

Sept. 10, 1963

W. A. YORK

3,103,282

ARTICLE GRAB

Filed Feb. 28, 1962

3 Sheets-Sheet 1

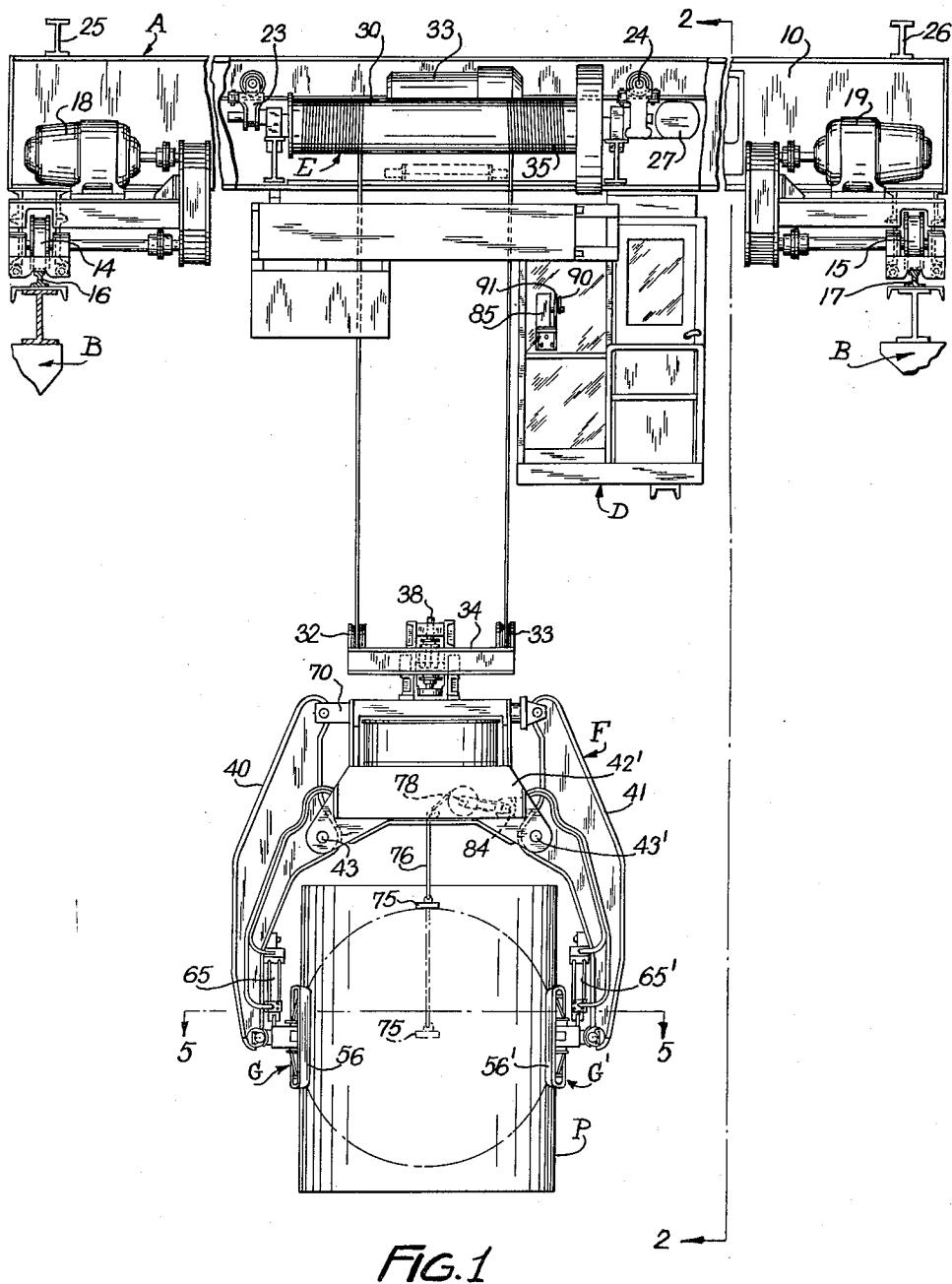


FIG. 1

INVENTOR.
WILLARD A. YORK
BY *Williams, David,
Hoffmann & Junt.*
ATTORNEYS

Filed Feb. 28, 1962

ARTICLE GRAB

3 Sheets-Sheet 2

