Sept. 20, 1966 L. M. CALDWELL ETAL 3,273,931

LIFTING GRAB

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Fig. 2

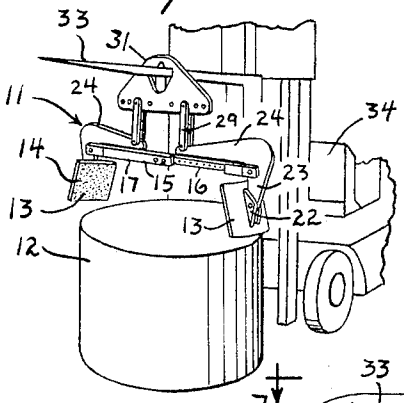


Fig. 4

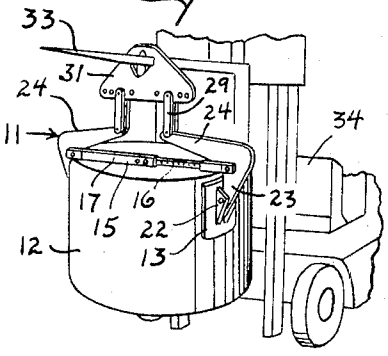


Fig. 1

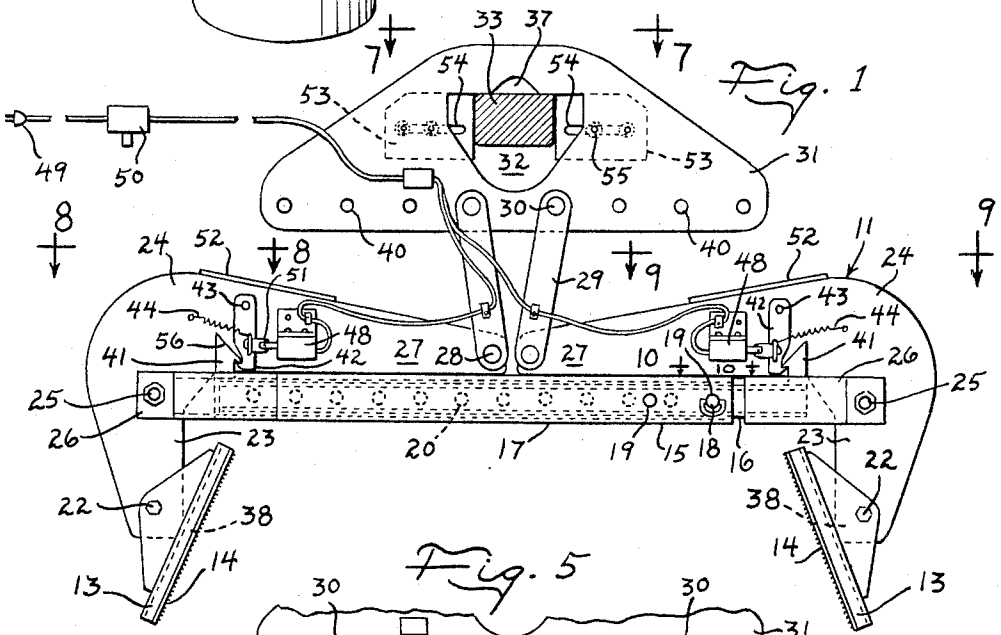
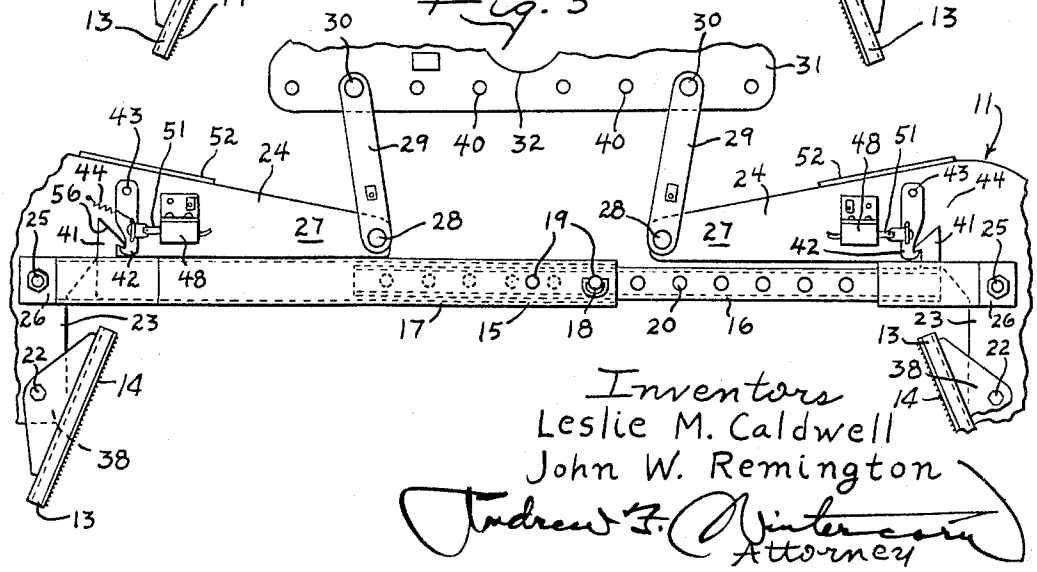


