting equipment, and is more particularly directed to an improved form of crane of the type having a clam shell bucket or the like suspended at the end of a boom.

In a crane of the type wherein a load carrying element, such as a clam shell bucket, grapple or the like, is suspended by a cable from the outer end of a boom, there is provided means for raising and lowering the load carrying element, as well as for opening and closing the relatively movable portions of the load carrier and for swinging the load from one position to another. The raising and lowering and the swinging movements of the load thus afforded are generally accompanied by a certain amount of incidental rotation of the load about a generally vertical axis, which in some instances is not objectionable. However, in many cases, such as the handling of logs, pipes etc. for loading on to flat cars or trucks, the orientation of the load is very important. Consequently, some means must be provided for controlling the relative disposition of the load as it is being swung by the crane from one position to another.

Various means have been devised for effecting the above-mentioned orientation of the crane load throughout its movement, but the known prior devices are usually difficult and awkward to control and generally produce a "hunting" effect wherein continual re-adjustment is necessary to properly orient the load.

It is the primary object of the present invention to provide means for controlling the rotation of the load-carrying element of a crane, which includes a single control means and which affords automatic adjustment of the selected orientation of the load, irrespective of any raising and lowering of the load and of the opening and closing of the load engaging parts. Another object is to provide improved control means for the load carrying element of a crane, including a pair of tag lines which are adjusted through a single control means in a manner such that as one tag line is extended the other tag line is retracted, and including means affording a constant and uniformly applied tension on both tag lines which provides uniform and automatic adjustment of both tag lines in response to any raising and lowering or swinging of the load carrying element.

Other objects and advantages will become apparent as the disclosure progresses with respect to the accompanying drawing, wherein:

Fig. 1 is an elevational view of apparatus embodying the principles of the present invention.

Fig. 2 is an enlarged perspective view of the apparatus, with parts broken away to more clearly illustrate certain details of construction.

The illustrated apparatus is in the form of a power crane indicated generally by the numeral 1. Portions of the crane, such as the power means usually contained in the cab 2, have been omitted from the drawings in order to more clearly show the details of construction

2

with which the present invention is particularly concerned.

Generally, the crane 1 comprises a platform 3 rotatably mounted on a vehicle chassis 5 which is supported by a pair of power driven endless tracks 7. One end of the platform 3 includes a pair of spaced-apart, plate structures 9 (Fig. 2) to which are attached the lower end of a broom structure 11. More particularly, the boom 11 includes a pair of forwardly converging structural members 13 which are pivotally attached at their rearward ends to the plates 9 by a pair of coaxial pins 15, in a manner affording vertical swinging movement of the boom relative to the platform 3.

The forward end of the boom 11 supports a cross shaft 17 upon which is rotatably mounted a pair of sheaves 19 and 21 affording a guide for a lifting cable 23 and a bucket operating cable 25, respectively. These cables extend from a suitable winding drum or winch within the cab 2 and along the boom 11 to their respective sheave at the outer end of the boom. The cable 23 is connected at its outer end to a clam shell 27 in a manner affording raising and lowering of the bucket as the cable is reeled in and let out.

The clam shell 27 comprises a generally rigid upper frame including four downwardly diverging corner posts 29 which provide a support at their lower ends for a pair of bucket forming members 31. Each of the bucket forming members 31 is pivotally mounted at opposite ends thereof on the lower ends of a pair of the posts 29 for relative swinging movement about a generally horizontal axis. The upper portions of the members 31 are interconnected at opposite sides and at the center by three pairs of toggle links 33 which are interconnected along the axis of their center pivots by a cross member 35 to which is attached the outer end of the cable 25. Thus it is seen that the movement of the cable 25 is effective to open and close the clam shell bucket.

It will be noted from the above described structure that the clam shell 27 is freely suspended from the end of the boom 11 and, consequently, any shifting of the boom or of the clam shell will result in some rotation of the latter about the axis of the supporting cable 23. This is objectionable when handling any load wherein orientation of the load is important, as in the handling of elongated objects such as logs, pipes and the like. In such cases it has frequently been necessary to utilize additional personnel or equipment to stabilize the position of the load and guide it to its destination.