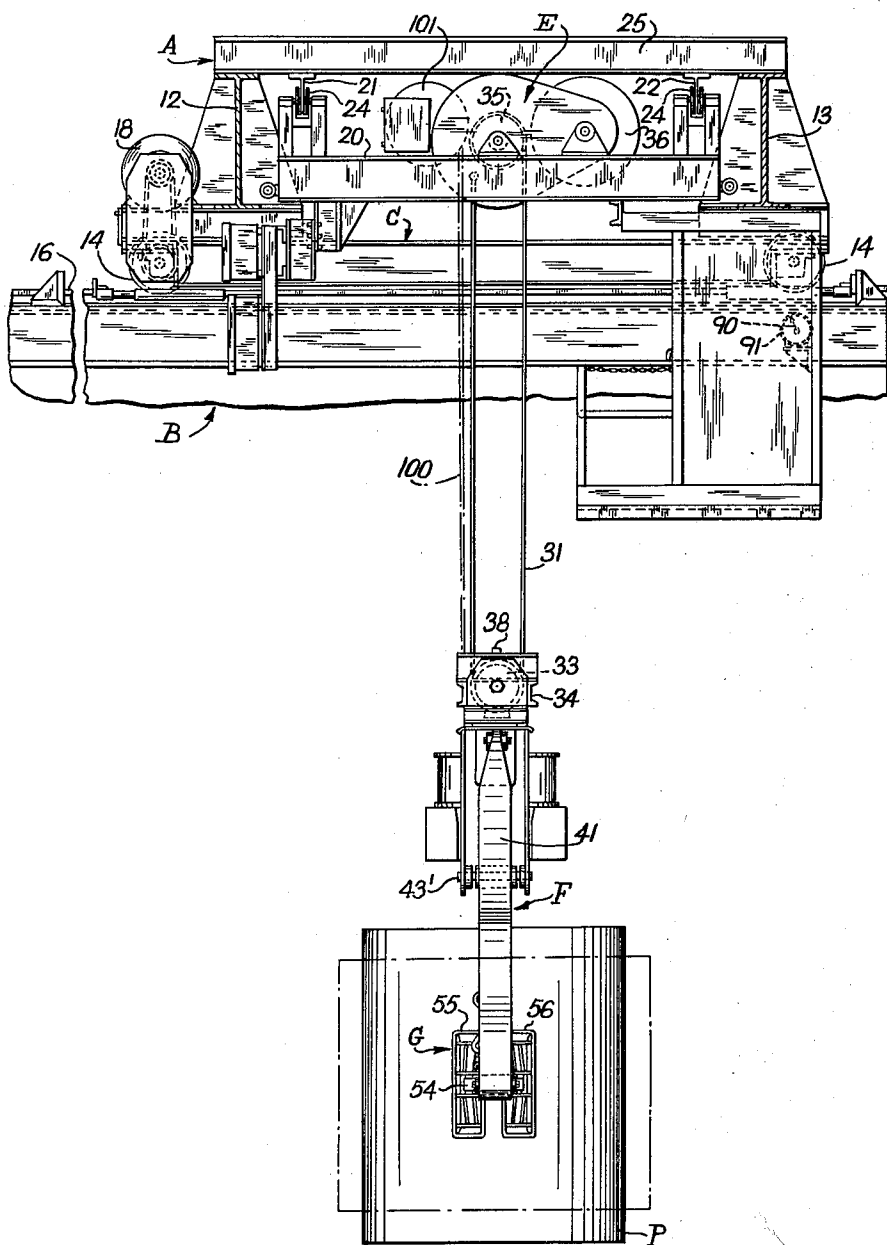


FIG. 2

INVENTOR.
WILLARD A. YORK
BY *Williams, David,*
Hoffmann & Junt
ATTORNEYS

Sept. 10, 1963

W. A. YORK
ARTICLE GRAB

3,103,282

Filed Feb. 28, 1962

3 Sheets-Sheet 3

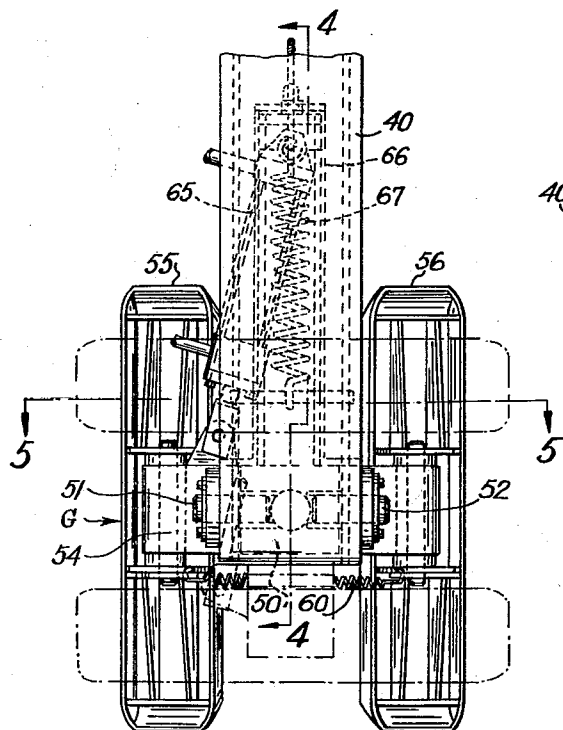


FIG. 3

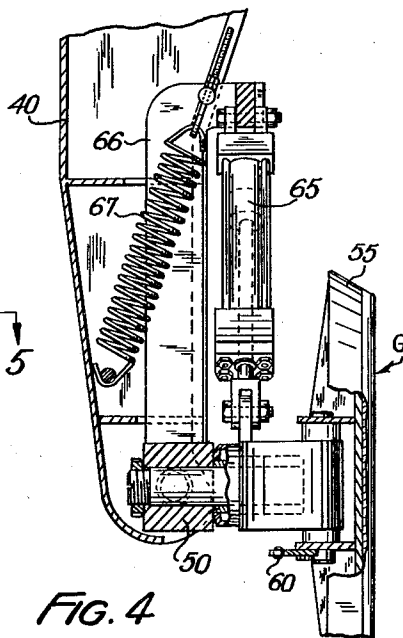


