

March 1, 1960

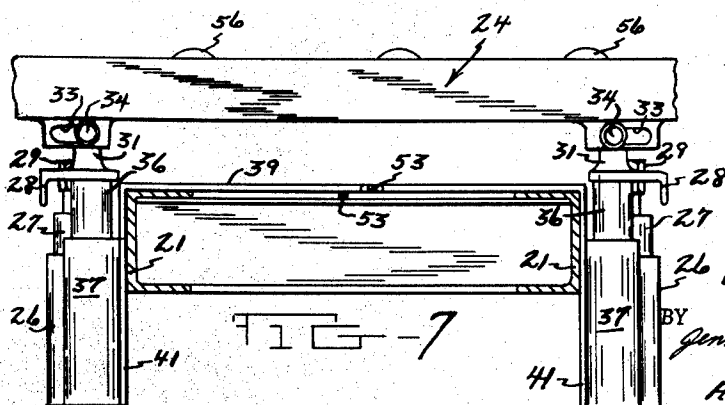
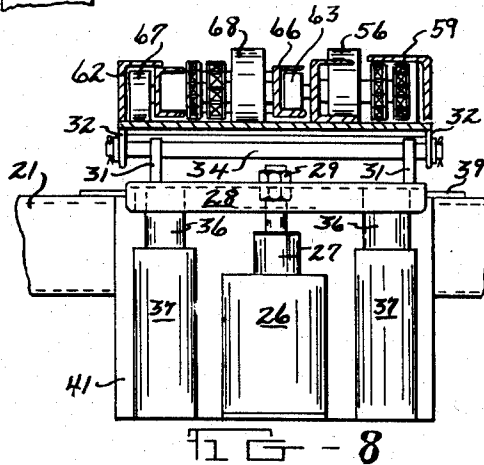
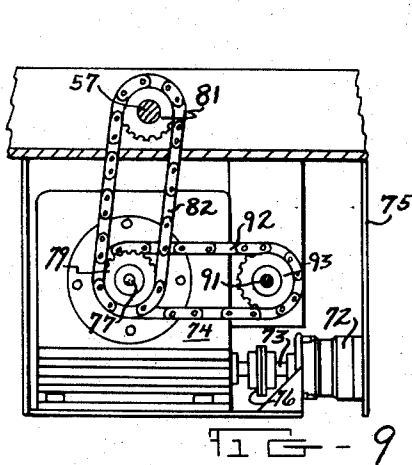
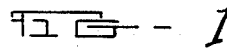
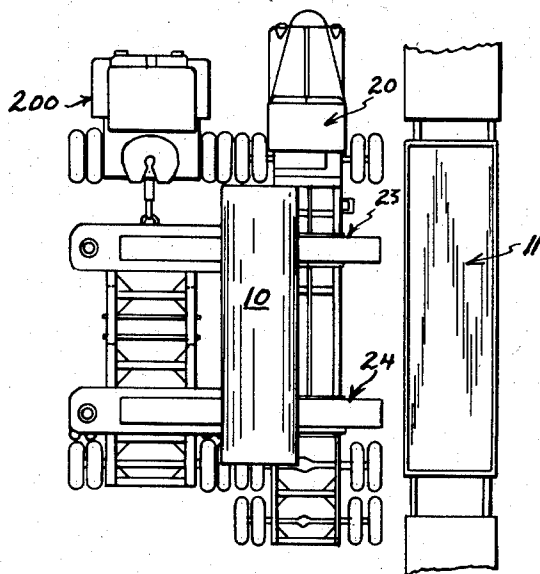
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2,926,797

MEANS FOR TRANSFERRING SHIPPING CONTAINERS

Filed June 6, 1958

7 Sheets-Sheet 1



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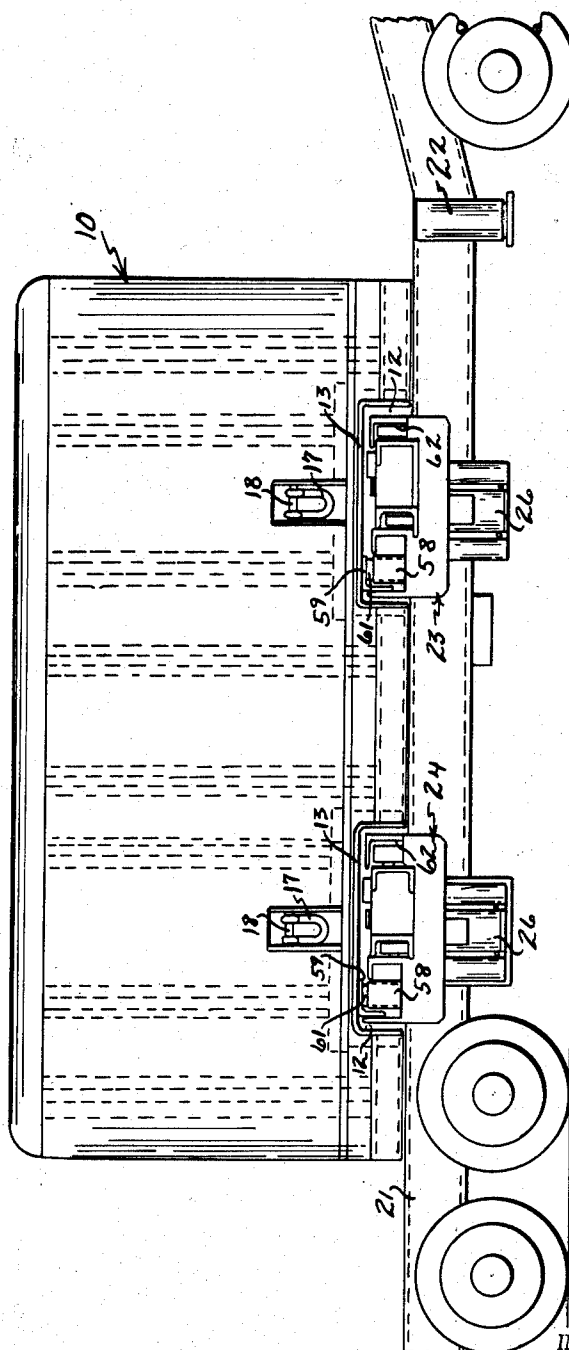


