March 29, 1966 J. E. GUTRIDGE 3,243,224

LIFTING SLING FOR SEMI-TRAILERS AND DEMOUNTABLE COUNTAINERS

Filed May 28, 1964 3 Sheets-Sheet 1

FIG. 1.

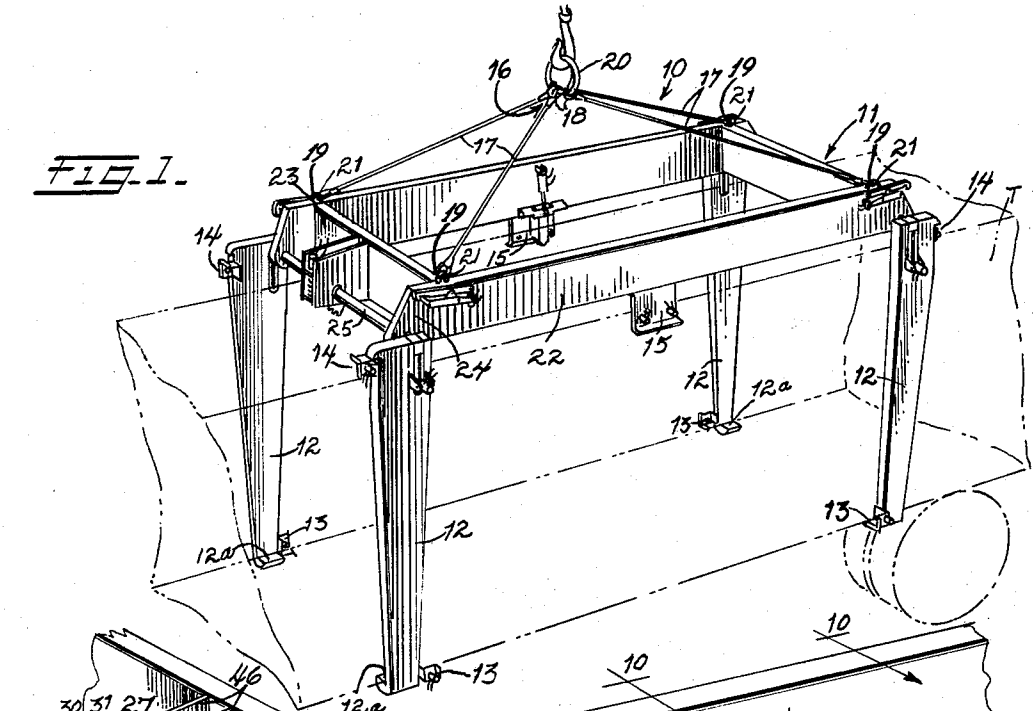
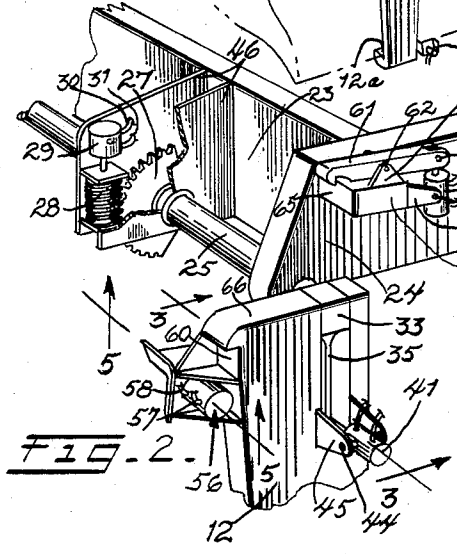
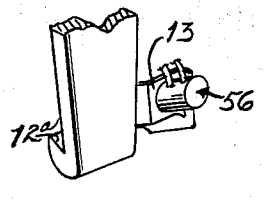


FIG. 2.





