

[54] FREIGHT CONTAINER TRANSFER MECHANISM

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[56] References Cited

UNITED STATES PATENTS

3,523,620	8/1970	Klaus	214/77 R
3,606,044	9/1971	Goldhofer	214/77 R
3,448,874	6/1969	Martinson	214/38 CC
3,552,557	1/1971	Green	214/621

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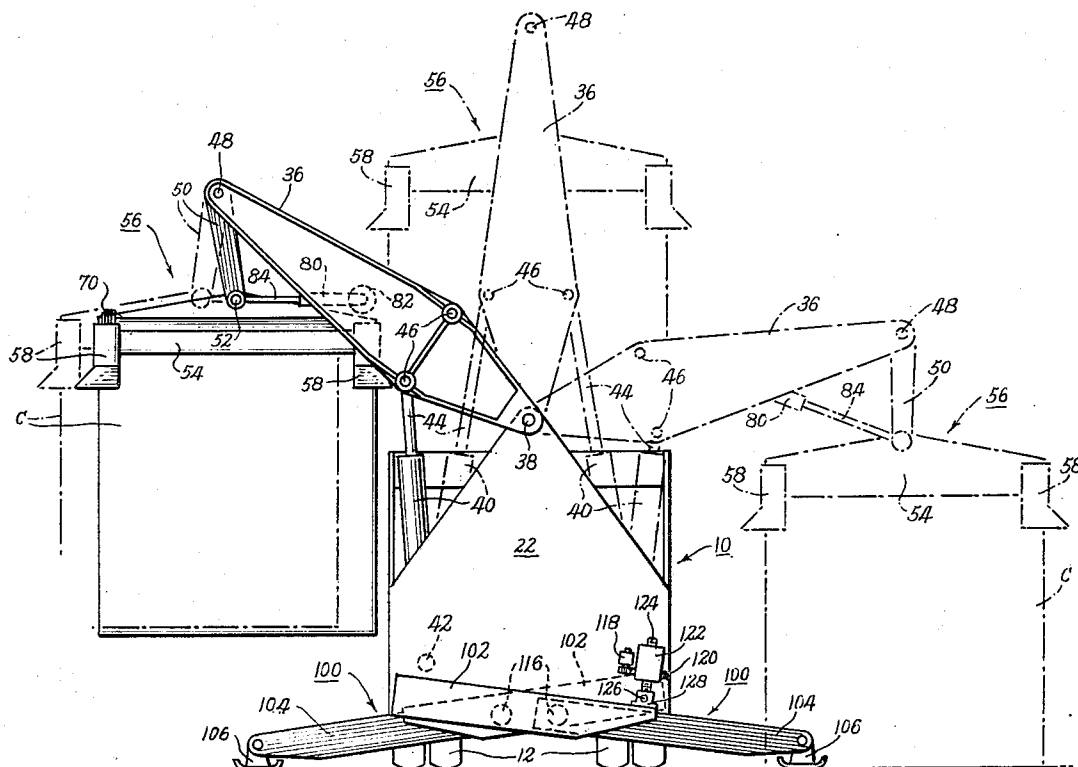
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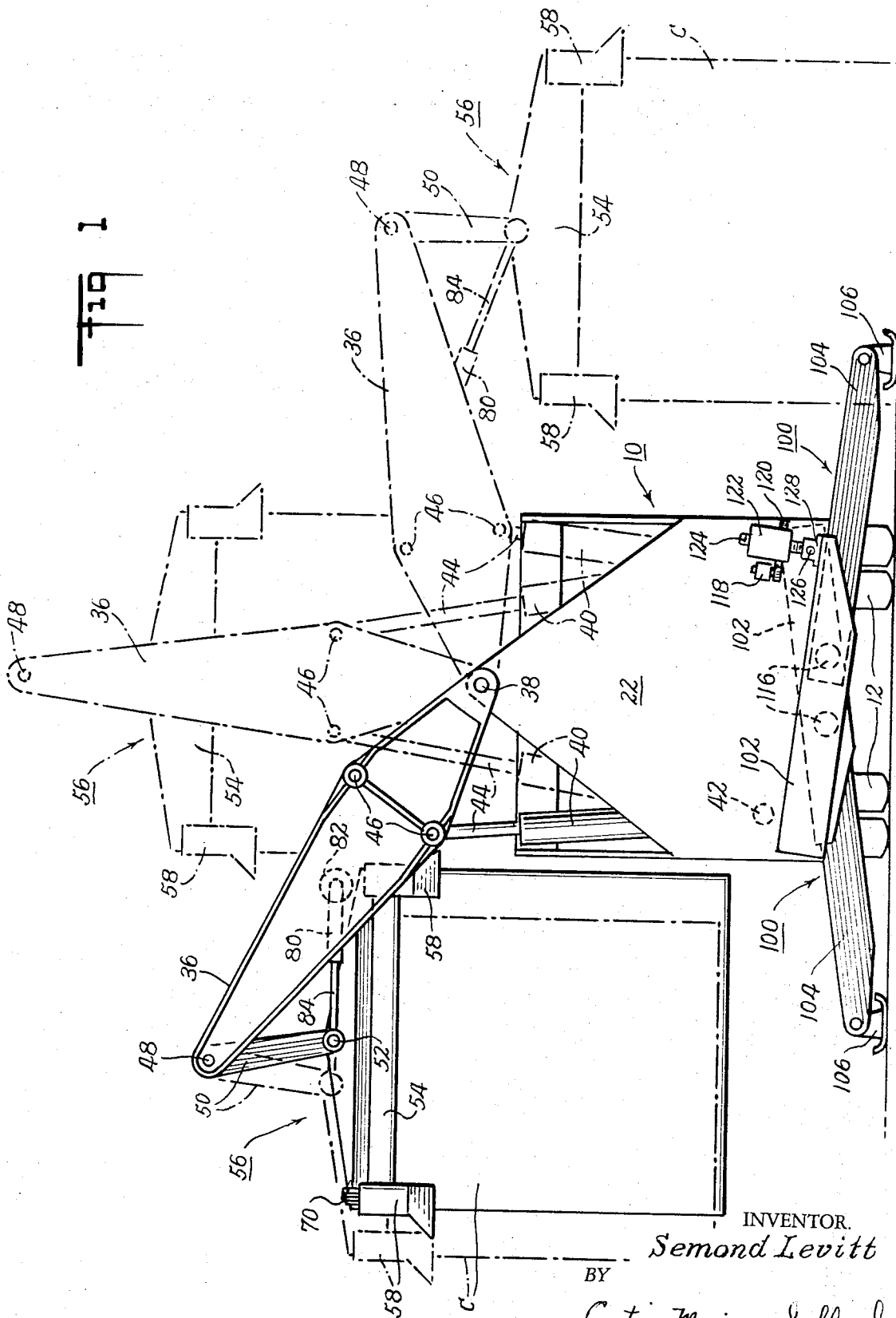
[57] ABSTRACT