In order to overcome the above difficulty and insure proper control at all times of the orientation of the clam shell bucket, or any similarly supported loading device which may be substituted for the clam shell, there is provided a pair of tag lines 37 and 39 which are connected at one end to laterally spaced positions at the lower end portions of two of the corner posts 29 on the clam shell 27. Each of the tag lines extends upwardly from its position on the bucket 27 to the boom 11 and then rearwardly under the guidance of a series of sheaves to a single control means 41 on the platform 3.

More specifically, each of the tag lines 37 and 39 extends upwardly and rearwardly from the clam shell 27 to a pair of guide sheaves 43 and 45 which are rotatably mounted along the inside of a forward portion of each of the boom members 13. These forwardly disposed sheaves are similarly disposed for each of the tag lines and provide for a change in direction of the tag lines to dispose the latter in a rearwardly extending direction along the boom. At an intermediate section of the boom structure there is further provided a uniform tensioning and flexing means for the tag lines comprising a spring loaded trolley 47 which includes a pair of rotatable sheaves 49 and 51 for receiving the tag lines 37 and 39, respectively.

The trolley 47 includes a cross shaft 53 which is disposed between a pair of guide bars 55 and rotatably mounts the pulleys 49 and 51. Each of the guide bars 55 are slidably fixed within an elongated slot or opening 57 formed in the associated boom member 13 to thereby afford movement of the shaft 53 and the tag line sheaves 49 and 51 longitudinally of the boom 11. The shaft 53 is biased toward a position rearwardly in the slots 57 by means of a coil spring 59, which is fixed between a suitable bracket 61 on the shaft 53 and a crossbar 63 which is secured in position between the boom members 13 rearwardly of the slots 57.

The tag lines 37 and 39 are disposed around the sheaves 49 and 51, respectively, and then about a pair of forwardly disposed smaller guide pulleys 65 so as to continue rearwardly along the boom. Adjacent each corner of the forward end of the platform 3 there is disposed a pair of additional guide pulleys 67 and 69 which direct each tag line along the side of the platform to a sheave or pulley 71 and thence to the control unit 41 at the rear of the platform.

The particular control unit 41 used in the illustrated apparatus comprises a double acting ram having a cylinder 73, a piston 75, and a piston rod 77 extending outwardly at opposite ends of the cylinder for attachment with the ends of the tag lines 37 and 39, respectively. A four way control valve 79 having an operating lever 81 is conveniently disposed for directing fluid communication between the cylinder 73 and a source of fluid pressure indicated at 83, in a manner affording selective movement of the piston 75 within the cylinder 73 to thereby retract one of the tag lines while simultaneously paying out the other tag line.

The illustrated control unit 41, in conjunction with the spring loaded trolley 47, will afford an adequate range of movement of the tag lines 37 and 39 in most instances. It is recognized, however, that in certain cases it might be desirable to use other types of control means either to correspond with existing types of power means or to provide a greater range of movement for the tag lines. For example, the tag lines may be operated by a steam or air cylinder functioning much in the same manner described with respect to the control 41.

It is seen from the foregoing, therefore, that the double tag lines 37 and 39 form a fixed length, flexible connection between the control cylinder 73 and the clam shell 27 in a manner such that the latter is under positive control at all times with respect to the orientation of the bucket forming members 31. The spring biased trolley 37 provides a constant tension for the tag lines, which is uniformly variable with respect to both lines so as to afford positive and automatic control of the orientation of the clam shell irrespective of any raising and lowering or swinging of the clam shell. As the boom is moved about, the tension thereby applied on the tag lines is uniform for both lines by virtue of the disposition of the spring biased trolley 47 and the movement of the trolley afforded by the slots 57 permits a flexing of the tag lines without effecting the orientation of the clam shell.

Furthermore, it is seen that the movement of a single control lever 81 is effective to retract one of the tag lines while simultaneously paying out the other tag line an equal amount to thereby rotate the clam shell about a generally vertical axis. Thus the bucket is positively controlled at all times as to its position and there is no provision for slippage in the tag lines which would otherwise cause the clam shell to rotate beyond the desired position and require a readjustment.

While the trolley unit 47 which provides a yieldable guide means for the double tag lines 37 and 39 is illustrated as being spring biased, other forms of construction affording a similar mode of operation might be used.

Although shown and described with respect to particular apparatus, it will be apparent to those skilled in the art that various modifications of such apparatus may be

employed without departing from the principles of the present invention.