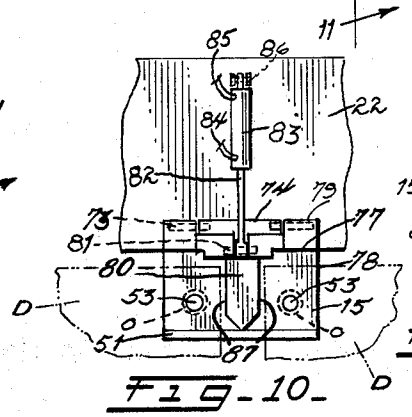


FIG. 10.

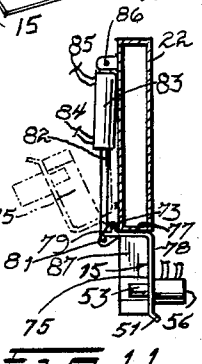


FIG. 11.

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March 29, 1966 J. E. GUTRIDGE 3,243,224

LIFTING SLING FOR SEMI-TRAILERS AND DEMOUNTABLE COUNTAINERS

Filed May 28, 1964 3 Sheets-Sheet 2

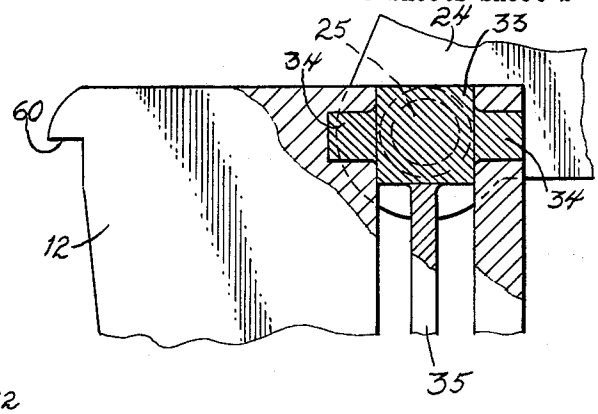


Fig. 4.

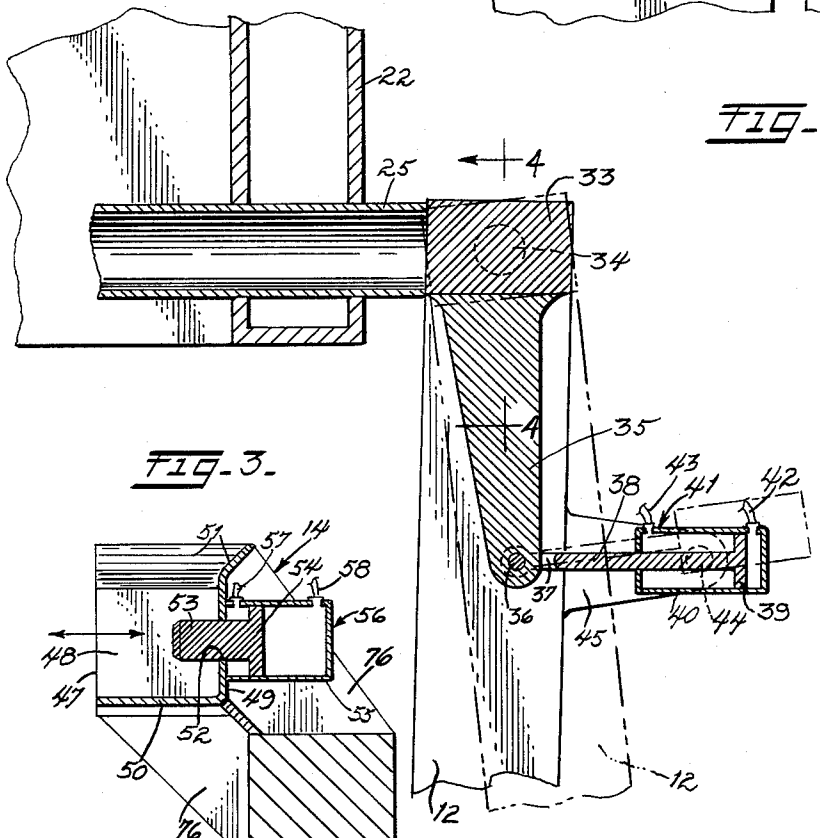


Fig. 3.