FIG. 4

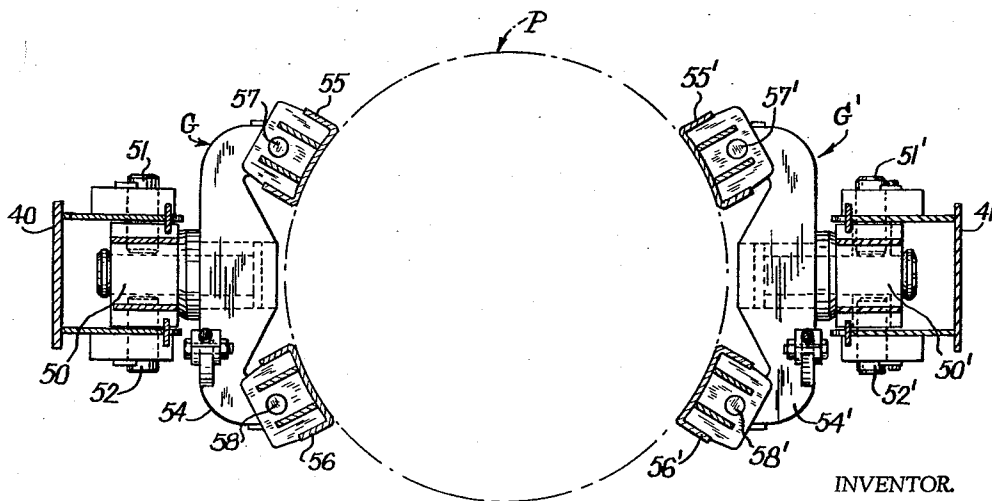


FIG. 5

INVENTOR
WILLARD A. YORK
BY *Williams, David*
Hoffmann & Jaunt
ATTORNEYS

1

3,103,282

ARTICLE GRAB

Willard A. York, Pepper Pike, Ohio, assignor to The Cleveland Crane & Engineering Company, Wickliffe, Ohio, a corporation of Ohio