Fig. 5



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Fig. 3

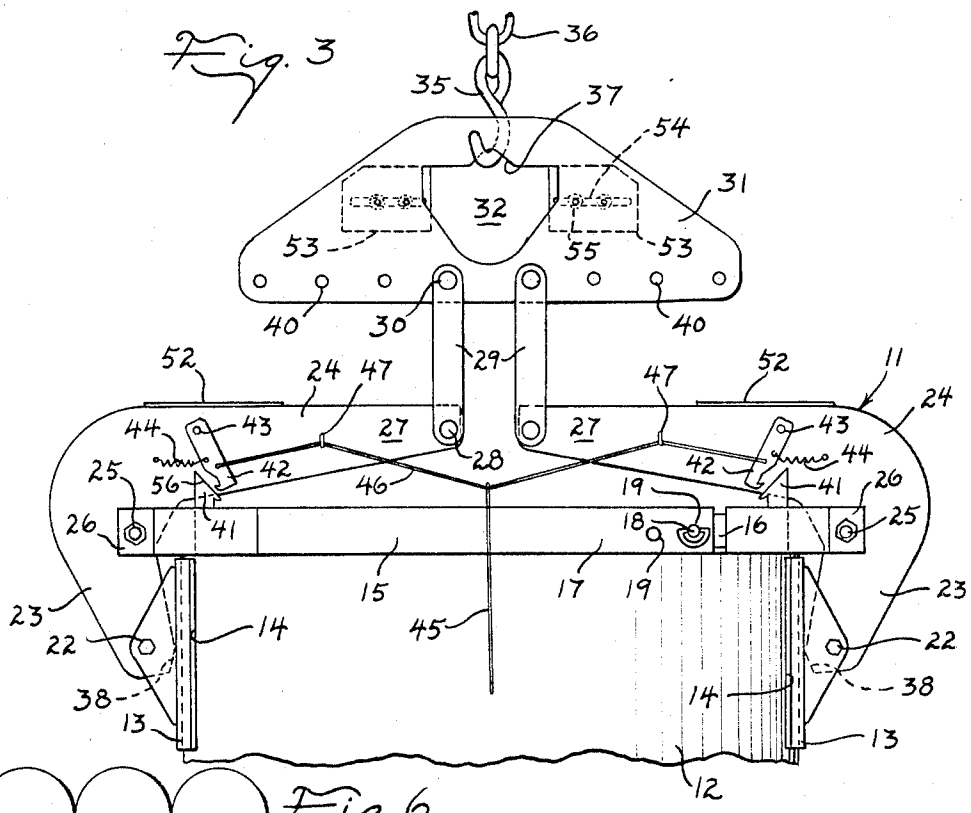


Fig. 6

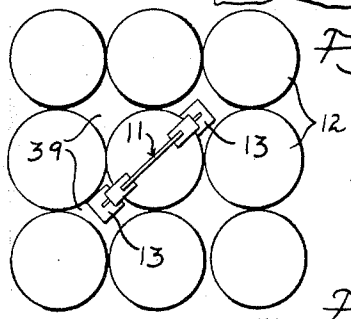


Fig. 7

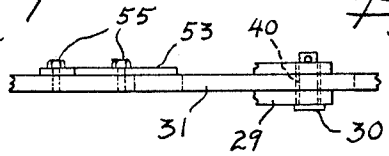


Fig. 8

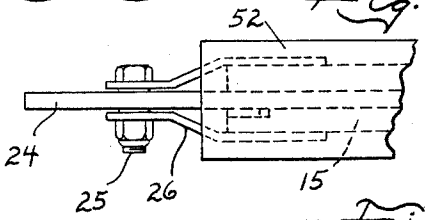


Fig. 9

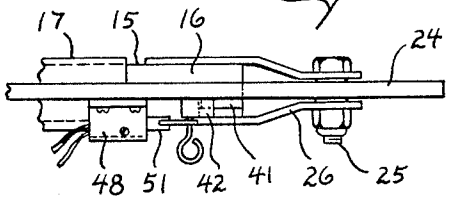
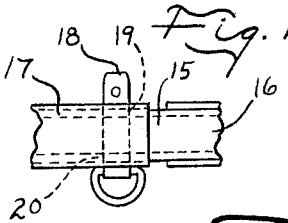


Fig. 10



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3,273,931

LIFTING GRAB

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Filed Jan. 4, 1965, Ser. No. 433,245
20 Claims. (Cl. 294—81)

This invention relates to a lifting grab especially designed for use with cranes and standard fork lift trucks for the safe and efficient handling of large heavy paper rolls on end in the loading and unloading thereof from ship holds, and for their good and speedy handling generally, as in stacking of such rolls for storage and in removal thereof from stacked relation.

The improved lifting grab of our invention has the following novel features:

(1) Grab pads with surfaces roughened all over only enough to bite into the paper roll for a secure hold but not enough to injure the paper;

(2) A pair of bell-crank levers carrying the grab pads on their outer ends are pivotally mounted on opposite ends of a spreader bar and are connected at their inner ends by a pair of links to opposite ends of a lifting bale to be closed on the roll with the required leverage ratio;

(3) Spring-pressed latches on the two bell-cranks lockingly engage hook-shaped projections on opposite ends of the spreader bar to lock the bell-cranks in open position until the latches are released by remote control with a manually operated pull-cord or electrically by means of solenoids, whereby to enable easy placement of the lifting grab on a roll and removal therefrom without any danger of damage to the roll;