FIG. 2

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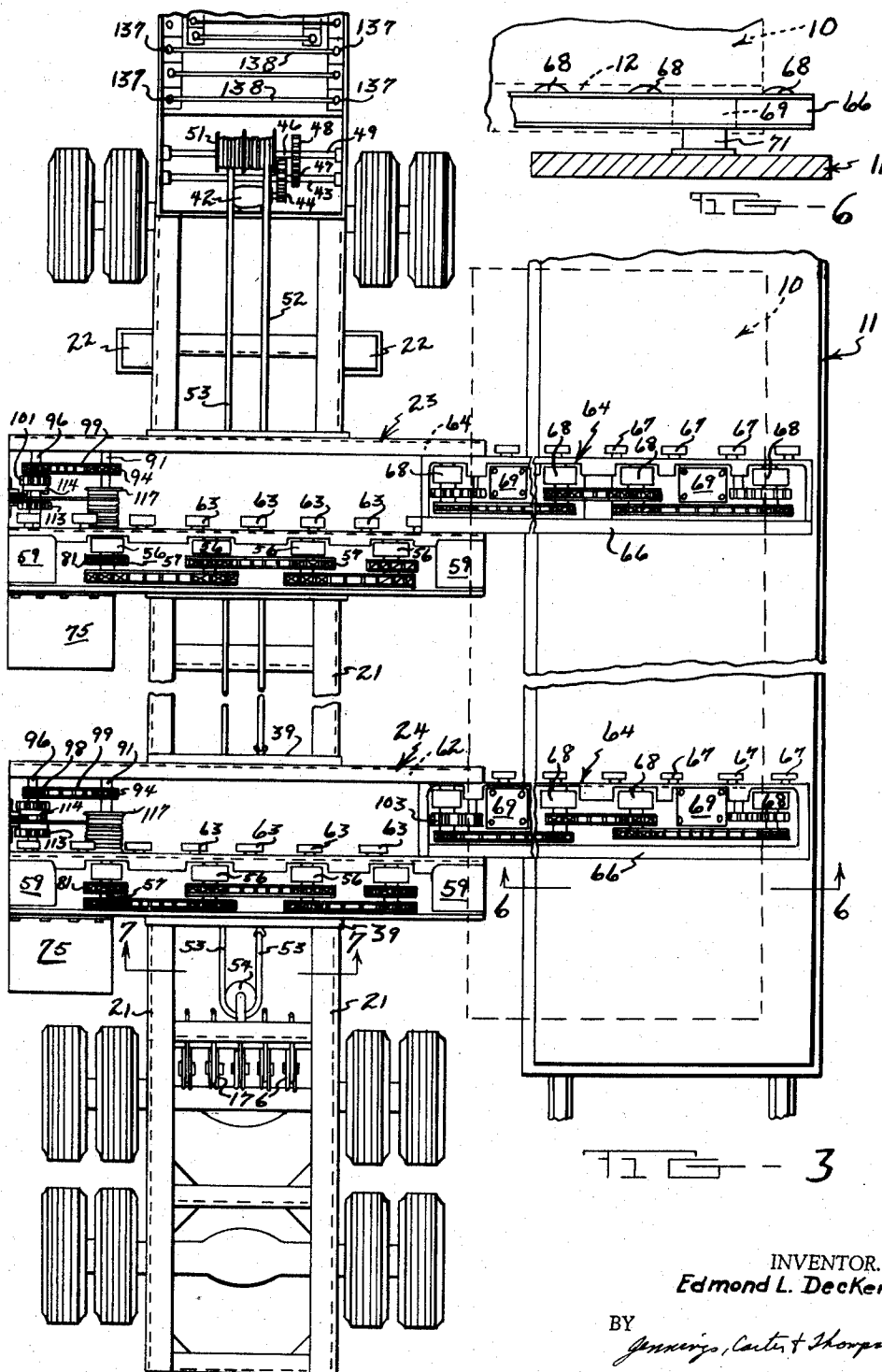
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MEANS FOR TRANSFERRING SHIPPING CONTAINERS

Filed June 6, 1958

7 Sheets-Sheet 3



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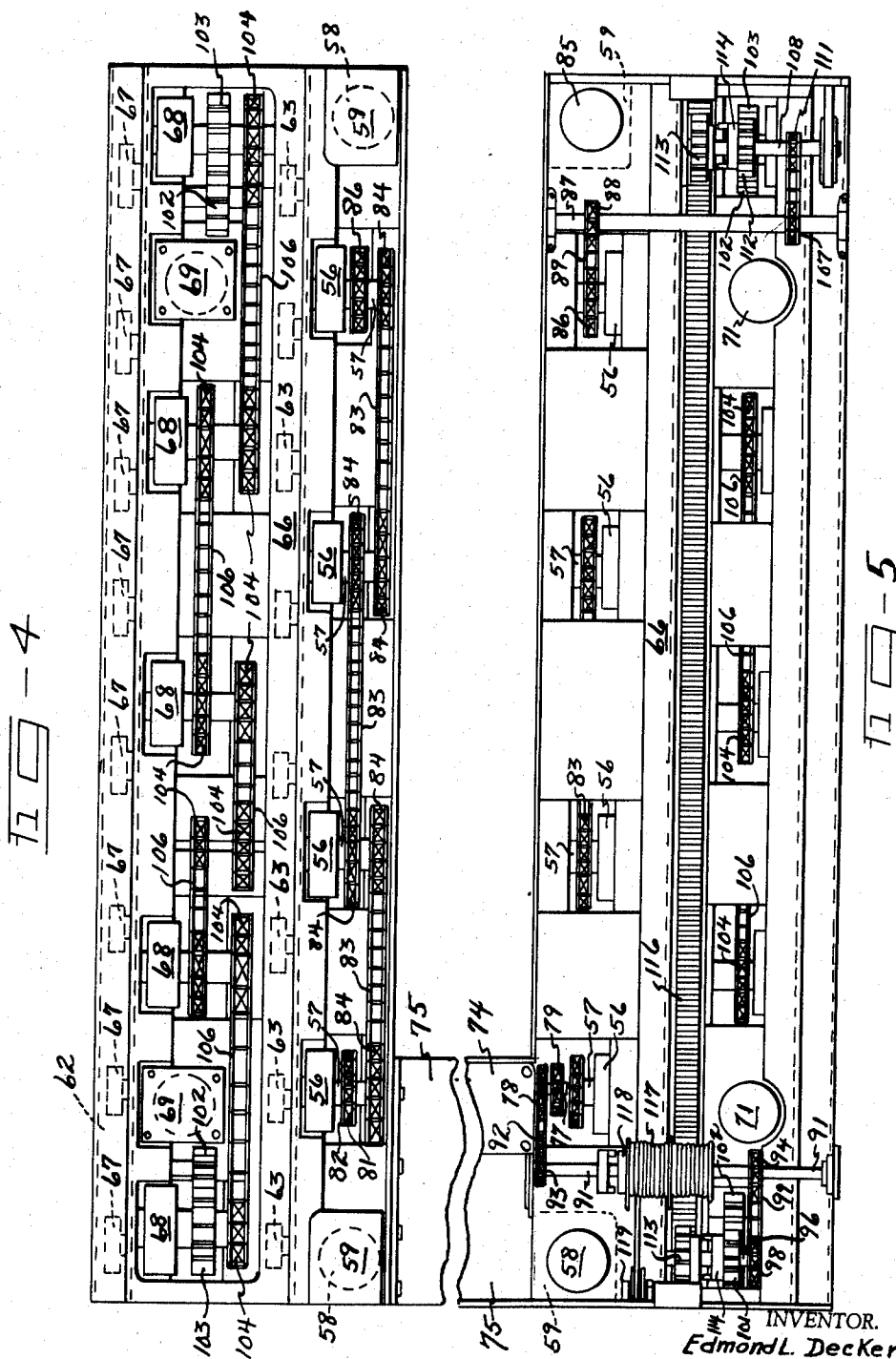
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Filed June 6, 1958

7 Sheets-Sheet 4



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MEANS FOR TRANSFERRING SHIPPING CONTAINERS

Filed June 6, 1958

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Fig. 11

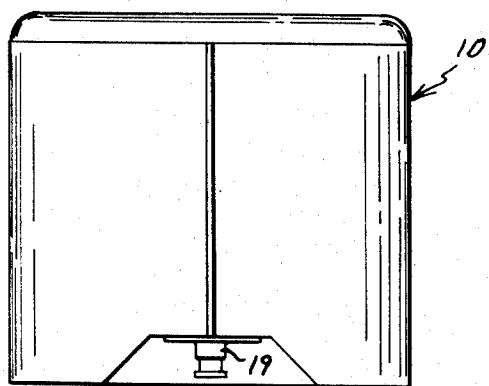
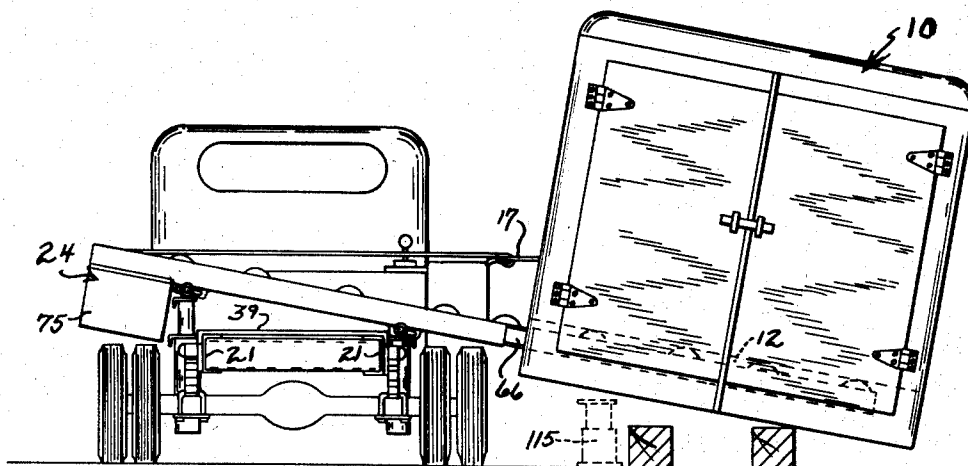