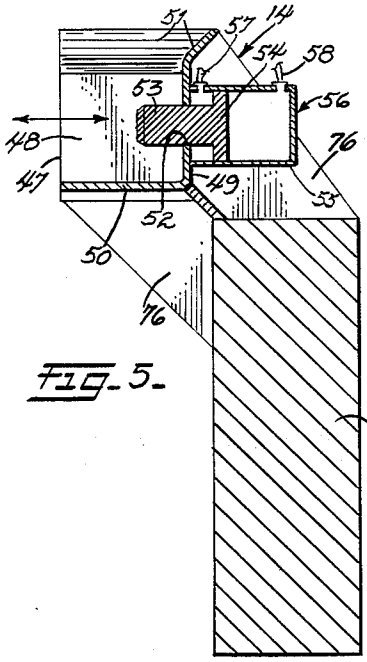


Fig. 5.

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LIFTING SLING FOR SEMI-TRAILERS AND DEMOUNTABLE COUNTAINERS

Filed May 28, 1964 3 Sheets-Sheet 3

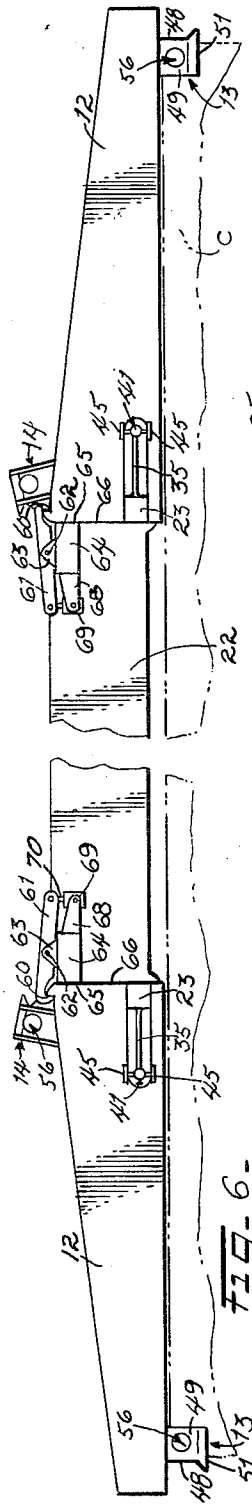


FIG. 6.

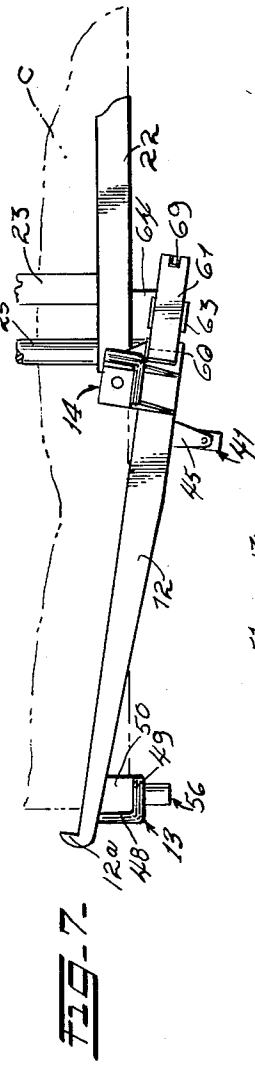


FIG. 7.