Filed Feb. 28, 1962, Ser. No. 176,367

6 Claims. (Cl. 212-128)

The present invention relates to material handling apparatus of the type comprising an overhead movable support having suspended therefrom a grab selectively engageable with a load, particularly a cylindrical article, such as a roll of paper, by an operator located at a distance from the load.

One of the principal objects of the invention is the provision of a new and improved material handling apparatus including a movable support member having suspended therefrom a grab controllable by an operator located at a distance from the grab to selectively engage a load and which includes means for indicating at the operator's position or station the relative vertical position of the grab with respect to the load, at least, when the grab is at or approximately at the optimum or desired position for engaging the load.

The invention resides in certain constructions and combinations and arrangements of parts and further advantages of the invention will be apparent to those skilled in the art to which it relates from the following description of the preferred embodiment described with reference to the accompanying drawings forming a part of this specification, in which similar reference characters designate corresponding parts, and in which:

FIG. 1 is a side elevational view, with portions broken away, of a material handling apparatus embodying the present invention lifting a roll of paper;

FIG. 2 is a sectional view with portions in elevation approximately on the line 2-2 of FIG. 1;

FIG. 3 is an enlarged elevational view of a portion of the material or load grab, as viewed from the left in FIG. 1;

FIG. 4 is a sectional view with portions in elevation approximately on the line 4-4 of FIG. 3; and

FIG. 5 is a sectional view with portions in elevation approximately on the line 5-5 of FIG. 3.

While the invention is susceptible of various modifications and alternate constructions, the present preferred embodiment is shown in the drawings and herein described in detail. It is to be understood, however, that there is no intention to thereby limit the invention to the specific form disclosed, but it is my intention to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

The invention is herein illustrated as embodied in an overhead bridge-type traveling crane comprising a bridge A formed of welded structural members including two spaced girders 12, 13, and having at its opposite ends pairs of wheels 14, 15, respectively, which wheels engage and travel along rails 16, 17 adjacent to the ends of the bridge and which rails form the crane runway. The rails 16, 17 are supported by the building B within which the crane is located, or by some other suitable structure. The crane is moved along the crane runway by driving one or more of each of the wheels 14, 15 from a pair of operator controlled reversible electric bridge travel motors 18, 19 in a suitable manner.

The crane also comprises a carrier or trolley C including a built-up trolley frame 20. The trolley C is suspended from rails 21, 22 connected to and forming a part of the bridge A by pairs of wheels 23, 24 located at opposite ends of the trolley and rotatably connected to the

2

frame 20 adjacent to its corners. The rails 21, 22 are welded to the underside of spaced cross members 25, 26 of the bridge C. The members 25, 26 rest upon and are welded to the top of the girders 12, 13. The wheels 23, 24 at the near side of the trolley, as viewed in FIG. 1, engage rail 21 on the bridge C, and the corresponding wheels at the far side of the trolley engage rail 22. The trolley C is moved lengthwise along the bridge by an operator controlled reversible electric trolley travel motor 27 connected to one or more of the wheels 23, 24. The operations of both bridge travel motors 18, 19 and the trolley travel motor 27 are under the control of the crane operator in the control cab D fixedly suspended from the trolley C.

The trolley C is provided with a cable-type hoist mechanism, designated generally as E, and comprising two cables 30, 31 to which the grab, designated generally as F, is connected. One end of each of the cables 30, 31 is connected to the frame 20 of the carrier C. After passing downwardly and around sheaves 32, 33, respectively, connected to opposite ends of a built-up member 34, the cables 30, 31 extend in an upwardly direction to the trolley C where they are connected to a cable drum 35 driven by a reversible hoist motor 36 and provided with a hoist brake of conventional construction. The motor 36, like the motors previously referred to, is controlled by the crane operator in the cab D. The hoist mechanism E will not be described in detail. Suffice it to say that the grab F can be raised or lowered by the operator energizing the motor 36 to rotate in one direction or the other, that is, to either reel the ends of the cables 30, 31 connected to the cable drum onto or off of the drum as the case may be.