Fig. 10

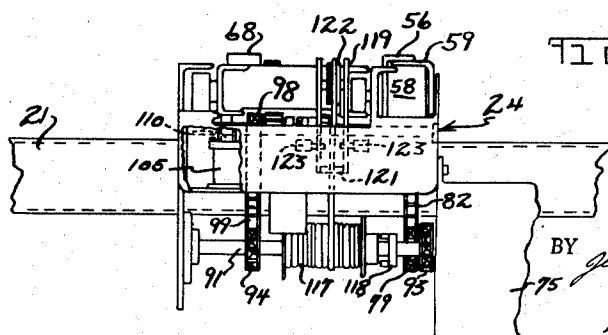


Fig. 12

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MEANS FOR TRANSFERRING SHIPPING CONTAINERS

Filed June 6, 1958

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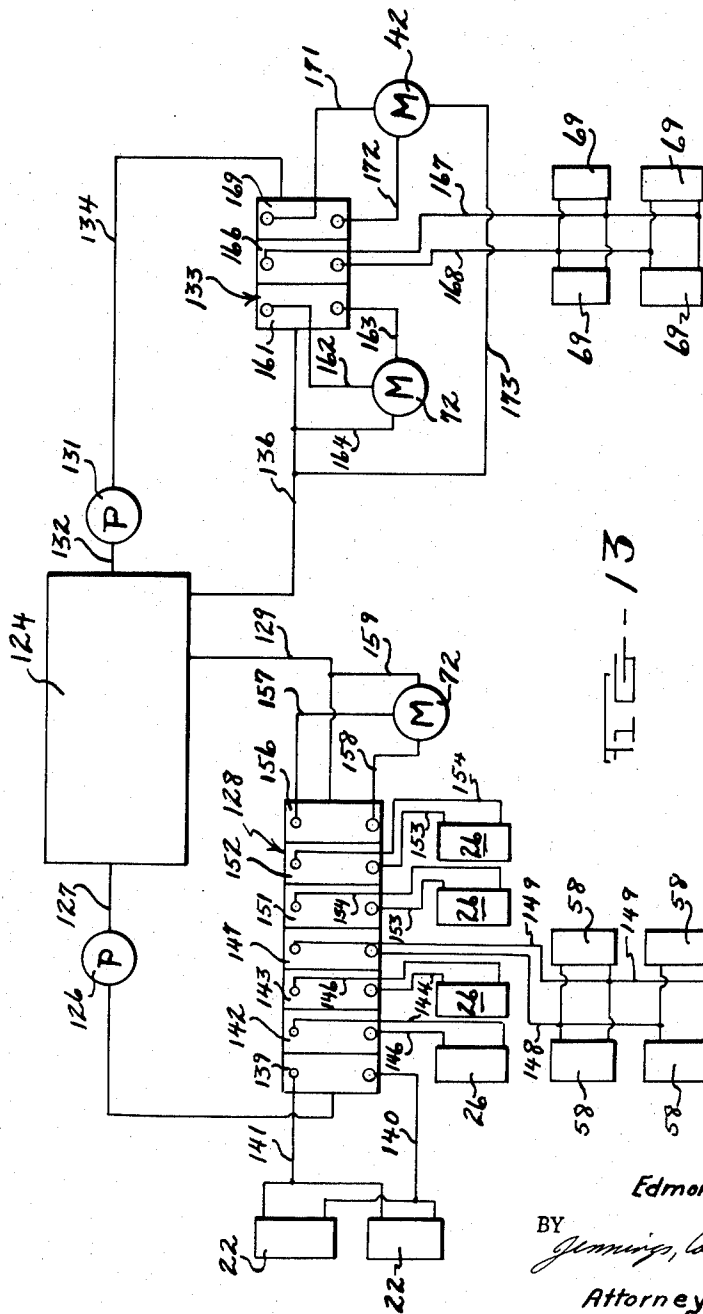


FIG. 13

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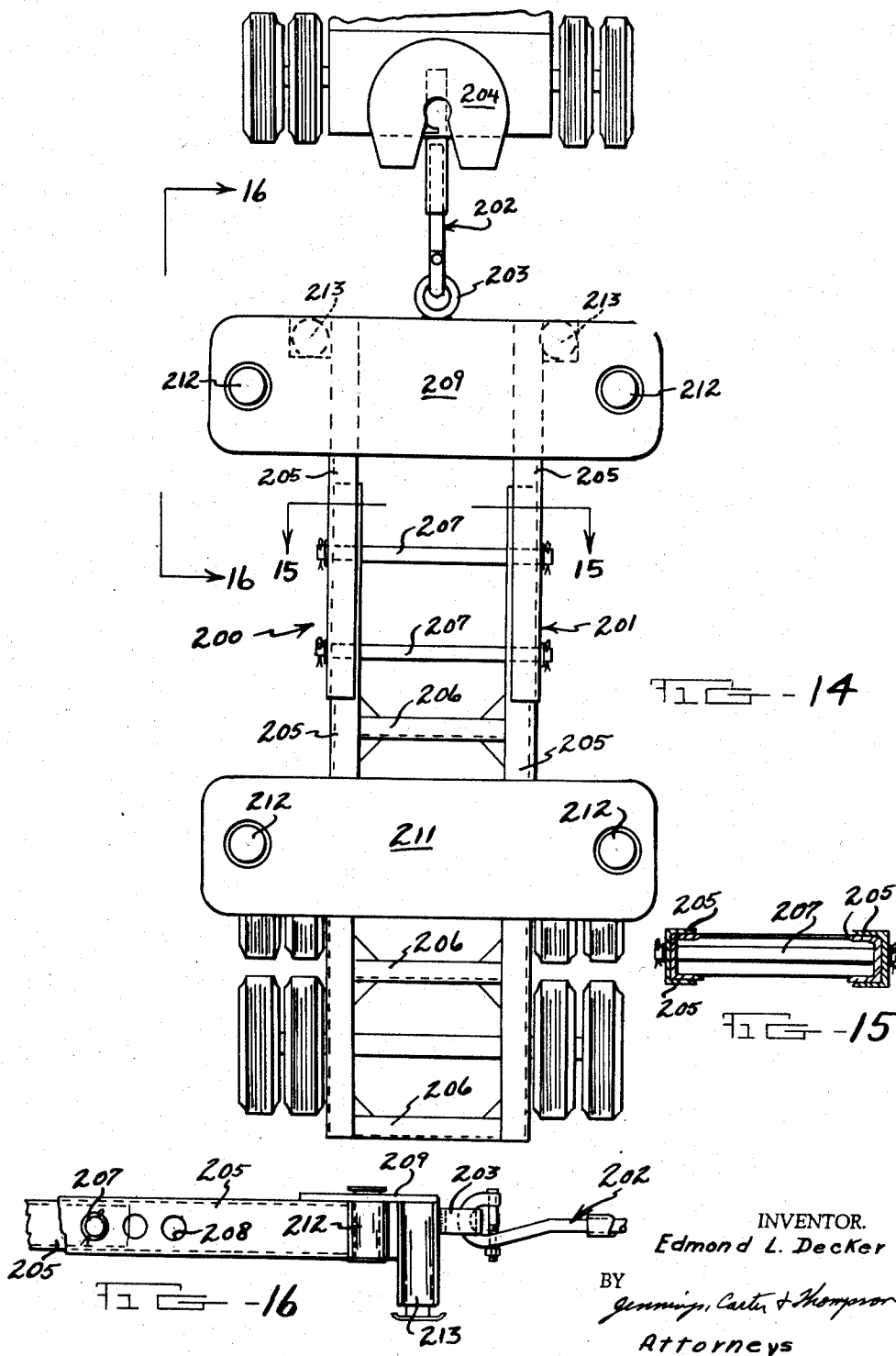
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2,926,797

MEANS FOR TRANSFERRING SHIPPING CONTAINERS

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2,926,797

MEANS FOR TRANSFERRING SHIPPING CONTAINERS

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Application June 6, 1958, Serial No. 740,346

20 Claims. (Cl. 214—38)

This invention relates to transportation equipment and more particularly to the method and means for transferring and supporting a shipping container between a conveying vehicle and the transferring apparatus.