(4) The spreader bar is easily adjustable in length by sliding adjustment of its two telescoping members to accommodate different diameters of rolls, and, when such an adjustment is made, the links are also adjustable relative to the lifting bale, and

(5) Two plates are adjustable laterally on the lifting bale toward and away from one another and relative to the fork opening in the bale to accommodate different widths of forks.

The invention is illustrated in the accompanying drawings, in which:

FIG. 1 is a face view of the lifting grab of our invention, showing the bell-cranks locked in open position by means of electrically controlled latches,

FIG. 2 is a perspective view showing how the lifting grab is easily maneuverable for placement relative to a roll to be lifted with a fork lift truck while the arms are locked in open position as in FIG. 1;

FIG. 3 is a face view of another lifting grab having manually controlled latches for the bell-cranks which are here shown in clamping relation to a roll, as shown also in perspective in FIG. 4;

FIG. 5 is a face view of he lifting grab of FIG. 1 showing how its spreader bar is adapted to be extended to meet different requirements, the bell-cranks having their operating links adjusted accordingly relative to the lifting bale;

FIG. 6 is a plan view of a group of rolls standing on end close together and showing how the present lifting grab is designed to fit over any selected roll in the group without interference from the neighboring abutting rolls;

FIG. 7 is a partial plan view of the lifting bale, taken on the line 7—7 of FIG. 1;

FIG. 8 is a plan view of one end of the lifting grab shown in FIG. 1, this view being on the line 8—8 thereof;

FIG. 9 is a plan view of the other end of the lifting grab, taken on the line 9—9 of FIG. 1, and

FIG. 10 is a detail on the line 10—10 of FIG. 1.