The grab F, illustrated, is rotatably connected to the member 34 by a pivot assembly 38, and is particularly suitable for handling cylindrical articles and more particularly rolls of papers and comprises a pair of vertical clamp arms 40, 41 pivotally connected to the opposite ends of a horizontal frame member 42 suspended from the member 34 by the pivot assembly 38 and in turn from the trolley C by the cables 30, 31. The pivot assembly 38 comprises power means also controlled from the cab D for rotating the grab F relative to the member 34. The clamp arms are pivoted to the member 42 at points intermediate their ends by pivot pins 43, 43', respectively, for movement in a common plane and about parallel axes. The clamp arms 40, 41 have load-engaging assemblies G, G', connected to their lower end, respectively, for engaging the load to be handled when the clamp arms are moved about their pivots in the direction to move their lower end toward one another.

Each of the clamp arms 40, 41 and the load-engaging assembly carried thereby are similar in construction and only the clamp arm 40 and its load engaging assembly G will be described. The corresponding parts of the clamp arm 41 and the load-engaging assembly G' thereon will be designated by the same reference characters with a prime mark affixed thereto.

The clamp arm 40 is of built-up construction and comprises a rectangular block 50 supported in its lower end by bearing pins 51, 52. The construction permits the block 50 to rotate about the axis of pins 51, 52, which axis is parallel to the axis of the pin 43 pivotally securing the clamp arm 40 to the member 42.

The load engaging assembly G includes a member 54, connected to the block 50 for rotation about an axis transverse to the axis of the pins 51, 52, and a pair of elongated shoes 55, 56 supported in parallel relationship to one another and having load-engaging faces shaped to conform to the cylindrical configuration of a paper roll P to be handled by the apparatus. The shoes 55, 56 are

3

spaced from each other circumferentially of the paper roll P and are connected to the member 54 by pins 57, 58, respectively, for oscillation about axes offset from and extending transversely of the axis of rotation of the member 54 in the block 50. The construction permits the shoes 55, 56 to rotate limited amounts about their connection with the member 45 to permit their load-engaging faces to align themselves with the circumference of the roll of paper being handled. The shoes 55, 56 are biased in an outward direction with respect to each other by a spring 60 connected therebetween.

The load-engaging assembly G is rotatable in the lower end of the arm 40 to permit the paper roll P, or other load being handled, to be rolled over or turned slightly more than 90°. This is accomplished by a double acting reciprocating hydraulic motor 65, the cylinder element of which is pivotally connected to a member 66 mounted on the upper side of the block 50 while the piston element is connected to the member 54 at a point off-set radially with respect to the axis of rotation of the assembly G in the lower end of the arm 40. The load-engaging assembly G is biased upwardly about the axis of the pins 51, 52 by a spring 67 connected between the arm 40 and the member 66. Preferably, the limit of the movement of the load-engaging assembly G to which the spring 67 urges it, is such that when the clamp arms 40, 41 are in their wide-open position, the shoes 55, 56 will be substantially vertical.

The clamp arms 40, 41 are adapted to be oscillated about the pivot pins 43, 43' as axis by a fluid actuated double acting reciprocating motor 70, the cylinder and piston of which are operatively connected between the upper end portion of the clamp arms. When fluid is supplied to the clamp side of the hydraulic motor 70, the upper ends of the clamp arms are moved apart to cause the lower ends of the clamp arms carrying the load-engaging assemblies G, G' to move toward each other in a clamping movement and to apply a clamping pressure to a load positioned therebetween. Application of fluid pressure to the release side of the hydraulic motor 70 causes the upper ends of the clamp arms to move toward each other to move the load-engaging assemblies on the lower end of the clamp arm away from each other. Fluid pressure for operating the motors 65, 65', 70 is supplied from an electric motor driven pump located in the frame 42 of the grab. The flow of fluid to and from the motors is controlled by the operator in the crane D, by suitable solenoid operated valves also located in the frame 42 of the grab.