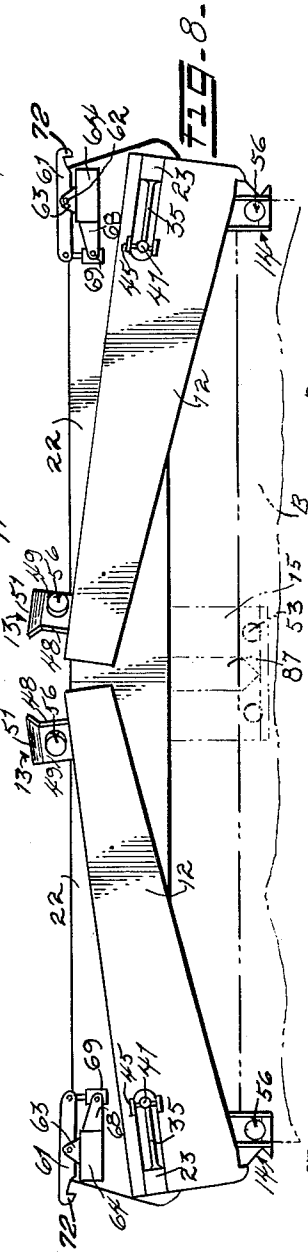


FIG. 8.

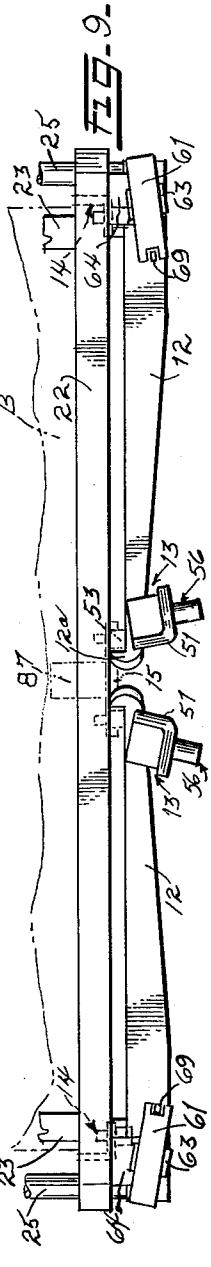


FIG. 9.

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LIFTING SLING FOR SEMI-TRAILERS AND DEMOUNTABLE CONTAINERS

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5 Claims. (Cl. 294—67)

The present invention relates to lifting slings for moving semi-trailers and demountable containers to and from railway cars and more particularly to a lifting arrangement which is equipped to move semi-trailers and containers of different sizes without requiring the manual attachment or detachment of lifting accessories on the sling structure.

Heretofore, lifting slings of the type above described, adapted to be used in the lifting of either trailers or containers, have required modification in order to render these slings suitable for the particular type of equipment being moved. Moreover, even when different length containers have been moved with the prior equipment, modifications and accessories were required to adapt the sling for use therewith.

It is an object of the present invention to provide a lifting sling arrangement which obviates the difficulties encountered heretofore.

It is a further object to provide a lifting sling arrangement for use in moving semi-trailers and demountable containers to and from a railway car which includes means permanently attached to the sling and which are operative to lift selectively a semi-trailer or a container of different lengths.

It is a further object of the invention to provide a lifting sling arrangement for semi-trailers and demountable containers which is of simple construction and economical to manufacture.

Further object and features will hereinafter appear.

In the drawings:

FIG. 1 is a perspective view of the sling arrangement of the present invention shown with the lifting components adaptable to move a semi-trailer;

FIG. 2 is a fragmentary perspective view of one corner of the lifting sling arrangement showing in particular the means for operating the grapple arms;

FIG. 3 is a cross-sectional view taken through the lifting arm connection, taken generally along the lines 3—3 of FIG. 2;

FIG. 4 is a fragmentary cross-sectional view taken generally along the lines 4—4 of FIG. 3;

FIG. 5 is a cross-sectional view through the corner engaging link and taken generally along the lines 5—5 of FIG. 2;

FIG. 6 is a fragmentary front elevational view showing the components of the lifting sling in position operative to lift a corner of predetermined length;

FIG. 7 is a fragmentary top elevational view of one end of the lifting sling arrangement shown in FIG. 6;

FIG. 8 is a front elevational view showing the disposition of the components of the lifting sling in position for elevating a container of a lesser increment of length than that shown in FIGS. 6 and 7;

FIG. 9 is a fragmentary top elevational view of the arrangement shown in FIG. 8;

FIG. 10 is an enlarged fragmentary view taken in the center of the lifting crane and taken generally along the lines of 10—10 of FIG. 2 and showing in particular the link arrangement for simultaneously lifting two containers which are of nominal length about one-half the nominal length of container shown in FIGS. 8 and 9; and

FIG. 11 is a cross-sectional view taken generally along the lines 11—11 of FIG. 2.