The present invention is adapted for transferring a shipping container to a flat supporting surface without any change in or addition to the supporting surface. The shipping container may thus be transferred by the apparatus of my invention to a railway flat car without any modification of the flat car whatsoever. My apparatus forms a bridge to the supporting surface to which the shipping container is to be transferred, and then the shipping container is conveyed to the supporting surface over the bridge. This is made possible by the use of a shipping container having a pair of spaced transverse slots extending across the bottom, and in which laterally extensible arms of my transferring apparatus fit for supporting the container. When the laterally extensible arms of my apparatus are extended, they are supported at their outer ends on the conveying vehicle to form the bridge.

The transfer apparatus forming the present invention comprises an elevator unit adapted for supporting a shipping container and moving vertically with the shipping container supported thereon to lift the container, and for tilting transversely of the shipping container to adjust the apparatus to the height and inclination of the conveying vehicle to which or from which the container is being conveyed. A laterally extensible arm is mounted on the elevator unit for movement therewith and means are provided on the elevator unit to lift the container supported thereon relative to the unit so that the arm may be extended and retracted without obstruction by the container. Further, means are provided on the ends of the arm for contacting the supporting surface under the arm when the arm is extended and thereby moving the arm vertically relative to the supporting surface.

It is an object of this invention to provide apparatus for transferring a shipping container between a conveying vehicle and the apparatus comprising an extensible arm forming a bridge to the conveying vehicle over which the shipping container is transferred.

It is a further object of the present invention to provide, in combination, a shipping container having a pair of spaced transverse slots extending across the bottom thereof, and transfer apparatus having a pair of extensible arms adapted for fitting in the slots and supporting the container thereat in transferring relation.

An additional object of the invention is to provide, in combination, transfer apparatus having a pair of spaced extensible arms, a conveying vehicle having a longitudinal frame and a pair of spaced transverse plates thereon adapted for transverse alignment with the extensible arms for supporting the ends of the arms when they are extended thereby forming a bridge over which a shipping container may be transferred.

Another object is to provide a process of transferring a shipping container between the transfer apparatus and a conveying vehicle disposed alongside the transfer appa-

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ratus comprising raising the container relative to the transfer apparatus and extending arms laterally of the apparatus to the conveying vehicle on which the outer ends of the arms are supported and then moving the container along the arms.

A further object of my invention is to provide a conveying vehicle having a pair of spaced transverse plates thereon adapted for transverse alignment with the extensible arms for supporting the ends of the arms with each plate having means on the outer ends thereof for raising the shipping container relative to the transverse plates for horizontal alignment with a supporting surface, such as a platform or horizontal arms to which the container may be transferred and supported.

Briefly described, the apparatus of my invention comprises a transfer unit having a pair of elevator units mounted transversely on the longitudinal frame of the unit. Hydraulic jack means are provided on each end of the elevator units for raising the units and tilting the units transversely of the frame. An extensible arm is mounted on each transfer unit for extension on either side of the transfer unit and adapted for being supported on the outer ends thereof by a conveying vehicle on which the shipping container is supported in travelling relation. Rollers are provided on the upper surface of the elevator units and on the upper surface of the extensible arms for supporting and conveying the container, the rollers being disposed in a common plane. Hydraulic jack means are provided on each end of the elevator units for raising a container supported thereon to allow extension and retraction of the arms to and from a conveying vehicle without any obstruction by the container. In addition, hydraulic jack means are disposed on each end of the arms and adapted for moving downwardly to contact with the supporting surface to or from which the container is transferred thereby moving the arms vertically.

Apparatus embodying features of my invention is illustrated in the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a diagrammatic top plan view showing the transfer apparatus of my invention with a shipping container thereon being transferred from a highway conveying vehicle to a railway conveying vehicle;

Fig. 2 is a side elevational view of the transfer apparatus mounted on a vehicle and supporting a shipping container thereon;

Fig. 3 is a top plan view of the transfer apparatus embodying the present invention with extensible arms thereof extending over a railway conveying vehicle with the shipping container being shown thereon in dotted lines;

Fig. 4 is a top plan view of one of the elevator units removed from the vehicle;

Fig. 5 is a bottom plan view of the removable elevator unit shown in Fig. 4;

Fig. 6 is a sectional view taken generally along the line 6—6 of Fig. 3 and showing the hydraulic jack means on the outer end of extensible arm engaging the supporting surface of a railway flat car;

Fig. 7 is a sectional view taken generally along the line 7—7 of Fig. 3 and showing the hydraulic jack means for raising and lowering the elevator unit shown in Figs. 4 and 5;

Fig. 8 is a side elevational view of the hydraulic jack means shown in Fig. 7 with the elevator unit being shown in section;

Fig. 9 is an elevational view of the drive means for extending the arms laterally of the elevator unit and for driving the rollers on the arms and on the elevator unit;

Fig. 10 is a front end elevational view of the shipping container used with the transfer apparatus and showing a king pin thereon;

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Fig. 11 is an end elevational view of my transfer apparatus showing a shipping container being lowered to the ground by tilting of the elevator units transversely of the vehicle frame;

Fig. 12 is a fragmentary, end elevational view of one of the elevator units showing a winch for restraining the shipping container as it is conveyed along the extended arms of the elevator unit in tilted position;

Fig. 13 is a hydraulic schematic diagram of the hydraulic system for the transfer apparatus mounted on a roadway vehicle;

Fig. 14 is a top plan view of a highway conveying vehicle for the shipping container showing transverse plate members on which the extended arms of the elevator units rest while the shipping container is being transferred to and from the conveying vehicle;

Fig. 15 is a cross sectional view taken along the line 15—15 of Fig. 14 and showing the telescoping connection of the longitudinal frame members of the conveying vehicle of Fig. 14; and,

Fig. 16 is an elevational view looking generally along the line 16—16 of Fig. 14.

Referring now to the drawings for a better understanding of my invention, I show in Fig. 1 a shipping container, indicated generally by the numeral 10, being transferred by a vehicle supported transfer unit 20 for the container embodying the transfer apparatus of my invention from a railroad conveying vehicle 11 to a highway conveying vehicle 200. If desired, the container transfer unit 20 may be adapted for use in carrying the container 10 over the highway. Referring now to Figs. 2 and 10, the shipping container 10 has a pair of spaced transverse slots 12 extending across the full width of the bottom of the container. The slots 12 are lined by channel members 13 which are welded to the body of the container 10.

In order to secure the container 10 to a conveying vehicle, clevis members 17 are provided on each side of the container 10 and are pivotally connected thereto by pins 18. Conveying vehicles for shipping containers normally have brackets thereon through which a cable or rope may be extended and connected to the clevises 17 for holding the container 10 in secured position. As shown in Fig. 10, a king pin 19 is provided on the front end of the container 10 so that the container may be secured to a fifth wheel of the transferring vehicle. Suitable doors may be provided at the ends or at the sides of the container 10, as desired.

The vehicle transfer unit 20 for the container comprises a frame having longitudinally extending channels 21 with hydraulic supports 22 (see Figs. 2 and 3) adapted for lowering to the ground or supporting surface of the unit to support the frame intermediate the wheel supports since the frame is of a relatively long length.