The same reference numerals are applied to corresponding parts throughout the views.

Referring to the drawings, the lifting grab of our invention which is indicated generally by the reference numeral 11 was especially designed for use in lifting large, heavy paper rolls, like those indicated at 12 in FIGS. 2 to 4 and 6, handling these rolls by their upper end by means of a pair of arcuate grab pads 13, engaging each roll from diametrically opposite sides, the pads being metallic and specially fabricated for tremendous gripping power without likelihood of damaging the paper, the roll contacting surfaces 14 of these pads having shallow depth roughnesses all over for non-skid noninjurious contact with the rolls. The rolls 12 come in a large variety of sizes and weights, as, for example, from 18" to 61" in diameter, and from 5½" to 65" in length, and they vary in weight from about 350 lbs. to about 6000 lbs. There is, accordingly, a need for various sizes of adjustable grabs 11, starting for example, with one to accommodate a range of 18" to 32", next 30" to 52", and next 48" to 61", the first size taking rolls weighing up to 1600 lbs., the second size up to 3,000 lbs., and the third size up to 6000 lbs., the pads 13 being also made available in different dimensions for each size grab, and also different radius of curvature to suit the work. The change in span of each size grab to suit different diameters of rolls in the range that can be handled by a given size grab is accomplished by changing the length of the spreader bar 15 by slidably adjusting the two telescoping parts 16 and 17 relative to one another and locking them in adjusting relationship by means of a pin 18 entered in either one of two parallel holes 19 extending transversely of the outer tubular part 17 of square section and spaced a predetermined distance apart lengthwise thereof, and entered in either one of a series of parallel holes 20 spaced uniformly lengthwise of the square tubular inner part 16 of the spreader bar. The second hole 19 is so spaced relative to the first hole 19 being used in FIG. 5 that it comes midway between two of the holes 20. Thus, for example, if the holes 20 are spaced one inch, holes 19 are spaced one and one-half inches, so that closer adjustment is made possible than would be possible if only one hole 19 were provided. The grab pads 13 are pivotally mounted on horizontal pins 22 carried on the lower ends of the downwardly projecting clamp arms 23 of a pair of bell-crank levers 24 that are pivotally mounted, as at 25, in forks 26 welded or otherwise suitably secured to the outer ends of the parts 16 and 17 of the spreader bar 15. The horizontal inwardly extending actuating arms 27 of the bell-cranks 24 are pivotally connected at their inner ends, as at 28, to the lower ends of links 29 that are pivotally connected at their upper ends, as at 30, to the lower end portion of a lifting bale 31, which has an opening 32 in the middle thereof to receive the fork 33 of a standard fork lift truck, like that indicated at 34 in FIG. 2, or the hook 35 on the end of a chain 36 of a crane as indicated in FIG. 3, the notch 37 in the middle of the upper portion of the opening 32 being provided for this hook to prevent its shifting laterally with respect to the bale. Approximately a 3 to 1 ratio is afforded by the bell-cranks 24 in applying clamping pressure to the pads 13 for lifting a roll, and we have found that this is the ideal ratio for the various sizes of lifting grabs, because it gives a clamping pressure that is neither too heavy nor too light, but just right for even the largest and heaviest rolls of paper that either of these various sizes of lifting grabs is called upon to lift. The radius of curvature of the grab pads 13 is preferably a mean radius between the two extremes; thus, in the smallest size adapted to handle rolls in the range from 9 inches to 16 inches radius, the radius of curvature of the grab pads is approximately 12½ inches, with the idea that in handling the larger diameters of rolls the grab pads can flex to the small extent necessary to take hold the full width of the pads, and on smaller diameter rolls a lesser area of contact is not apt to be serious be-