Referring now to the drawings, the lifting sling arrangement 10 of the present invention comprises essentially a rectangular frame 11 having grappling arms 12 movably attached thereto at the corners for movement between a downwardly depending vertical position and a horizontal position, and positions extending downwardly and inwardly of the rectangular frame 11. Fixed to the grappling arms 12 adjacent the iner and outer ends thereof are container corner engaging plunger assemblies 13 and 14 of which the container plunger assemblies 13 are adapted to engage the corners of a predetermined large length container C and the corner plunger assemblies 14 are adapted to engage a container B of a length which is an increment of the larger size container C. Fixed to the rectangular frame 11 intermediate the ends thereof are a pair of side by said paired corner plunger assemblies 15 which are adapted to engage the inner end of two containers D which are concurrently lifted by the rectangular frame 11. Fixed or attached to the rectangular frame 11 is a suspension means 16 adapted to be connected to the hook of a crane or the like which may be employed to provide the motivating force for lifting the frame 11 and the semi-trailer or container carried thereby as more fully to be explained hereinafter.

The suspension means 16 comprises essentially a plurality of cables 17 of which each is formed at each of the ends thereof with loops 18 and 19. The loops 18 are connected by means of a ring 20 which is adapted to be engaged by a hook extending from the end of a crane cable. The loops 19 are connected to the respective corners of the rectangular frame 11 by means of U-bolts 21 or the like which fasten to the frame.

The rectangular frame 11 is formed of sides 22 and ends 23, each of which may be formed of hollow construction as shown in particular in FIGS. 3 and 11. The hollow construction employing plate members to form the sides and end 22 and 23 lightens or reduces the weight of the frame. The end member 23 is disposed inwardly of the terminal ends of the sides 22 (as shown) so as to provide a space defined by the projecting end portions 24 for accommodating the operating mechanism for the grapple arms 12.

As shown in particular in FIGS. 2 to 4, the grapple arms 12 are mounted at their upper ends for turning movement transverse and parallel to the sides 22. To this end, a rock shaft 25 is turnably mounted in the projecting ends 24. Fixed intermediate the ends of the rock shaft 25 is a sector gear 27 which meshes with a worm drive 28. The worm drive 28 is actuated by way of a suitable hydraulic motor 29 of more or less standard construction and which is connected to a suitable hydraulic source (not shown) by means of hydraulic lines 30 and 31. The hydraulic motor 29 is suitably actuated by means of a control system (not shown) which may be located in the cab of the crane for operating the other hydraulic means hereinafter to be described.

The terminal ends of the rock shaft 25 extending outwardly of the sides 22 is formed with a rectangular end 33 from the transverse side of which there project pintles 34—34. Extending downwardly from the lower face of the rectangular end 33 is a pivot arm 35 to the lower end of which there is connected by means of a pivot pin 36 the bifurcated end 37 of a piston rod 38 fixed at it other end to a piston head 39. The piston head 39 is slidable within a hydraulic fluid filled cylinder 40 of a two way hydraulic valve unit 41. Fluid is introduced into and out of the cylinder 40 by means of hydraulic lines 42 and 43 which are also associated with the control system located in the cab of the crane (not shown).