A front elevator unit 23 and a rear elevator unit 24 are mounted transversely on the channel members 21 and are adapted for fitting in the slots 12 of the container 10 as shown in Fig. 2 for supporting the container thereon. The elevator units 23 and 24 are identical in structure, the only difference being that the rear elevator unit 24 is adapted for moving longitudinally on the channel members 21 as will be explained in detail hereinafter. For raising and lowering the elevator units 23 and 24 relative to the frame members 21, hydraulic jack means comprising a hydraulic cylinder 26 is mounted on each side of the vehicle frame on each of the elevator units 23 and 24. A piston 27 extends upwardly from the cylinder 26 (see Figs. 7 and 8) and has a transverse plate 28 mounted on the upper end thereof between a pair of nuts 29 adjustably connected to the piston 27. A bracket 31 having an aperture therethrough extends upwardly from each side of the transverse plates 28. An extension 32 having a laterally extending slot 33 therein projects downwardly from the elevator units 23 and 24 and a connecting bar 34 connects the plate 28 to the elevator units. A supporting rod 36 is secured to each end of the transverse

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plate 28 and is guided and supported by holders 37 having a central aperture therein in which the rods 36 fit. The rods 36 aid in supporting the elevator units and keep them from rocking longitudinally of the channel members 21. The laterally extending slots 33 allow the elevator units 23 and 24 to be tilted transversely of the frame by raising the hydraulic jack means 26 on one side of the frame while holding the hydraulic means on the opposite side of the frame, the bars 34 moving laterally in the slots 33 upon tilting of the elevator units. Individual controls are arranged for operating each of the hydraulic jack means 26 independently of the remaining jack means 26.

The rear elevator unit 24 is mounted on the plate member 39 which is supported in sliding relation on the longitudinal channels 21. The upper surface of the channels 21 is greased so that the plate member 39 will easily slide thereon. As shown in Fig. 7, side plate members 41 are connected to the plate member 39 and the hydraulic jack means 26 for the elevator unit 24 is mounted on the plate members 41. Thus, upon movement of plate member 39 the entire elevator unit 24 along with the hydraulic jack means therefor moves longitudinally. A hydraulic motor 42 (see Fig. 3) is mounted on the frame of the transfer unit and drives the shaft 43 through a pinion 44 and spur gear 46. A pinion 47 is mounted on shaft 43 and meshes with a spur gear 48 on countershaft 49. A double cable drum 51 is mounted on shaft 49 and has a cable 52 secured to one side of the plate member 39 and a cable 53 extending around a pulley 54 to the other side of the plate member 39. The hydraulic motor 42 is of the reversible type and thus the cable drum 51 can be rotated in either direction thereby shifting or sliding the rear elevator unit 24 toward or away from the elevator unit 23 for adjusting the spacing between the front and rear elevator units 23 and 24 to correspond to the spacing of the transverse slots 12 in the shipping container 10. This is required since shipping containers up to 40 feet in length will be employed and the distance between the slots varies for containers of different lengths. Thus, it is necessary that the distance between the elevator units 23 and 24 be adjustable for adapting my container transfer unit for different sizes of shipping containers.

The elevator units 23 and 24 have supporting rollers 56 spaced along the upper surface of the elevator units and adapted for supporting the shipping container 10 thereon. The rollers 56 are mounted on shafts 57 and are driven in a manner to be explained in detail below. Hydraulic cylinders 58 having an angle member 59 secured to the piston rod 61 are mounted on each end of the elevator units 23 and 24. The cylinders 58 are adapted for lifting the shipping container 10 off the rollers 56 on which the shipping container 10 is normally supported when on the elevator units. A guideway 62 (see Fig. 8) is formed on a side of the elevator units 23 and 24 and laterally spaced, aligned rollers 63 are mounted on the elevator units 23 and 24. An extensible arm indicated generally by the numeral 64 is mounted on each of the elevator units 23 and 24 and has a channel member 66 on one side thereof forming a guideway for receiving the rollers 63 on the elevator units. Laterally spaced, aligned rollers 67 are arranged on the side of the extensible arms 64 opposite the channel 66 and are adapted for being received in the guideway 62 in supporting relation. The extensible arms 64 have container supporting rollers 68 laterally spaced on the upper surface thereof and adapted for engaging the slot 12 of the shipping container 10. The rollers 68 are of the same height as the rollers 56 on the elevator units and are in the same plane thereof so that the container 10 may be transferred along the arms 64 onto the elevator units 23 and 24 without any change in the direction of movement of the shipping container 10. Hydraulic cylinders 69 having piston rods 71 directed downwardly therefrom are arranged on each end of the arms 64 for supporting the ends of the arms 64 when the arms are extended

and for raising the shipping container 10 on the arms (see Fig. 6).

The drive means (see Figs. 5 and 9 also) for my container transfer apparatus comprises a hydraulic motor 72 on each elevator unit having a drive shaft 73 extending therefrom to a gear box 74 with a coupling 76 interposed between the motor 72 and gear box 74. The output shaft 77 of gear box 74 has a pair of sprockets 78 and 79 mounted thereon. The gearbox 74 and motor 72 are mounted in a housing 75 which is secured to a side of the elevator units 23 and 24 and movable therewith. Sprocket 79 drives the sprocket 81 through sprocket chain 82 extending between the sprockets. The sprocket 81 is mounted on a roller shaft 57 which drives one of the rollers 56 which in turn, drives the other rollers 56 through sprocket chains 83 and sprockets 84. The last roller 56 (see Fig. 4) to be driven on the elevator unit has a sprocket 86 on the shaft 57 which drives a cross shaft 87 through sprocket 88 secured to shaft 87 and sprocket chain 89 connecting sprockets 86 and 88. Sprocket 78 drives cross shaft 91 (see Fig. 5) through sprocket chain 92 and sprocket 93 mounted on the cross shaft 91.

For extending the arms 64 laterally of the elevator units 23 and 24 and for driving the rollers 68 on the extensible arms, the drive is obtained from the cross shafts 87 and 91. It is understood that when the arms are extended the drive for the rollers 68 is received either through cross shaft 87 or cross shaft 91 depending on which side of the elevator units the arms are extended. When the arms 64 are extended to the left viewing Figs. 4 and 5, the drive for rollers 68 is obtained through a sprocket 94 mounted on shaft 91 and drives a countershaft 96 through sprocket 98 and sprocket chain 99. A spur gear 101 is mounted on shaft 96 and is adapted for engaging idler gears 102 mounted on each end of the extensible arms 64. The idler gears 102 mesh with gears 103 which drive the rollers 68 on the end of the arm. The end roller 68 is connected by sprockets 104 and sprocket chains 106 for driving the remaining rollers 68 on the extensible arms 64.

It is understood that the gear 101 drives the rollers 68 only when the extensible arms 64 are extended to the left viewing Figs. 4 and 5 and when the arms are in retracted position.

For driving the rollers 68 when the arms 64 are extended to the right viewing Figs. 4 and 5, a sprocket 107 is mounted on shaft 87 and drives countershaft 108 through sprocket chain 109 and sprocket 111 mounted on shaft 108. A spur gear 112 is mounted on shaft 108 and is adapted for engaging idler gear 102 which, in turn, drives rollers 68 through the gear 103. Thus, the gear 112 drives the rollers 68 when the extensible arms 64 are extended to the right viewing Figs. 4 and 5 through the drive from the rollers 56 on the elevator units as there is no direct connection between shaft 87 and the drive means except through the rollers 56.

Mounted on the shafts 96 and 108 are freely rotatable pinions 113. Clutches 114 are adapted for engaging and thereby driving pinions 113. A rack 116 is mounted on the underside of each of the extensible arms 64 and meshes with the pinions 113. Thus, upon engagement of clutches 114 with pinions 113 the arms 64 will be extended by the racks 116. The clutches 114 are air operated and are actuated by suitable controls behind the cab of the vehicle carrying my container transfer apparatus. A double acting air cylinder 105 is secured to each end of each of the elevator units 23 and 24 and has an upwardly extending piston rod 110 thereon adapted for engaging a slot on the ends of the extensible arms 64 in the extended and retracted positions of the arms to lock the arms 64 in such positions. Suitable controls are provided on the control panel for actuating the cylinders 105.