Freight container transfer apparatus having a pair of

lifting beams mounted on support assemblies at opposite end portions of an elongated chassis for pivotal movement between opposite sides of the chassis, with spreader assemblies suspended at the outer ends of the beams for engaging the upper corners of a container, and hydraulic cylinders for swinging the beams to lift the chassis off a railroad car, highway trailer or other support (including the ground) at one side of the chassis, move it across the chassis in the space between the support assemblies and deposit it on the other side. One of the support assemblies is movable longitudinally of the chassis to accommodate different lengths of container. Hydraulically actuated stabilizer legs are engageable with the ground at each corner of the chassis to prevent overturning the chassis when the load is supported at one side, the legs being vertically adjustable to compensate for variations in ground level. Flared guide members at each end of the spreader assemblies are engageable with the corners of the container as the spreader assemblies are lowered onto the container to align them automatically with the corners of the container. Hydraulically actuated hanger links are pivotally connected between spreader assemblies and the ends of the beams to allow lateral movement of the spreader assemblies to compensate for greater lateral misalignment of the spreader assemblies with the container. Hydraulically actuated locks are provided for engagement with the corners of the container.

1 Claim, 8 Drawing Figures





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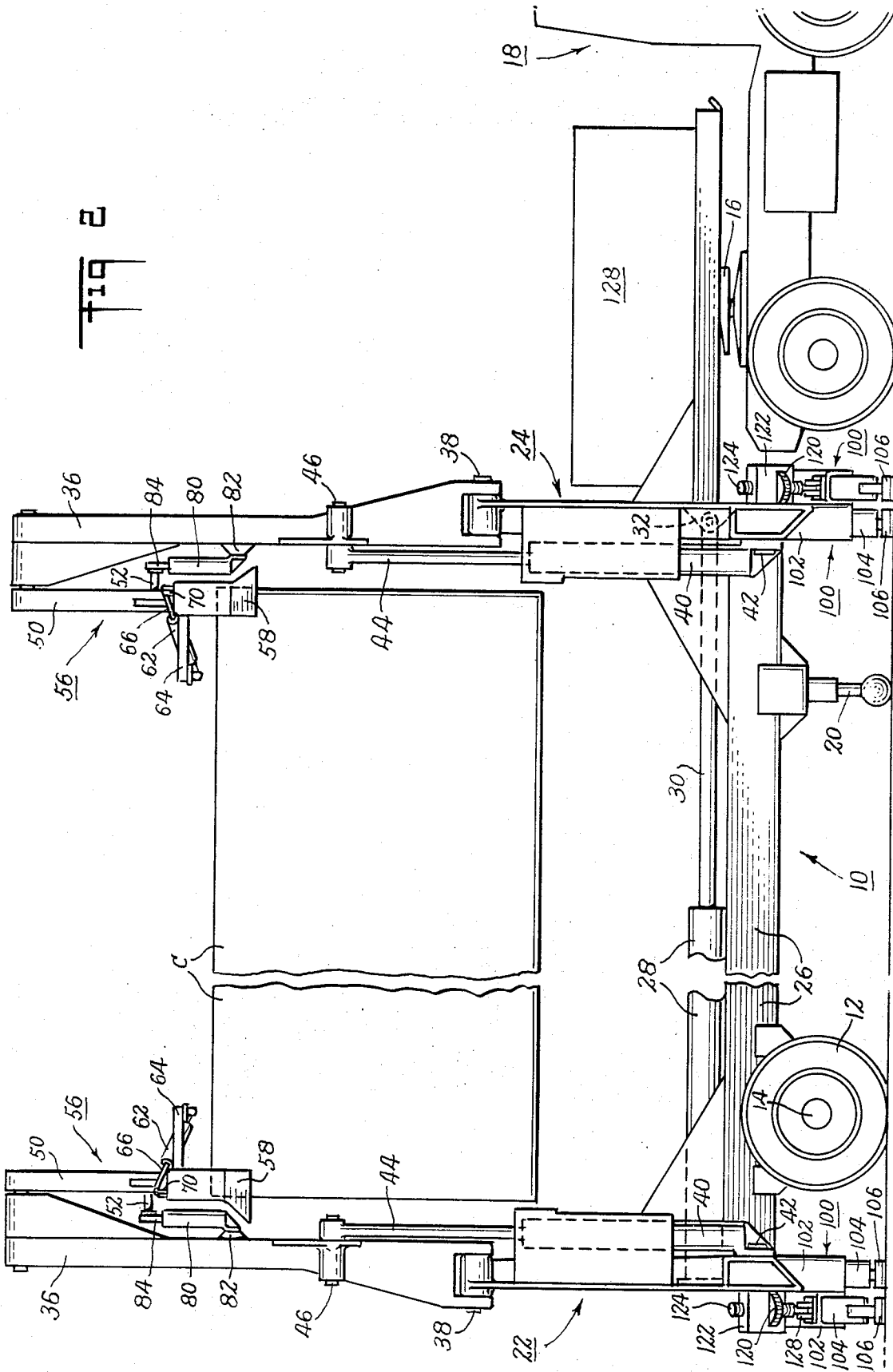
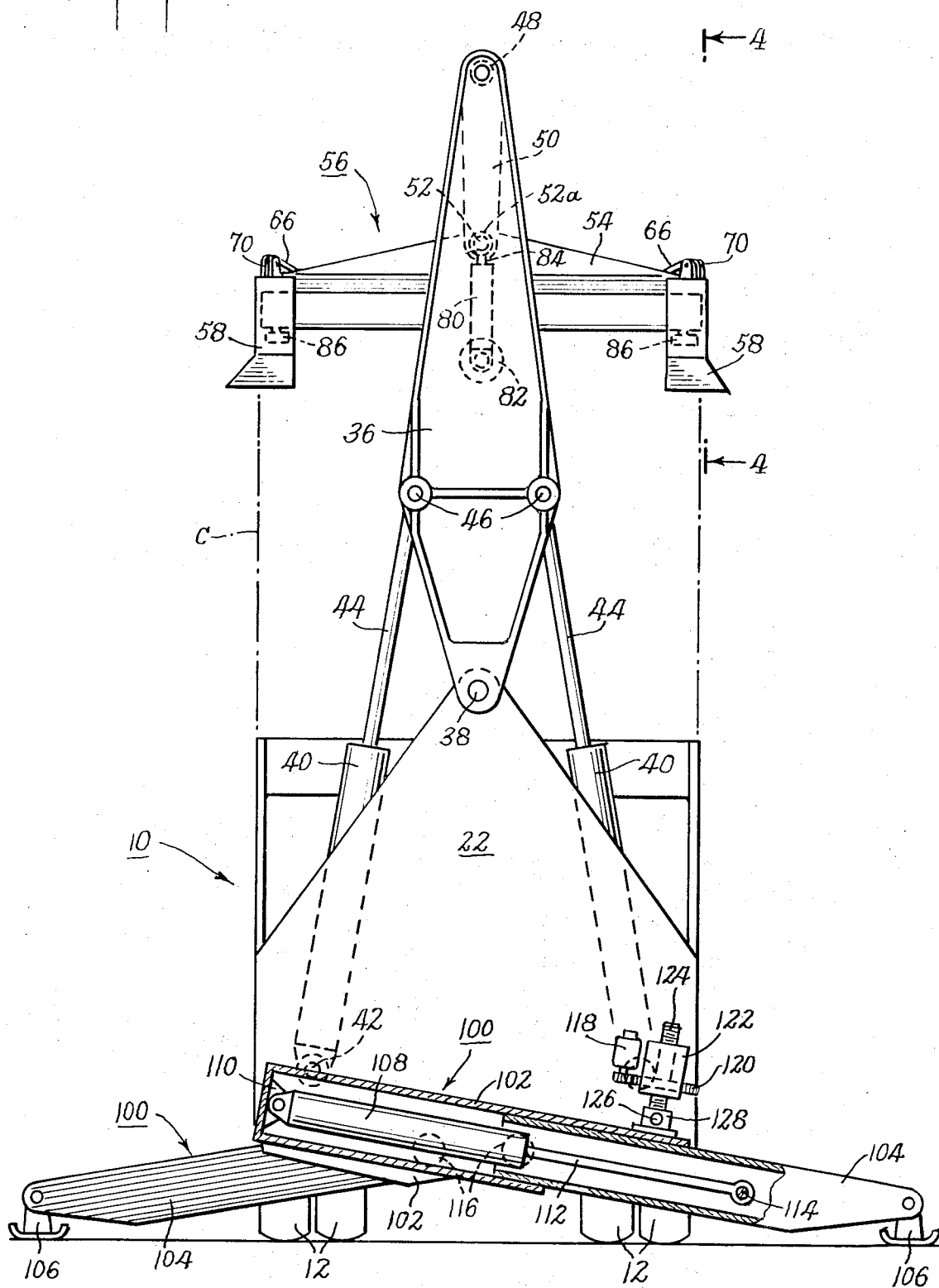