The grab F may be rotated relative to the built-up member 34 by a double acting fluid actuated motor similar to the motor 65, previously referred to, and interconnected between the member 34 and the frame 42 of the grab F. This motor could also be controlled from the crane cab D by the operator through solenoid valve means carried by the grab.

In operating material handling apparatus of the character to which the present invention relates, it is believed that it will be apparent that in most instances it is preferable, and in some cases imperative, to have the grab centered with respect to the load or particularly with respect to the vertical dimension of the load, especially where it is desired to pick up a heavy cylindrical object, such as a roll of newsprint, lying with its axis horizontal. Referring especially to the handling of newsprint, it will be difficult to rotate the roll about a horizontal axis for the purpose of standing the roll on end or lay it on its side unless the roll is centered in the grab, and when the roll is lying on its side the grab may not properly engage it unless it is dropped over the roll the right amount with the result that the roll might be dropped. The grab in picking up a horizontal roll should engage it symmetrically with respect to its horizontal central plane.

In order to facilitate the operator in properly engaging

4

the load by the grab, which in the present instance is operated or controlled from an operator's station remote from the grab proper, the present invention contemplates the provision of means preferably at the operator's station, responsive to a mechanism in the grab sensing one or more relative positions between the grab and the load or article to be handled, for indicating the relative position between the grab and the load or article to be handled, particularly while the grab is in the approximate position for engaging the load. Referring to the preferred embodiment of the invention shown, this mechanism includes a weighted member 75 connected to the lower end of a flexible cable 76 and adapted to engage the top of an article to be handled by the grab F. From the weighted member 75, the cable 76 extends upwardly about an idler sheave rotatably supported in the frame 42 of the grab and then makes a number of turns about a cable drum 78 to which the end of the cable is secured. The drum 78 is biased by a helical spring of suitable construction in a direction to wind the cable 76 onto the drum. The force of the spring, however, is not sufficient to overcome the weight of the member 75 connected to the free end of the cable 76. The drum 78 is fixed to a shaft rotatably supported in the frame 42 of the grab and having a sprocket pinion fixed thereto. The sprocket wheel is in turn connected by a sprocket chain to a driven sprocket on the rotor shaft of a Selsyn generator 84.

The Selsyn generator 84 is connected to a Selsyn motor 85 in the cab D of the crane, the rotor of which carries an indicator or pointer 90 adapted to oscillate over a dial member 91 provided with an arcuate scale suitably calibrated for the intended purpose. The Selsyn system is of commercial construction and is not herein shown and described. Suffice it to say that the electric circuits between the generator 84 and the motor 85 are carried between the cab D and the grab F, as are all of the other electric control circuits required for the operation of the grab, through a multiple conductor flexible cable 100 of commercial construction connected to the grab F and a spring biased reel 101 also of commercial construction in the trolley C.

The construction of the parts of the apparatus just described is such that as the grab is lowered over a load the weight 75 engages the upper surface thereof thus relieving the lower end of the cable 76 of the weight thereof. This allows the drum 78 to rotate in a clockwise direction, as viewed in the drawings, an amount proportional to the distance that the member 75 is raised by its engagement with the load as the grab is lowered. Rotation of the drum 78 in the direction mentioned rotates the Selsyn generator 84, which in turn causes a proportional rotation of the Selsyn motor 85 and the pointer 90. As will be apparent, the relative size of the drum 78 and the sprockets connecting it to the generator 84 must be such that the Selsyn generator 84 makes not more than one full revolution for the maximum vertical travel of the member 75. Assuming that in its normal position the bottom of the member 75 coincides with the axes of rotation of the load engaging assemblies G, G', in the lower ends of the arms 40, 41 and that the operator knows the height or the diameter of the load to be handled, he can readily determine by watching the indicator 90 when the grab has been lowered so that the axis of rotation of the load engaging assemblies coincides with the horizontal center plane of the load.