When the arms 64 are not in fully retracted or fully

extended position, the gears 101 and 112 are not in mesh with the idler gears 102 and thus, the rollers 68 on the extensible arms 64 are not driven. This arrangement provides a safety feature in that a shipping container supported on the elevator unit cannot be conveyed along the arms 64 unless the arms are in fully extended position thus preventing the shipping container 10 from being driven off the ends of the arms when the arms 64 are partially extended. The rollers 56 on the elevator units are driven whenever the hydraulic motor 72 is actuated and the rollers 68 on the arms will be driven only if the arms are fully retracted or fully extended while motor 72 is actuated.

A shipping container 10 is normally supported on the elevator unit on the upper surface of the rollers 56. Since the rollers 68 on the extensible arms are in the same plane as the rollers 56, it is necessary to raise the container above rollers 56 in order for the extensible arms 64 to be extended and retracted while the container is on the elevator units. Thus, hydraulic cylinders 58 are provided for lifting the container above the elevator units off the rollers 56 so that the extensible arms 64 may be extended and retracted.

In order to lift the shipping container 10 from a conveying vehicle so that the rollers 68 will be in contact with the slots 12, hydraulic cylinders 69 are actuated when the arms 64 are extended over the conveying vehicle within the slots 12. As shown in Fig. 6, the hydraulic cylinders 69 move downwardly and contact the conveying vehicle thereby raising the arms 64 and the container 10 whereby the shipping container 10 can be conveyed along the arms 64 on the rollers 68 while the arms are supported at their outer ends by cylinders 69.

My container transfer unit can be used for lowering a shipping container 10 onto the ground or other supporting surface alongside the unit by the tilting of the elevator units. By raising the hydraulic cylinders 26 on one side of the transfer apparatus and by lowering or keeping the hydraulic cylinders 26 on the other side of the apparatus in lowered position, the elevator units 23 and 24 can be tilted transversely of the frame members 21 to an angle of about 20° to the horizontal as shown in Fig. 11. This arrangement can be used to load or unload a shipping container 10 by merely the use of a portable hydraulic jack 115 which may be used for raising the container 10 so that the arms may move thereunder, and for lowering the container 10 to permit retraction of the arms when the container is being lowered onto the supporting surface. To restrain and guide the lowering of the container 10, a single cable drum 117 is freely mounted on shaft 91 and is adapted for engagement by clutch 118 secured to the shaft 91 but adapted for sliding along shaft 91. A yoke 119 is hinged at 121 to the inner surface of an end plate of each of the elevator units 23 and 24 (see Figs. 3 and 12). Yoke 119 has a pulley 122 mounted on the outer end thereof. The yoke 119 is adapted for swinging upwardly when the arms 64 are extended and lock means 123 is provided for securing the bracket 119 in the upright position. In this position, a cable can be trained thereover from the drum 117 and connected to the clevis 17 of the shipping container 10 and thus, the shipping container 10 can be restrained when it is lowered alongside the transfer apparatus. The clutches 118 are air operated and actuated by suitable controls on a control panel and are adapted for engaging the drum 117 in either direction of rotation of shaft 91. In some instances, it may be desirable to have the drum 117 employed for conveying the shipping container along freely mounted rollers on the arms.

Referring now to Fig. 13 in which the hydraulic system for my transfer apparatus is shown diagrammatically, a hydraulic fluid reservoir 124 is shown for supplying the hydraulic fluid. Pump 126 is connected to reservoir 124 through the flow line 127 and supplies the valve bank indicated generally by the numeral 128 with fluid, a re-

turn line 129 returning the fluid to the reservoir. A pump 131 is connected to reservoir 124 through flow line 132 and supplies a valve bank indicated generally by the numeral 133 with fluid through flow line 134, a return line 136 returning fluid to the reservoir. Pumps 126 and 131 are driven by the power takeoff (not shown) of the vehicle on which the apparatus is mounted. A hand lever 137 (see Fig. 3) is provided for each of the valve sections of the valve banks 128 and 133 and as shown in Fig. 3, the apparatus can be actuated from either side of the vehicle as levers 137 are provided on each side of the vehicle and connected to each other by links 138.

Valve section 139 of the valve bank 128 actuates the hydraulic cylinders 22 for supporting the longitudinal frame of the vehicle on which the transfer apparatus is carried with flow lines 140 and 141 extending from the valve section 139. Valve sections 142 and 143 actuate the hydraulic cylinders 26 for raising and lowering the front elevator unit 23 through flow lines 144 and 146. Valve section 147 actuates the hydraulic cylinders 58 on both the front and rear elevator units through flow lines 148 and 149. The hydraulic cylinders 58 are actuated simultaneously to raise the shipping container 10 above the elevator units for extension of the arms 64.

Valve sections 151 and 152 actuate the hydraulic cylinders 26 on the rear elevator unit 24 for raising and lowering the rear unit. Flow lines 153 and 154 are provided for supplying fluid to the cylinders 26. Valve section 156 is provided for driving the reversible motor 72 for the front elevator unit through flow lines 157 and 158, a return line 159 being provided to the reservoir.

Valve section 161 in valve bank 133 actuates the reversible motor 72 for the rear elevator unit 24 and has flow lines 162 and 163 extending thereto, and a return line 164 to the reservoir 124. Valve section 166 actuates the hydraulic cylinders 69 on the extensible arms 64 for raising and lowering the arms when they are in extended position. The cylinders 69 are actuated simultaneously and are supplied with hydraulic fluid through flow lines 167 and 168. Valve section 169 controls the reversible motor 42 for moving the rear elevator unit 24 along the channel members 21. Fluid is supplied to the reversible motor 42 through flow lines 171 and 172, and a return line 173 is provided for returning hydraulic fluid to the reservoir 124. A lever 137 is provided for each of the valve sections, as indicated in Fig. 3, on each side of the vehicle.

My container transfer apparatus is thus operated completely hydraulically except for the air cylinders 105 and the air clutches 114 and 118. In order to keep the hydraulic lines taut for the rear elevator unit 24 as it is moving longitudinally on the channel members 21, I provide spring actuated reels 176 which take up the slack in the hydraulic lines running to the rear elevator unit.

The conveying vehicle to or from which the shipping container is transferred may be a railroad car, a boat, a cargo airplane, barge or truck. A conveying vehicle for which my invention is particularly adaptable is illustrated in Figs. 14, 15 and 16 comprising the highway conveying vehicle 200. A trailer portion 201 is connected to the tractor of vehicle 200 by a telescoping draw bar 202 on the tractor pivotally engaging an eye 203 on the trailer portion 201 for pulling trailer 201 in travelling relation when the shipping container 10 is not supported thereon. When the shipping container 10 is supported on trailer portion 201, the king pin 10 of the shipping container engages a fifth wheel 204 on the tractor and the trailer portion 201 is carried through suitable securing means (not shown), such as cables and the like, securing the container to the trailer through the clevises 17 and suitable brackets on the trailer portion 201. The trailer portion 201 comprises a frame having longitudinally extending telescoping channels 205 connected by transverse beam members 206. The telescoping channels 205 are

connected to each other through connecting bars 207 extending through suitable aligned apertures 208 in the channel members 205. Front and rear transverse plate members 209 and 211, respectively, are connected transversely on the upper surface of the channel members 205. The transverse plates 209 and 211 are adapted for supporting the extensible arms 64 thereon when a shipping container is being transferred to or from the trailer portion 201. As the space between the elevator units 23 and 24 of the transfer apparatus varies, it is necessary that the spacing between the transverse plate members 209 and 211 vary. Thus, the telescoping connection allows the plate members 209 and 211 to be spaced according to the spacing of the elevator units 23 and 24. If desired, a sliding plate member such as used to space the elevator units may be used.