Fig 2

Fig 3



FREIGHT CONTAINER TRANSFER MECHANISM

This invention relates to mechanism for transferring loaded freight containers between various types of carriers or storage means, for example between a rail car and a highway trailer or between either of such carriers and a loading dock or storage platform or ground support.

Heretofore automotive trailers have been available which were provided with lifting means for lifting loaded containers off of rail cars alongside which the trailers were parked and moving them over onto the bed of the trailers for transportation over the road. However, such trailers have generally been capable of lifting loads on only one side of the trailer, and were not adapted for transferring containers from one form of transportation or storage means to another without movement of the trailers with the load thereon. Thus the trailers had to be constructed heavily enough to carry the full load over the road.

It has previously been proposed to provide a transfer mechanism capable of lifting loads on both sides and of transferring them from either side to the other, for example directly from a rail car, a highway trailer, an elevated stationary support or ground support at one side of the mechanism to another such carrier or support means at the other side, to allow the load to be transferred directly from one type of carrier or support to another, without bodily movement of the transfer mechanism while the load is supported thereon, thus permitting the transfer mechanism to be supported on a trailer which is relatively lightweight and inexpensive in construction. However, the apparatus proposed was of limited commercial utility since the hanger means which engaged the container had to be coupled by hand to the container, which involved considerable labor and expense, as well as some hazard in climbing to relatively inaccessible positions.

It is therefore among the objects of the present invention to provide such an apparatus in which there are provided spreader assemblies engageable with the container, with means for aligning the spreaders with the 26 corners of the container despite substantial misalignment of the transfer mechanism with the container.

It is another object to provide remotely controlled means for locking the spreader to the container. Still another object is that of providing such a transfer mechanism having outrigger arms for stabilizing the mechanism against tipping when a heavy load is supported at one side, the arms being vertically adjustable to compensate for variations in ground level at either side.

It is a further object to provide these features in a compact, inexpensive and practical device which is relatively rapid and trouble-free in operation.

In the drawings:

FIG. 1 is a rear and elevational view of an illustrative transfer trailer embodying features of the invention, with the transfer mechanism being shown in full lines engaging a container on an elevated support at one side and in broken lines lifting and transferring the container to ground level at the opposite side.

FIG. 2 is a foreshortened side elevational view of the trailer of FIG. 1.

FIG. 3 is an enlarged rear and elevational view of the trailer with transfer mechanism in its center position.

FIG. 4 is a fragmentary vertical and longitudinal sectional view taken on the line 4—4 of FIG. 3.

FIGS. 5 and 6 are horizontal sectional views taken respectively on the lines 5—5 and 6—6 of FIG. 4.

FIG. 7 is a vertical sectional view taken on the line 7—7 of FIG. 6.

FIG. 8 is a fragmentary and elevational view of a trailer having an alternative sling assembly for engaging the container.

The illustrative trailer shown in FIGS. 1—3 includes a chassis, generally designated 10, with wheels 12 rotatably supported on an axle 14 (FIG. 2) suspended in conventional manner beneath the rear portion of the chassis 10, while its front portion is provided with a king pin (not shown) for pivotally engaging the fifth wheel 16 (Figure 2) of a highway tractor 18 or other towing vehicle. The forward portion of the chassis 10 may also be provided with conventional retractable landing gear 20 which may be extended to provide stationary support for the trailer when it is detached from the tractor 18.