I claim:

1. In a crane having a platform supporting an outwardly extending boom structure, a load supporting device comprising a clam shell bucket suspended from said boom in a manner affording rotation about a generally vertical axis, said bucket including a pair of relatively movable load engaging elements, means affording a raising and lowering of said bucket, means affording relative movement between said load engaging elements to thereby engage and release loads, and additional means for orienting said clam shell bucket about said generally vertical axis of rotation comprising a pair of tag lines having one end thereof attached to laterally spaced positions on said bucket, each of said tag lines extending rearwardly along said boom and being disposed about a sheave carried by said boom, said pair of sheaves being coaxially mounted on a transverse shaft slidably carried by said boom for movement fore and aft of said boom structure, resilient means connected between said transverse shaft and said boom structure to urge said shaft rearwardly along said boom and thereby exert tension uniformly on both of said tag lines, said tag lines extending rearwardly from said sheaves to a power operated means on said platform comprising a double-acting, fluid pressure operated piston, each of said tag lines being connected with opposite sides of said piston for movement therewith, whereby movement of said piston effects simultaneous and oppositely directed movement of said tag lines.

2. In a crane having a platform supporting an outwardly extending boom structure, a load supporting device comprising a grapple suspended from said boom in a manner affording rotation about a generally vertical axis, said grapple including a pair of load engaging elements supported for relative movement therebetween, means affording a raising and lowering of said grapple, means affording relative movement between said load engaging elements, and an additional means for orienting said grapple about said generally vertical axis of rotation comprising a pair of tag lines having one end thereof connected with said load supporting device at laterally spaced positions thereon, each of said tag lines extending rearwardly along said boom and being disposed about a sheave carried by said boom, said pair of sheaves being coaxially mounted on a transverse shaft slidably carried by said boom for movement fore and aft of said boom structure, resilient means connected with said transverse shaft and said boom structure to urge said shaft rearwardly along said boom and thereby exert tension uniformly on both of said tag lines, said tag lines extending rearwardly from said sheaves to a power operated means mounted on said platform.

3. In a crane having a platform supporting an outwardly extending boom structure, a load supporting device comprising a clam shell bucket suspended from said boom in a manner affording rotation about a generally vertical axis, said bucket including an upper frame structure and a pair of relatively movable load engaging elements carried by the lower portion of said frame structure for relative movement therebetween, means affording a raising and lowering of said bucket, means affording relative movement between said load engaging elements to thereby engage and release loads, and additional means for orienting said clam shell bucket about said generally vertical axis of rotation comprising a pair of tag lines having one end connected with said load supporting device at generally horizontally spaced portions thereon, each of said tag lines extending rearwardly along said boom and being disposed about a sheave carried by said boom, said pair of sheaves being coaxially mounted on a transverse shaft slidably carried by said boom for movement fore and aft of said boom structure, resilient means connected to said transverse shaft intermediate said sheaves for urging said

5

6

shaft rearwardly along said boom and thereby exert tension uniformly on both of said tag lines, said tag lines extending rearwardly from said sheaves to a power operated means on said platform comprising a double-acting, fluid pressure-operated piston, each of said tag lines being connected with opposite sides of said piston for movement therewith, whereby movement of said piston effects a simultaneous and oppositely directed movement of said tag lines.

4. In a crane having a platform supporting an outwardly extending boom structure, a load supporting device comprising a grapple suspended from said boom in a manner affording rotation about a generally vertical axis, said grapple including a pair of load engaging elements supported for relative movement therebetween, means affording a raising and lowering of said grapple, means affording relative movement between said load engaging elements, and an additional means for orienting said grapple about said generally vertical axis of rotation comprising a pair of tag lines having one end thereof connected with said load supporting device at laterally spaced positions thereon, each of said tag lines

extending rearwardly along said boom and being disposed about a sheave carried by said boom, said pair of sheaves being coaxially mounted on a transverse shaft slidably carried by said boom for movement fore and aft of said boom structure, resilient means connected with said transverse shaft and said boom structure to urge said shaft rearwardly along said boom and thereby exert tension uniformly on both of said tag lines, said tag lines extending rearwardly from said sheaves to a power operated means mounted on said platform comprising a double acting, fluid pressure-operated piston, each of said tag lines being connected therewith, whereby movement of said piston effects simultaneous and oppositely directed movement of said tag lines.

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