As shown, the cylinder 40 is pivotally supported by means of pivot pins 44, each of which is fixed at its

inner end to the body of the cylinder and at its outer end to brackets 45 which are fixed for movement with the grapple arm 12. From the foregoing, it should be readily apparent that upon the selective introduction of hydraulic fluid into and out of the cylinder 40 of the two way hydraulic piston unit 41, the piston 39 is moved whereby the piston rod end 37 fixed to the pivot arm 35 causes the grapple arm 12 to rock about the pintles 34—34 inwardly and outwardly relative to the side frame members 22. This movement of the grapple arms 12 is usually employed for the purpose of lifting semi-trailers.

As shown in FIG. 1, to lift a semi-trailer the grapple arms 12 are arranged to depend substantially vertically downwardly from the frame 11. In this position the lower grapple ends 12*a* underlie the bottom of the semi-trailer so that the latter is capable of being lifted. It should be mentioned that while FIG. 1 shows the paired corner plunger assemblies 15 in the operative position for carrying two containers, the plunger assemblies 15 normally occupy the stored position shown in phantom in FIG. 11 when a semi-trailer is lifted.

As above described, upon actuation of the motor unit 29 the drive or worm drive 28 is operative to turn the sector gear 27 and thereby the rock shaft 25 fixed thereto. In this connection it is also to be noted that the worm and drive arrangement may be enclosed by a pair of lengthwise spaced side plates 46 which also serve to support the rock shaft 25. Thus, upon actuation of the worm-gear drive 27, 28, the grapple arms 12 in each end of the frame 11 are movable about a pivot axis transverse to the sides 22. The grapple arms 12 upon actuation of the screw drive in one direction operative to be extended outwardly of the end frame 23 in more or less of a cantilever fashion as shown, for example, in FIGS. 6 and 7. In this position each of the grappling arms 12 are arranged so that the container plunger assemblies 13 attached to the outer ends thereof are adapted to be engaged with the respective outer corner ends of a container C for lifting the same to a railway car in a more or less conventional manner. The container plunger assemblies 13 and 14 are each of substantially identical structure and of which the typical construction is shown in particular in FIGS. 2 and 5, comprising essentially a preformed right angularly bent plate member 47 forming sides 48 and 49 adapted to engage the end and side walls of the container C respectively. Across the upper edges of the sides and end walls there may be formed a top cover plate 50 which is adapted to lie over the top of the container. Flaring outwardly from the bottom of the side and ends of the plate member 47 are guiding webs 51 which serve to guide the frame 11 over the ends of the container as the latter is being brought in alignment therewith.

Extending through an opening 52 in the side wall 49 is a plunger 53 formed at the outer end of a piston head 54 which is reciprocal within a cylinder 55 of a hydraulic two way piston rod 56 which is connected to a suitable source of hydraulic fluid by inlet and outlet lines 57 and 58 upon operation of the control in the crane cab (not shown). Upon extension of the plunger 53 inwardly into the confines of the enclosure 59 defined by the sides 48, 49 and cover plate 50 of the container plunger 13, the plunger 53 is adapted to be seated within an opening conventionally found adjacent the corner of a container. Thus, in the event each of the plungers 53 is extended to engage the container openings at the corners of the container C whereby the latter is firmly gripped so that the frame 11 and the crane associated therewith is capable of lifting or moving the container C supported thereby.

As shown, in order to align the container plunger assemblies 13—13 with each of the corners of the container C, the grapple hooks 12 are each inclined inwardly relative to the vertical plane of the sides 22 as shown in particular in FIG. 7. Such inclination of the grapple arms 12 is accomplished by actuation of the hydraulic valve unit 41 associated with the pivot arm 35 to rock the grapple arms 12 about the pintles 34—34 extending from the rectangular end 33 of the rock shaft 25, as above described.