cause of the smaller weight involved. While the lifting grab is hanging free of the roll, the bevelled corners 38 on the lower ends of the downwardly extending clamp arms 23 of the bell-cranks 24 serve to limit the pivotal movement of the grab pads 13 relative to the arms 23, as seen in FIGS. 1, 2 and 5, so that the angle of tilt of the pads hanging free is a certain angle, as seen in FIG. 1, and the operator will have less difficulty with the lifting grab in approaching the top of a roll to be lifted. In FIG. 6 the generally rectangular spaces 39 between neighboring rolls in the group are illustrated as more than adequate for the entry of the grab pads 13 between the rolls when the lifting grab is being placed on the end of a roll in readiness for lifting the same. In passing, it will be seen that the bale 31 has two series of holes 40 spaced lengthwise of opposite ends of the bale, similarly as the holes 20 are spaced lengthwise of the spreader bar 15, and, when the spreader bar is extended to accommodate a larger size roll, the pins 30 must be inserted in other holes 40 farther from the middle of the bale to agree with the spreader bar adjustment. Whenever the spreader bar is to be elongated to any appreciable extent it is first necessary to remove the pins 30 preliminary to the adjustment of the spreader bar and reset the pins 30 thereafter.

Hooks 41 are provided on opposite ends of the spreader bar 15 arranged to be engaged by latches 42 that are pivotally mounted on the bell-cranks 24, as at 43, and are urged outwardly toward engagement with the hooks 41 by means of springs 44 shown in FIG. 3. In that form, a vertical pull-cord 45 is provided connected to the middle of a horizontal cord 46 that is connected at opposite ends to the latches 42 and is slidable through suitable guides 47 provided on the bell-cranks 44. In the other form shown in FIGS. 1 and 5, remote control of the latches 42 is afforded by means of solenoids 48 suitably connected to any source of electrical current by means of an extension cord plug 49, the current being turned on momentarily by the operator depressing the button of switch 50 to energize the solenoid 48 and thus retract the plungers 51 against resistance of springs 44, the plungers 51 being pivotally connected to the latches 42, as shown. The latches 42 lockingly engaging the hook-shaped projections 41 on the opposite ends of the spreader bar serve to lock the bell-cranks 24 in open position, as shown in FIGS. 1 and 5, to keep the grab pads 13 spread apart sufficiently to make it an easy matter to place the lifting grab 11 on or remove the same from the top of a roll 12, the latches being releasable by remote control, namely by a pull on the cord 45 in FIG. 3, or by energization of the solenoids 48 in FIGS. 1 and 5 by depressing the button of switch 50 so as to allow the closing of grab pads 13 on the roll as the fork 33 of the lift truck 34 is raised, or the chain 36 of a crane is raised. Flat plates 52 welded or otherwise suitably secured to the bell-cranks 24 on their upper edges serve by their projection from the sides of the bell-cranks to shield the latches 42 and hooks 41 from damage by contact with any object while the lifting grab is being swung into place on or being swung away from a roll. After a roll has been lifted and placed on top of a stack or wherever desired, the bell-cranks 24 when free to do so will drop down onto the spreader bar to re-engage the latches 42 with hooks 41 at the same time that the pads 13 are disengaged from the roll so as to permit lifting the device 11 off the roll. In the event the operator inadvertently pulls the cord 45 or depresses the button of switch 50 while the lifting grab is suspended in mid-air the chances are that the friction hold of the latches 42 on hooks 41 will be enough to prevent release of the latches, but we prefer to under-cut the hooks 41 a little to insure an even better hold so as to reduce the likelihood of any accidental release of the latches. Should the latches be released nevertheless, the pads 13 are arranged so that they will strike the spreader bar and limit angular movement of the bell-cranks so that latches 42 cannot rise to a position above the upper ends of the cam surfaces 56 on the hooks, which serve to guide the latches into locking relationship to the hooks when the spreader bar comes to rest on top of a roll.