As best shown in FIG. 2, supported on top of the chassis 10 near its forward and rear ends is a pair of similar support assemblies generally designated 22 and 24 which extend vertically upward from the chassis 10, the front support assembly 24 being fixed on the chassis and the rear support assembly 22 being mounted for movement along the longitudinal side rails 26 of the chassis to various positions to accommodate different lengths of container. The rear support assembly 22 is moved longitudinally of the chassis by a hydraulic cylinder 28, the outer end of the casing of which is secured to the rear support assembly 22 and the forward end of the piston rod 30 of which is secured by a bracket 32 to the forward support assembly 24. Alternatively, the cylinder 28 may be eliminated and the movable support assembly 22 (or 24, if desired) may be pulled or pushed to the desired position by the tractor 18 while the brakes on the chassis 10 are locked.

Each of the support assemblies 22 and 24 is generally triangular in transverse shape and has projecting horizontally from each side of its upper apex a heavy pin 38 (FIGS. 1 and 3) on which the forked lower end of a rocker beam 36 is supported for pivotal movement in a transversely extending vertical plane between extreme positions at which the beams extend generally horizontally to the side of the chassis.

Each of the rocker beams 36 is actuated by a pair of hydraulic cylinders 40 which are mounted at opposite sides of the beam, with the lower ends of the casings of the cylinders pivotally attached by pins 42 to the lower corners of the support assembly and with the piston rods 44 of the cylinders pivotally attached by pins 46 to opposite sides of the beam.

As best shown in FIG. 4, the upper end of each of the rocker beams 36 carries a ball 48 which is engaged by a spherical socket at the upper end of a hanger link 50 to provide a universal joint which supports the link 50 for pivoting movement, not only in a transverse plane, but also in a longitudinal plane, as indicated in broken lines in FIG. 4. The lower end of the hanger link 50 is bifurcated and supports a pin 52 having an enlarged ball portion 52a which is positioned between the two legs of the link 50 and is engaged by a spherical socket at the center of the cross arm 54 of a spreader assembly 56 which permits the spreader assembly not only to pivot in a transverse plane but also to move a limited

distance longitudinally of the chassis where necessary to align the spreader assembly with the upper corners of the container C.

To guide the spreader assembly into alignment with the corners of the container as it is lowered onto the container, each end of the cross arm has pivotally attached to it a normally downwardly projecting guide arm 58, the lower portion of which is flared both transversely and longitudinally to engage the upper corner of the container and cam the spreader assembly laterally into proper position on top of the container.

As shown in FIGS. 6 and 7, each of the guide arms 58 is provided at its inner side with a support block 60a supporting a shaft 60 which extends diagonally across one end of the cross arm 54 with the opposite ends of the shaft 60 being rotatably supported in flanges 54a projecting upwardly from the cross arm 54.

When it is desired to pick up or deposit a container in abutment with or in close lateral proximity to an adjacent container or other obstacle, the rock shaft 60 may be rotated to swing the guide arms 58 diagonally outwardly and upwardly to a position shown in broken lines in FIG. 7, where they will not interfere with such adjacent containers and other obstacles as the spreader assembly is lowered. Such movement of each rock shaft 60 and guide arm 58 is accomplished by means of a hydraulic cylinder 62 (FIGS. 6 and 7), the casing of which is secured to a triangular bracket assembly 64 extending inwardly from each end of the cross arm 54, and the piston rod 66 of which is secured by a pin 68 to a bracket 70 which extends upwardly from the top of the guide arm 58.

If the transverse misalignment of the trailer relative to the container is so great that the flared lower ends of both of the guide arms 58 will not clear the corners of the container but one of them instead will engage the flat roof of the container, the spreader assembly may be moved transversely into alignment with the container by means of a hydraulic cylinder 80 whose casing is pivotally attached to a bracket 82 (FIG. 4) on the inner surface of the beam 36 and whose piston rod 84 is pivotally attached to the outwardly projecting end of the pin 52. Supply of fluid under pressure to the cylinder 80 causes transverse pivotal movement of the hanger link 50, as shown in broken lines in FIG. 1, with resulting transverse movement of the spreader assembly 56 into proper alignment with the container.