In the extended position of the grapple arms 12, the latter forms more or less a cantilever beam. In order to maintain the grapple arms 12 rigid with the respective side members 22, there is provided adjacent the upper end thereof an upstanding ledge 60. Coacting with the upstanding ledge 60 is a latch member 61 which is pivotally connected intermediate its ends by means of a pin 62 supported in trunnion brackets 63 projecting upwardly from a stop block 64 fixed to the outer face of the sides 22. The stop block 64 is formed with a vertical face 65 adapted to abut the upper end 66 of the arm 12. Connected to the inboard face of the stop block 64 are a pair of trunnion brackets 68 on which there is pivotally mounted by means of a pivot pin 67 a two-way hydraulic piston unit 69 having a piston rod 70 connected to the outer end of the latch member 61 by means of a pivot pin 71. Actuation of the two-way hydraulic piston unit 69 is operative to elevate or retract the piston rod 70 whereby the latch 61 is turned about the pivot pin 62 thereby to engage or disengage the latch lip 72 from engagement with the upstanding ledge 60 on the grappling arm 12.

Turning now in particular to FIGS. 8 and 9, there is shown another position of the grappling arm 12 in which the sling 10 is operative to raise or move a container B of a predetermined or lesser length than the container C shown in FIGS. 6 and 7. As is well known, the containers in accordance with present practise are now manufactured in standardized nominal sizes as for example, 40, 20, 10 and 5 foot long containers. Each of these containers B, as in the previously described container C, is provided with indexing opening means which is located adjacent the corner of the container for the purpose of either locating, mounting or lifting the container into the various locations and positions demanded of the latter during transport of the same in the various modes of transportation. To this end it is possible to locate the plunger assemblies 13 and 14 relatively to each other so as to accommodate the varied standardized lengths of the containers. As shown, the plunger assemblies 14 accommodating the container B shown in FIGS. 8 and 9 are located adjacent the upper or inner end of each of the bracket arms or grappling arms 12. The bracket or corner plunger assemblies 14 are substantially identical in construction to the corner plunger assemblies 13, differing therefrom only in the mode of attachment to the arm. The attachment is accomplished by a plurality of webs 76 which are disposed and fixed along one edge to the sides and ends of 48 and 49 of the plate member 47.

As shown, the grappling arms 12 are brought inwardly to overlie the respective side members 22 of the frame 11. The grappling arms 12 are turned about the pintles 34—34 and the rock shaft 25 as heretofore described until they assume the positions shown in FIGS. 8 and 9 in which positions the corner plunger assemblies 14 are adapted to be disposed with sides and ends 48 and 49 overlying the side and end walls of the container B. Thereafter the plunger 53 is extended through the opening 52 and enters the opening O in the side of the container and thereby to retain the latter attached to the lifting frame 11 for movement therewith upon operation of the crane.

Turning now to FIGS. 10 and 11, there is shown an arrangement whereby two containers D, each being one-half the nominal length of the container B, may be concurrently carried by the lifting sling 10. To this end there is provided a pair or dual corner plunger assemblies 15 disposed intermediate the ends of the sides 22. As shown, the corner plunger assemblies 15 are pivotally attached to the respective inner walls of the side frames 22 by means of a pivot pin 73 which is mounted in a pair of hinge leaves 74 fixed to the inner side of the side 22.

The corner plunger assemblies 15 comprise essentially a preformed plate 75 having a web 77 arranged at right angles to a web 78 adapted to engage the side of the container D in the operative position shown in FIG. 10. Extending from the web 77 is a leaf 79 which receives the pivot pin 73 mounting the plate 75 for turning movement on the pin 73. Disposed intermediate the ends of the plate 75 is a spacer member 80 which as is shown comprises essentially a rectilinear block fixed at one end to the web 77 and terminating at its free end in a V notch. The width of the spacer member or block 80 is arranged so as to maintain the two containers D—D spaced a predetermined distance apart as shown in phantom in FIG. 10.

Connected to the plates 75 of each of the dual corner plunger assemblies 15 adjacent the inner edge of the web 77 by means of a pin 81 is one end of an actuating rod 82 of which the other end is connected to a suitable hydraulic piston unit 83 which is pivotally mounted on the inner face of the side 22 by means of a pin 86. Upon selective energization through the hydraulic inlet and outlet lines 84 and 85 the respective rods 82 are retracted and extended to thereby pivot the dual corner plunger assemblies 15 about the pin 73 between the rest or inoperative position shown in phantom lines on FIG. 11. In the rest position the assemblies 15 are disposed out of engagement with the container or semi-trailer carried thereby in the other operative position of the corner plunger assemblies 13 and 14.