Hydraulic jack means 212 is provided on each end of each of the plate members 209 and 211 for lifting the container 10 relative to trailer 201 in order to unload the container 10 from the trailer portion 201 by allowing support means such as pivoted arms to be placed under the container, and then lowering the jack means 212 leaving the container resting on the support means. The trailer portion 201 may then be connected to the telescoping draw bar 202 through eye 203 and moved from under the container 10 to another location. For supporting the front end of the trailer portion 201, jack means 213 are provided on the outer side of channels 205 beneath the plate member 209 and may be lowered by hand through a suitable gear arrangement or automatically, either hydraulically or electrically.

In operation, to transfer a shipping container from a conveying vehicle, such as a truck, railroad car or the like, as shown in Fig. 3, the transfer apparatus is pulled up alongside the conveying vehicle with the front elevator unit 23 aligned with the front slot in the shipping container 10. The rear elevator unit 24 is then aligned with the rear slot in the shipping container by actuation of the motor 42 through valve section 169. Next, the elevator units 23 and 24 are elevated until the upper surface of the arms 64 is level with the slots. The motors 72 are energized and the air clutch 114 is actuated thereby extending the arms 64 to the right viewing Fig. 3 in the slots of the containers. The air cylinders 105 beneath the extended arms are actuated to lock the arms in position. The downwardly extending cylinders 69 on the extensible arms are actuated through the valve section 166 and the cylinders move downwardly to engage the conveying vehicle and raise the arms 64 and the container 10 thereon. The front and rear elevator units 23 and 24 will rock vertically approximately $2\frac{1}{2}$ inches as the arms are moved upwardly through actuation of cylinders 69 so it is not necessary to actuate the elevator units when the cylinders 69 on the arms are actuated. In this position, the container is resting on the rollers 68 of the extensible arms 64. The drive motor 72 is deenergized after the arms were extended and is now energized again. Since the arms 64 are in fully extended position to the right, gear 112 is in mesh with gear 102 and thus the rollers 68 are driven along with the rollers 56 thereby moving the container onto the elevator units 23 and 24. The motors 72 are deenergized to cease the movement of the container 10. In this position, the container 10 rests on the rollers 56 on the front and rear elevator units 23 and 24.

If desired, stop means (not shown) may be provided on the ends of the elevator units 23 and 24 to engage the forward side of the shipping container 10 when it is being moved onto the elevator units and thereby preventing the shipping container from being driven off the elevator units onto the ground. These stops may be removed when the elevator units 23 and 24 are not in operation and may be operated by hand or automatically. With the container resting on elevator units 23 and 24, the hydraulic cylinders 58 are actuated which raises the

container off of the rollers 56. The air cylinders 105 are actuated to release the locking means and in this position, the arms 64 may be retracted upon actuation of the motors 72 through valves 156 and 161 while actuating the air operated clutches 114. Before the container 10 is loaded onto the transfer apparatus, it is desirable to lower the hydraulic supports 22 to minimize the deflection in the channels 21 by giving added support intermediate the frame of the transfer apparatus.

In some instances it might be desirable to have the shipping container 10 transported along the highway on the container transfer apparatus, but it is usually desirable to transfer the shipping container 10 to a separate highway conveying vehicle. In operation to transfer the shipping container 10 from the container transferring apparatus to the highway conveying vehicle 200 shown in Figs. 13 and 14, the hydraulic cylinders 26 on the front and rear elevator units are actuated through valve sections 142, 143, 151, and 152 to align the elevator units vertically. Next, cylinders 58 on the elevator units are actuated thus raising the container above the rollers 68 and 56. The transverse plates 209 and 211 are aligned with the elevator units. In this position, the hydraulic drive motors 72 are actuated along with the air operated clutches 114 thereby extending the arms 64 over the plates 209 and 211 at which position the motors 72 are deenergized. The cylinders 105 are actuated to lock the arms 64 and the cylinders 69 on the arms are lowered. After the cylinders 69 on the outer end of the arms 64 contact plates 209 and 211, the motors 72 are energized thereby driving rollers 56 and 68 to transfer the shipping container along the arms 64. Normally, stops will be provided on the conveying vehicle against which the forward side of the shipping container will abut, in the event the operator of the transfer apparatus does not deenergize the motors 72 at the proper time. When the container 10 has reached the proper position over the conveying vehicle, the motors 72 are deenergized through valves 156 and 161 and the cylinders 69 are retracted thereby lowering the extensible arms 64 and the shipping container 10 thereon to the conveying vehicle 200. The cylinders 105 are actuated to unlock the extended arms 64, and in this position, the motors 72 can be again energized to retract the extensible arms 64.

From the foregoing, a container transfer unit has been described which may transfer a shipping container to or from a flat level surface such as a railway flat car, without the alteration or change of the flat car in any manner. My apparatus forms a bridge over which the shipping container may be transferred and allows the shipping container to be transferred in a minimum of time from either side of the transferring apparatus with a minimum of skill. By forming a bridge, substantially heavy shipping containers may be transferred between the transfer apparatus and the conveying vehicle. The elevator units comprising the present invention are removable from the vehicle on which they are carried and are adapted for attachment to any type of vehicle or to any fixed support. While the drawings show the container 10 having a king pin 19 thereon for engaging the fifth wheel 204, the highway conveying vehicle 200 may be provided with a king pin instead of the container 10. Further, if desired, the fifth wheel may be removed from the conveying vehicle and no king pin will be necessary on the container or the conveying vehicle.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In combination, an elongated shipping container 75

having a pair of downwardly opening, spaced transverse slots extending across the full width of the bottom of the container, a vehicle supported transfer unit having a pair of elevator units mounted thereon adapted to enter the transverse slots in said container and move the container vertically while fully supporting the container thereon at said slots, an extensible arm on each of the elevator units movable vertically with the movement of the elevator units and adapted for movement in a generally horizontal direction relative to the elevator units and the container and for supporting the container at said transverse slots, and means providing relative vertical movement between said container and said arms for permitting the generally horizontal movement of said arms relative to the elevator units and the container when the container is supported on said elevator units.

2. In combination, an elongated shipping container having a pair of downwardly opening, spaced transverse slots extending across the full width of the bottom of the container, a vehicle supported transfer unit having a pair of elevator units mounted thereon adapted to enter the transverse slots in said container to move the container vertically while fully supporting the container thereon, a laterally extensible arm on each of the elevator units movable vertically with the movement of the elevator units and adapted for lateral movement relative to the elevator units and the container, said extensible arms being adapted for engaging the container in supporting relation at said transverse slots, and means on said elevator units for raising and lowering said container relative to the elevator units.

3. In combination, a shipping container having a pair of downwardly opening, spaced transverse slots extending across the full width of the bottom of the container, a vehicle supported transfer unit having a pair of elevator units mounted thereon adapted to enter the transverse slots in said container and to move the container vertically while fully supporting the container thereon at said slots, said elevator units adapted for tilting transversely of said transfer unit, a laterally extensible arm on each of the elevator units movable vertically with the elevator units and being adapted for lateral movement relative to the elevator units and the container, means providing relative vertical movement between said container and said arms for permitting the lateral movement of said arms relative to the elevator units and the container when the container is on the transfer unit, and rollers on said elevator units and said arms adapted for engaging the container in supporting relation at the slots thereof whereby said container may be conveyed along the arms and along said elevator units.

4. In combination, an elongated shipping container having a pair of downwardly opening, spaced transverse slots extending across the full width of the bottom of the container, a vehicle transfer unit having a pair of elevator units mounted thereon adapted to enter the transverse slots in said container and to move the container vertically while fully supporting the container thereon at said slots, said elevator units being adapted for tilting transversely of said transfer unit, a laterally extensible arm on each of the elevator units movable vertically with the elevator units, means on said elevator units for raising a shipping container supported thereon to permit the arms to be extended and retracted, said arms adapted to be supported at their outer ends when in fully extended position, means on said arms for moving said arms vertically when the arms are in fully extended position and supported at their outer ends, rollers on the upper surface of said elevator units and the upper surface of said arms adapted for engaging the container in supporting relation at the slots thereof, and drive means for rotating said rollers whereby said container may be conveyed along the arms and the elevator units.