As shown in FIGS. 4 and 5, pivotally mounted at each end of the cross arm 54 of each of the spreader assemblies 56 is a conventional oblong twist lock 86 which is adapted to enter an oblong slot 88a in the top of the corner casting 88 of the container and then be rotated about a vertical axis through an angle of approximately 90° to lock the corner casting to the spreader assembly for lifting of the container. Each of the twist locks 86 is rotated for engagement and disengagement with the corner castings by a crank arm 90 fixed to its upper end, with the outer end of the crank arm 90 being pivotally attached to one end of a bell crank 92 (FIG. 5) which is pivotally mounted on a pin 94 and whose opposite end is pivotally attached to the outer end of the piston rod 96 of a hydraulic cylinder 98 whose casing is pivotally attached to the cross arm 54.

To brace the trailer against tipping when a heavy load is supported at one side, a pair of stabilizer assemblies, generally designated 100, is provided for each of the support assemblies 22 or 24. As best shown in FIG. 3,

each of these stabilizer assemblies 100 includes a sleeve 102 which extends obliquely across the support assembly and which slidably receives a hollow leg 104 which has pivotally attached to its outer end a foot pad 106. The leg 104 is moved longitudinally of the sleeve 102 by a hydraulic cylinder 108 whose casing is attached to a bracket 110 at the inner end of the sleeve 102 and whose piston rod 112 is connected by a pin 114 to the leg 104. When it is desired to use the transfer mechanism, fluid is supplied under pressure to the cylinders 108 to drive the legs 104 outwardly to the maximum extension permitted by the ground level at the side of the trailer.

Then the stabilizer assemblies are driven downwardly into forcible engagement with the ground, the stabilizer assemblies being pivotally mounted on horizontal stud shafts 116 projecting from the inner sides of the sleeves 102 into a bearing in the support assembly 22 or 24. Each stabilizer assembly is moved in a vertical arc about the pivot 116 by means of a hydraulic motor 118 which drives a nut 120 rotatably supported on a bracket 122 on the support assembly, with a lead screw 124 which is threaded through the nut 120 having at its lower end a transverse pin 126 whose opposite ends loosely engage enlarged openings in a bracket 129 secured to the upper side of the sleeve 102. As will be understood, rotation of the nut 120 by the motor 118 causes raising or lowering of the outer end of the stabilizer assembly. As will also be understood, the telescoping arrangement of the legs 104 assures that, regardless of variations in the ground level, the foot pads 106 will engage the ground at a sufficient distance outwardly from the side of the trailer to provide stability when a fully loaded container is supported at one side of the trailer.

When it is desired to move the trailer to a new position, the motor 118 and the cylinders are driven in the opposite direction to lift the foot pads 106 and to retract the legs 104 against the sides of the trailer.

When it is desired to transfer a container alongside which the trailer has been positioned and stabilized, a manually-actuated valve (not shown) is operated to supply fluid under pressure to the appropriate ends of the dual-acting cylinders 40 and drive their piston rods 44 in such direction as to rock the beams 36 over to lower the spreader assemblies onto the container. Shortly before the beams 36 reach the "dead center" position, at which the piston rods 44 extending from the cylinders 40 on the side of the trailer opposite to that on which the container is located are aligned with the axis of rotation of the beams 36, the beams engage limit switches (not shown) which shut off the supply of pressure fluid to those cylinders, thus preventing them from working in opposition to the cylinders on the side on which the container is located.

When the twist locks 86 have been engaged with the corner castings 68 at all four upper corners of the container and it is desired to lift the container and transfer it to the opposite side of the trailer, the manually operated valve is actuated to supply pressure fluid to the opposite ends of the cylinders 40 on the side of the chassis on which the container is located, rocking each beam 36 in the opposite direction to lift the container and swing it over the top of the chassis between the two support assemblies 22 and 24. Shortly after the beams 36 again pass the "dead center" point for the cylinders 40 on the opposite side, the limit switches are again ac-

tuated to restore the supply of pressure fluid to the latter cylinders, so that they again work in conjunction with the other pair.