To release the corner assemblies 15 to operative position, each of the piston units 83 is energized so that the rod 82 disposes the dual plunger assembly 15 with the web 77 in underlying engagement with the bottom edge of the side 22 as shown in full lines in FIG. 11. In this position, one side 87 of the spacer member 80 is cooperative with one of the webs 48 on the corner bracket 14 to engage the opposing end or opposite ends of the containers therebetween while the other webs 78 of the assemblies 15 and the web 49 of the assemblies 14 engage the respective sides of the container D. As shown mounted on the outer face of each of the webs 78 are two-way hydraulic piston units 56 identical to the units mounted on the plunger assemblies 13 and 14. Upon actuation of the plungers 53 to an extended position it enters the opening O in the side of the container as heretofore described in connection with the operation of plunger assemblies 13 and 14. Thus, the corner plunger assemblies 15 and 14 are operative to concurrently carry two containers on the lifting sling 10.

What is claimed is:

1. Lifting sling comprising a substantially rectangular frame having side members and end members, grappling arms extending from the sides of said frame adjacent the corners thereof, means mounting each of said grappling arms at one end thereof for movement about a first pivot transverse to said side members and a second pivot normal to said first pivot so that said grappling arms are movable to a position extending substantially vertically downwardly from said frame thereby to be capable of lifting a semi-trailer, said grappling arms further being movable between a position extending outwardly of said end members as an extension of said side members and a position extending inwardly from said end members in

overlying relationship with said sides, first and second attachment means spaced lengthwise of said grappling arms for attachment to the corners of a container, said first attachment means in the outwardly extending position of said grappling arms being capable of lifting a container of predetermined length and said second attachment means in the inwardly extending position of said grappling arms being capable of lifting a container of lesser predetermined length than said first mentioned container.

2. The invention as defined in claim 1 comprising means for alutomatically moving said grappling arm mounting means so that said grappling arms are pivoted about said first and second pivots to said vertical position, and said outwardly and inwardly extending positions.

3. The invention as defined in claim 1 wherein said frame includes third attachment means located on said side members intermediate the ends thereof, said third attachment means including means attachable to two adjacent containers so as to be cooperative with said second attachment means for simultaneously lifting two containers.

4. The invention as defined in claim 1 wherein said grappling arm mounting means comprises a transversely extending rock shaft having a rectangular end, said grappling arms include opening means having flatted sides accommodating rectangular end, and wherein said second pivot means includes pintles normal to the longitudinal axis mounting said grappling arm for pivotal movement thereabout.

5. A lifting sling for moving a semi-trailer or a container having corners provided with corner fittings used for lifting containers, said lifting sling comprising a frame, grappling arms extending from said frame, said grappling arms including grappling ends engageable with the underside of a said semi-trailer and first corner engaging means engageable with the corners of a container of predetermined length, said grappling arms including second corner engaging means spaced from said first corner engaging means and being adapted to engage the corner fittings of a container of a different length means mounting said grappling arms for movement about a first pivot means transversely to the longitudinal axis of said frame and a second pivot normal to said first pivot so that said grappling arms are movable to a substantially vertical position extending downwardly from said frame wherein said grappling ends are disposed to engage the underside of said semi-trailer, and to a substantially horizontal position extending outwardly of said frame as an extension thereof wherein said first corner engaging means are engageable with said corners of said container of predetermined length and extending inwardly from said frame wherein said second corner engaging means are engageable with the corners of said container of different length.

References Cited by the Examiner

UNITED STATES PATENTS

3,086,807	4/1963	Russel et al.	294—67
3,161,309	12/1964	Baudhuin et al.	294—67 XR

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