From the foregoing description of the preferred embodiment of the invention it will be apparent that the objects heretofore enumerated and others have been accomplished and that there has been provided a novel and improved material handling apparatus including a movable support member having suspended therefrom a grab controllable by an operator located at a distance remote from the grab and including means for indicating at the operator's position or state, the relative vertical position

5

of the grab with respect to the load, at least, while the grab is in the proximity of the load and more particularly while the grab is at or approximately at the optimum or desired position for engaging the load.

While the preferred embodiment of the invention has been described in considerable detail, the invention is not limited to the particular apparatus shown and it is the intention to hereby cover all adaptations, modifications and uses thereof which come within the scope of the appended claims.

Having thus described my invention, what I claim is:

1. In a material handling apparatus a movable overhead support, a load grab including a member for engaging a load to be handled, elevatable means connecting said load grab to said overhead support, a control station remote from said grab for controlling actuation of said elevatable means, means in said grab independent of said member for sensing a relative position of said grab to a load to be handled thereby, and indicator means at said control station operatively connected to said sensing means for indicating said relative position of said grab to the load.

2. In a material handling apparatus a movable overhead support, a load grab comprising a pair of clamp members movable by power towards and from one another, opposed load engaging assemblies rotatably supported in said clamp members for rotation about a generally horizontal axis, elevatable means connecting said load grab to said overhead support, a control station remote from said grab for controlling actuation of said elevatable means, power means controlled from said control station for oscillating said load engaging assemblies about said axis, means in said grab for sensing the relative position therebetween and a load to be handled, and indicator means at said control station operatively connected to said sensing means for indicating the relative position between said grab and the load.

3. In a material handling apparatus a movable overhead support, a load grab including a member for engaging and lifting a load to be handled; elevatable means connecting said load grab to said overhead support, a control station remote from said grab for controlling actuation of said elevatable means, first means on said grab for sensing a relative position of said grab to a load to be handled thereby when said grab is in the proximity of the load but not engaged by said member, and second means operatively connected to said first named means for indicating said relative position of said grab to the load.

4. In a material handling apparatus, a movable overhead support, a load grab including a member for engaging a load to be handled, elevatable means connecting said load grab to said overhead support, a control station

6

remote from said grab for controlling actuation of said elevatable means, first means on said grab for sensing relative positions of said grab to a load to be handled thereby when said grab is in the proximity of the load, and second means operatively connected to said first means for indicating different positions of said grab relative to the load to be handled as the grab is moved into position to engage the load.

5. In a material handling apparatus a movable overhead support, a load grab including a first member for engaging a load to be handled, elevatable means connecting said load grab to said overhead support, a control station remote from said grab for controlling actuation of said elevatable means, first means on said grab for sensing the relative position of said grab to a load to be handled thereby when said grab is in the proximity of the load, said last named means including a second member movably connected to said grab and adapted to engage the load to be handled when said grab is in the proximity of the load, and second means at said control station operatively connected to said first means for indicating varying positions of said grab relative to the load incident to said second member being in engagement with the load to be handled.

6. In a material handling apparatus a movable overhead support, a load grab including a frame member and a pair of clamp members movably connected to said frame member, power actuated means for moving said clamp members toward one another to engage a load to be handled, opposed load engaging assemblies rotatably supported by said clamp members for rotation about a generally horizontal axis, power actuated means for oscillating said load engaging assemblies about said axis, power actuated means connecting said load grab to said overhead support, a control station remote from said grab for controlling actuation of said various power actuated means, first means on said grab for sensing the relative position of said grab to a load to be handled thereby when said grab is in the proximity of the load, said last named means including a second member movably connected to said grab and adapted to engage the load to be handled as the grab is being moved into position to be engaged with the load, and second means at said control station operatively connecting said sensing means for indicating the position of said grab relative to the load.

References Cited in the file of this patent

UNITED STATES PATENTS

2,600,538	Jacks et al. _____	June 17, 1952
2,915,332	Cotesworth et al. _____	Dec. 1, 1959
3,040,911	Turner _____	June 26, 1962