The two cylinders 40 on the same side of the trailer may be hydraulically interconnected in parallel, or the control valves may be adjacently positioned for simultaneous operation so that the cylinders normally operate in unison to move and hold rocker beams 36 in mutual alignment and keep the container level at all times. However, a manually operated override "inching" control is provided to allow one end to be raised or lowered slightly independently of the other where necessary to compensate for a non-level support for the trailer or for the container.

The same type of parallel interconnection with manual override is provided for the two cylinders 80 which swing the lower ends of the hanger links 50 toward and away from the trailer. And, of course, all four of the cylinders 98 which actuate the twist locks 86 are connected in parallel for simultaneous operation, as are all four of the cylinders 108 which actuate the stabilizer legs 104, although individual controls are also provided so that any one of these cylinders may be individually actuated. As will be understood, the parallel connection of the four cylinders 108 will automatically equalize the pressure exerted by the four legs 104 and compensate for minor differences in the ground level adjacent the four corners of the chassis.

All of the aforementioned hydraulic circuitry is conventional and therefore need not be shown or described in further detail. The hydraulic pump and most of the hydraulic components are mounted within a protective housing 128 (FIG. 2) on the forward end of the trailer. The manual controls are preferably mounted on this housing 128.

FIG. 8 shows an alternative form of sling-type spreader assembly which is supported on a cable 130 and which includes hooks 132 pivotally mounted at the ends of a cross bar 134 for self-locking tong-like engagement with openings at the sides of the corner castings of the container. The flexible cables allow slight lateral movements of the spreader assemblies, and the bevelled inner faces of the hooks 132 give a self-centering action to compensate for moderate lateral misalignments of the spreader assemblies relative to the container.

I claim:

1. A freight container transfer mechanism comprising an elongated chassis, a support means at each end portion of said chassis, a pair of beams, each pivotally mounted near its lower end on one of said support

means for swinging movement in a vertical plane extending transversely of said chassis so that its upper end may be caused to project laterally from either side of said chassis for a distance at least equal to one-half the width of said container, said beams being spaced apart longitudinally of said chassis a distance exceeding the length of said container, hanger links having their upper ends pivotally supported at the upper ends of said beams for swinging movement transversely and longitudinally of said chassis, a spreader assembly supported on the lower end of each of said hanger links for transverse and longitudinal pivotal movement relative thereto, aligning members normally projecting downwardly from each end of each of said spreader assemblies, the lower portions of said aligning members being flared outwardly and positioned to engage the upper corners of said container to guide said spreader assemblies laterally into aligned and centered relationship with the ends of said container as said spreader assemblies are lowered thereon, said aligning members being mounted on said spreader assemblies for movement to retracted positions out of the way of closely stacked containers or other obstacles, first power means for moving said aligning members to and from said retracted positions, twist locks rotatably mounted at each end of each of said spreader assemblies for engagement with the upper corners of said container, second power means connected between said spreader assemblies and said twist locks to rotate said twist locks for engagement and disengagement with said container, third power means for swinging said beams from one side of said chassis to the other to lift said containers at one side, move them between said beams across the top of said chassis, and set them down on the other side, outrigger assemblies mounted at each side of said mechanism for movement between retracted positions and extended positions at which they engage the ground alongside said mechanism to stabilize said mechanism against tipping during the lifting of said containers, fourth power means for moving said outrigger assemblies between said extended and retracted positions, and fifth power means connected between said beams and the lower portions of said hanger links to cause swinging of said links transversely of said chassis for rough alignment of said spreader assemblies transversely with said container preparatory to lowering said spreader assemblies onto said container by swinging of said beams to effect final precise transverse positioning of said spreader assemblies.

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