In conclusion, the generally triangular shaped opening 32 in the lifting bale 31 is wide enough at the top to accommodate the widest fork on a fork lift truck, and where the fork is narrower than the opening, as shown at 33 for example in FIG. 1, it is important to have two plates 53 adjustable toward and away from one another on opposite sides of the opening to center the narrower fork 33 properly with respect to the opening 32, so that the lifting grab 11 will be on a true center line with respect to the roll being lifted and the pads 13 will accordingly be given the same pressure on opposite sides of the roll. These plates have longitudinally extending slots 54 provided therein through which clamping screws 55 threaded in holes in the bale 31 extend to clamp the plates 53 in adjusted position.

In operation, latches 42 lock the bell-cranks 24 in open position, as shown in FIGS. 1 and 5, so that the lifting grab 11 can be applied much more easily to and later removed from the upper end of a roll 12. The lifting grab is maneuvered into place over the top of the roll with the bell-cranks locked open in this manner, so that it can be lowered onto the upper end of the roll without any interference from the pads 13. Then the operator releases the latches 42 and everything is in readiness for the lifting operation as the pads 13 will, of course, close on the end of the roll from opposite sides as the bell-cranks 24 are swung about their pivots 25 in the initial upward movement of the bale 31. The pads 13, by virtue of the all-over roughness on the inner faces 14, take a good hold on the roll 12 and enable lifting the roll without damage to the paper, and the approximate 3 to 1 leverage ratio afforded by the bell-cranks 24 is just right in that the pads 13 are urged inwardly with enough pressure to lift the roll but not enough to damage it. When the roll has been transferred to the new location and set down it is sufficient for the releasing of the pads 13 from the roll to lower the bale 31 enough to cause the bell-cranks 24 to swing downwardly and thus release the pads 13 and at the same time lock the latches 42 on the hooks 41, so that when the bale 31 is raised again the pads 13 will move free of the roll. The cam surfaces 56 on the top of the hooks 41 help to guide the latches 42 into locking position against action of the springs 44 as the actuating arms 27 of bell-cranks 24 are lowered. To facilitate adjustment of the spreader bar we may utilize remotely controllable power operable hydraulic piston and cylinder means of remotely controllable electric motor operable screw and nut means in lieu of the manually adjustable means shown.

While we have described our invention as applied to the lifting of large, heavy paper rolls from a position standing on end, it should of course be understood that our invention is not to be regarded as limited to that specific application, as it is, of course, apparent that cylindrical objects of various kinds could be handled in a similar fashion, and, so far as the shape of the article to be lifted is concerned, we believe it is apparent that the lifting grab with different shaped grab pads 13 can be used on different shaped objects having rounded or flat sides or even concave sides.

It is believed the foregoing description conveys a good understanding of the objects and advantages of our invention. The appended claims have been drawn to cover all legitimate modifications and adaptations.

We claim:

1. A lifting device comprising, in combination, a substantially horizontal elongated spreader bar, a pair of bell-crank levers pivotally connected to the opposite ends thereof, each having a substantially vertical clamp portion at one end and a substantially horizontal actuating portion at the other end, grab pads mounted on the clamp portions for engagement with diametrically opposite sides

of an object to be lifted, the actuating portions of said levers extending substantially horizontally inwardly toward each other over opposite ends of said spreader bar, a lifting bale above and in spaced relation to said actuating portions and adapted to be lifted, and a pair of upright links pivotally connected at their lower ends to the inner ends of said actuating portions pivotally connected at their upper ends to the lifting bale.

2. A lifting device as set forth in claim 1 wherein the spreader bar includes means whereby the same may be changed in length to span different widths of objects to be lifted, the bell-crank levers being thereby spread farther apart or brought closer together but otherwise retaining their same relationship to the spreader bar, the links being connectable to the lifting bale in farther apart or closer together relationship accordingly as the bell-crank levers are disposed farther apart or closer together.

3. A lifting device as set forth in claim 1 including means for releasably locking said bell-crank levers to the spreader bar in open position.

4. A lifting device as set forth in claim 1 including means for releasably locking said bell-crank levers to the spreader bar in open position, and remotely controllable means for releasing said locking means.

5. A lifting device as set forth in claim 1 including means for releasably locking said bell-crank levers to the spreader bar in open position, said means comprising latches pivotally mounted on said bell-crank levers and engageable with hooks provided on said spreader bar, said latches normally swinging in one direction toward locking engagement with said hooks but being operable under manual control in the opposite direction.

6. A lifting device as set forth in claim 1 including means for releasably locking said bell-crank levers to the spreader bar in open position, said means comprising latches pivotally mounted on said bell-crank levers and engageable with hooks provided on said spreader bar, said latches normally swinging in one direction toward locking engagement with said hooks but being operable under manual control in the opposite direction by means of a pull-cord for remote control of said latches.

7. A lifting device as set forth in claim 1 including means for releasably locking said bell-crank levers to the spreader bar in open position, said means comprising latches pivotally mounted on said bell-crank levers and engageable with hooks provided on said spreader bar, said latches normally swinging in one direction toward locking engagement with said hooks but being operable under manual control in the opposite direction by means of plungers movable by means of solenoids that are manually controlled as to energization from a remote point in relation to said solenoids.

8. A lifting device as set forth in claim 1 including means for releasably locking said bell-crank levers to the spreader bar in open position, said means comprising latches pivotally mounted on said bell-crank levers and engageable with hooks provided on said spreader bar, said latches normally swinging in one direction toward locking engagement with said hooks but being operable under manual control in the opposite direction, the hooks having inclined cam surfaces provided thereon so arranged with respect to the latches to guide the latches toward locking engagement with the hooks in downward swinging movement of said bell-crank levers relative to said spreader bar.

9. A lifting device as set forth in claim 1 wherein the grab pads are arcuate in horizontal section to conform to the curvature of an object to be clamped thereby and lifted, said pads being of flexible resilient material and the arc of curvature being of a mean radius between the two extremes of radius of curved objects to be engaged by the pads and lifted thereby, whereby objects in the upper range of diameters cause the pads to be flexed to larger radius for all-over contact with the objects to be engaged and lifted, said pads remaining substantially

unchanged in curvature when engaging objects in the lower range of diameters.

10. A lifting device as set forth in claim 1 wherein the grab pads are arcuate in horizontal section to conform to the curvature of an object to be clamped thereby and lifted, said pads being of flexible resilient material and the arc of curvature being of a mean radius between the two extremes of radius of curved objects to be engaged by the pads and lifted thereby, whereby objects in the upper range of diameters cause the pads to be flexed to larger radius for allover contact with the objects to be engaged and lifted, said pads remaining substantially unchanged in curvature when engaging objects in the lower range of diameters, the grab pads having on their inner surfaces an allover shallow depth of roughness whereby to reduce likelihood of damage to the object being engaged and lifted while at the same time insuring a good hold on the object.

11. A lifting device as set forth in claim 1 especially adapted for the lifting of cylindrical rolls of paper by engagement of the grab pads on diametrically opposite sides of the upper end thereof, wherein the leverage ratio afforded by the bell-crank levers is approximately 3 to 1.

12. A lifting device as set forth in claim 1 wherein the lifting bale has a horizontally elongated opening provided therein at the middle thereof adapted to receive the fork of a fork lift truck for lifting the bale, the bale having plates adjustable thereon inwardly toward each other from opposite ends of said opening and having means for securing the same in adjusted relationship to one another.

13. A lifting device as set forth in claim 12 wherein the bale has a notch provided in the middle of the top of the elongated opening adapted to receive the hook of a crane for lifting the bale.

14. A lifting device as set forth in claim 1 wherein the spreader bar comprises two elongated relatively slidable telescoping members, the outer one of which has a transverse hole provided therein receiving a locking pin, the inner one having a plurality of longitudinally spaced holes provided therein, any one of which is adapted to register with the hole in the outer member and receive the pin to lock said spreader bar in a given adjustment.

15. A lifting device as set forth in claim 14 wherein the holes in the inner member are evenly spaced a predetermined distance apart, and the outer member has a second pin receiving hole provided therein spaced longitudinally with respect to the first mentioned hole differently than the space between the holes in the inner member.

16. A lifting device as set forth in claim 1 especially adapted for the lifting of cylindrical rolls of paper by engagement of the grab pads on diametrically opposite sides of the upper end thereof, wherein the leverage ratio afforded by the bell-crank levers is approximately 3 to 1, and wherein the grab pads are arcuate in horizontal section to conform to the curvature of a roll to be clamped thereby and lifted, said pads being of flexible resilient material and the arc of curvature being of a mean radius between the two extremes of radius of rolls to be engaged by the pads and lifted thereby, whereby rolls in the upper range of diameters cause the pads to be flexed to larger radius for allover contact with the rolls to be engaged and lifted, said pads remaining substantially unchanged in curvature when engaging rolls in the lower range of diameters.

17. A lifting device as set forth in claim 1 especially adapted for the lifting of cylindrical rolls of paper by engagement of the grab pads on diametrically opposite sides of the upper end thereof, wherein the leverage ratio afforded by the bell-crank levers is approximately 3 to 1 and wherein the grab pads are arcuate in horizontal section to conform to the curvature of a roll to be clamped thereby and lifted, said pads being of flexible resilient material and the arc of curvature being of a mean radius between the two extremes of radius of rolls to be engaged

by the pads and lifted thereby, whereby rolls in the upper range of diameters cause the pads to be flexed to larger radius for allover contact with the rolls to be engaged and lifted, said pads remaining substantially unchanged in curvature when engaging rolls in the lower range of diameters, the grab pads having on their inner surfaces an allover shallow depth of roughness whereby to reduce likelihood of damage to the roll being engaged and lifted while at the same time insuring a good hold on the roll.

18. A lifting device as set forth in claim **1** including means for releasably locking said bell-crank levers to the spreader bar in open position, said means comprising latches pivotally mounted on said bell-crank levers and engageable with hooks provided on said spreader bar, said latches normally swinging in one direction toward locking engagement with said hooks but being operable under manual control in the opposite direction, the device including lateral projections on said bell-crank levers which by abutment with objects when the lifting grab is swinging freely before or after a lifting operation serve to protect the latches and hooks from damage by violent contact with such objects.

19. A lifting device as set forth in claim **1** including means for releasably locking said bell-crank levers to the spreader bar in open position, said means comprising latches pivotally mounted on said bell-crank levers and engageable with hooks provided on said spreader bar, said latches normally swinging in one direction toward locking engagement with said hooks but being operable under manual control in the opposite direction, the inter-engagement of the latches and hooks involving a semi-positive locking action so as to reduce likelihood of accidental manual release of the latches.

20. A lifting device as set forth in claim **1** including means for releasably locking said bell-crank levers to the spreader bar in open position, said means comprising latches pivotally mounted on said bell-crank levers and engageable with hooks provided on said spreader bar, said latches normally swinging in one direction toward locking engagement with said hooks but being operable under manual control in the opposite direction, the hooks having inclined cam surfaces provided thereon so arranged with respect to the latches to guide the latches toward locking engagement with the hooks in downward swinging movement of said bell-crank levers relative to said spreader bar, the device also including means limiting the pivotal movement of said grab pads relative to said bell-crank levers, whereby, when said lifting grab is swinging freely, if the latches are accidentally released, the pads limit the upward swing of the bell-crank levers by abutment with the spreader bar so as to prevent movement of the latches upwardly beyond the upper ends of said cam surfaces.

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