5. The combination as defined in claim 4 and further characterized in that the drive means for the rollers on

said arms is operable only when the arms are in fully extended position or in fully retracted position thereby preventing movement of the container along the arms when the arms are partially extended.

6. In combination, a shipping container having a pair of downwardly opening, spaced transverse slots extending across the full width of the bottom of the container, a vehicle supported transfer unit having a pair of elevator units mounted thereon adapted to enter the transverse slots in said container and to move the container vertically while fully supporting the container thereon at said slots, a conveying vehicle for carrying the container in travelling relation disposed alongside the vehicle transfer unit, a laterally extensible arm on each of the elevator units movable vertically with the elevator units and adapted for lateral movement relative to the elevator units and the container, said extensible arms adapted to be supported on said conveying vehicle when the arms are extended and to engage the container in supporting relation at said slots, means on said units to provide relative vertical movement between the container and the arms, and means on the extended arms and the elevator units for moving said container between the transfer unit and said conveying vehicle after the arms are extended and supported by said conveying vehicle.

7. The combination defined in claim 6 and further characterized in that one of said elevator units is movable longitudinally relative to said transfer unit whereby the spacing between said elevator units may be varied to accommodate containers having slots of different spacings.

8. In combination, a shipping container having a pair of downwardly opening, spaced transverse slots extending across the full width of the bottom of the container, a vehicle supported transfer unit for the container having a pair of elevator units mounted thereon adapted to enter the transverse slots in said container and to move the container vertically while fully supporting the container thereon at said slots, a laterally extensible arm on each of the elevator units movable vertically with the elevator units, a conveying vehicle for carrying the container in travelling relation disposed alongside the vehicle transfer unit, said arms adapted to be supported on said conveying vehicle when the arms are extended and to engage the container in supporting relation at said slots, means providing relative vertical movement between said container and said arms for permitting the lateral movement of said arms relative to the elevator units and the container when the container is supported on the elevator units, rollers on said elevator units on which the container is supported at said slots, and rollers on said arms on which the container is supported at said slots and is conveyed between the transfer unit and the conveying vehicle.

9. In combination, a shipping container having a pair of downwardly opening, spaced transverse slots extending across the full width of the bottom of the container, a vehicle supported transfer unit having a pair of elevator units mounted thereon adapted to enter the transverse slots in said container and to move the container vertically while fully supporting the container thereon at said slots, a conveying vehicle for carrying the container in travelling relation disposed alongside the vehicle transfer unit, a laterally extensible arm on each of the elevator units movable vertically with the elevator units and adapted for lateral movement relative to the elevator units and the container, said extensible arms adapted to engage the container at the slots in supporting relation when in extended position, means on said elevator units to provide relative vertical movement between said container and said arms, said conveying vehicle comprising a longitudinal frame having a pair of transverse plate members spaced longitudinally thereon disposed in transverse alignment with the extensible arms and adapted to support the outer ends of the arms when they are extended, and means for moving said container between the transfer unit and said conveying vehicle along the arms after the arms are ex-

tended and supported at their outer ends on the plate members of said conveying vehicle.

10. The combination as defined in claim 9 and further characterized in that the longitudinal frame of said conveying vehicle comprises spaced longitudinal pairs of telescoping channel members being adjustably connected to each other between the transverse plate members whereby the distance between the transverse plate members may be varied to accommodate the spacing of said elevator units on the transfer unit.

11. A transfer unit for transferring a shipping container between a conveying vehicle and said transfer unit comprising a longitudinally extending frame, a pair of longitudinally spaced elevator units mounted transversely on said frame and movable vertically relative to said frame for lifting and supporting the container, said elevator units being mounted to tilt transversely of said frame to adapt the units for easily transferring the container, a laterally extensible arm mounted on each of the elevator units and movable with the elevator units, said arms adapted for lateral movement to extended position relative to the elevator units and for supporting the container when the outer ends of the extended arms are supported, and means for raising the container relative to the elevator units whereby the arms may be moved laterally relative to the elevator units and the container when the container is on the transfer unit.

12. A transfer unit for transferring a shipping container between a conveying vehicle and said transfer unit comprising a longitudinally extending frame, a pair of longitudinally spaced elevator units mounted transversely on said frame and movable vertically relative to said frame for lifting and supporting the container, said elevator units being mounted to tilt transversely of said frame, a laterally extensible arm mounted on each of the elevator units and movable therewith, said arms adapted for lateral movement to extended position relative to the vator units and for supporting the container when the arms are extended and the outer ends thereof are supported, means on the elevator units for lifting the container relative to the units to permit the arms to move laterally relative to the container and the elevator units when the container is supported on the elevator units, rollers on said elevator units for supporting said container and adapted to convey the container therealong, rollers on said extensible arms adapted to convey the container therealong, and means on said arms and said elevator units for driving said rollers, said means being mounted on said elevator units and movable therewith.

13. A transfer unit for transferring a shipping container between a conveying vehicle and said transfer unit comprising a longitudinally extending frame, a pair of longitudinally spaced elevator units mounted transversely on said frame and movable vertically relative to said frame for lifting and supporting the container, said elevator units being mounted to tilt transversely of said frame to adapt the units for easily transferring the container, a laterally extensible arm mounted on each of the elevator units and movable therewith, said arms adapted for lateral movement to extended position relative to the elevator units and for supporting the container when the outer ends of the extended arms are supported, means on the elevator units for lifting the container relative to the units for permitting the arms to move laterally relative to the container and the elevator units when the container is supported on the elevator units, means on said arms for raising said arms vertically when the outer ends of the arms are extended and supported whereby a container may be lifted from a conveying vehicle to supporting relation on said arms, rollers mounted on the upper surface of said elevator units for engaging the container in supporting relation, rollers mounted on the upper surface of said extensible arms for engaging the container in supporting relation when the outer ends of the arms are supported, and means for driving said rollers whereby said container

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may be moved relatively to the arms and the elevating units.

14. A transfer unit as defined in claim 13 and further characterized in that one of said elevator units is movable along the longitudinally extending frame whereby the distance between the elevator units may be varied to accommodate shipping containers of various lengths.

15. A transfer unit for transferring a shipping container between a conveying vehicle and said transfer unit comprising a longitudinally extending frame, a pair of longitudinally spaced elevator units mounted transversely on said frame and movable vertically relative to said frame for lifting and supporting the container, said elevator units being mounted to tilt transversely of said frame to adapt the units for easily transferring the container, a laterally extensible arm mounted on each of the elevator units and movable therewith, said arms being adapted for lateral movement to extended position relative to the elevator units and for supporting the container when the outer ends of the extended arms are supported, means on the elevator units for lifting the container relative to the units to permit the arms to move laterally relative to the container and the elevator units when the container is supported on the elevator units, means on said arms for raising said arms vertically when the outer ends of the arms are extended and supported whereby a container may be lifted in supporting relation on said arms from a conveying vehicle, rollers mounted on the upper surface of said elevator units to engage the container in supporting relation, rollers mounted on the upper surface of the extended arms to engage the container in supporting relation when the outer ends of the arms are supported, means mounted on said elevator units for driving said rollers whereby said container may be moved relatively to the arms and the elevating units, and the drive means for the rollers on said arms being operable for rotating the rollers only when the arms are in fully extended position or in fully retracted position thereby preventing movement of the container along the arms when the arms are partially extended.

16. A transfer unit for transferring a shipping container between the transfer unit and a lower container supporting surface comprising a longitudinally extending frame, a pair of longitudinally spaced elevator units mounted transversely on said frame and movable vertically relative to said said frame for lifting and supporting the container, said elevator units being mounted to tilt transversely of said frame to adapt the units for transferring the container between the lower supporting surface and the transfer unit, a laterally extensible arm mounted on each of the elevator units and movable therewith, said arms being adapted for lateral movement to extended position over the lower supporting surface, means on said elevator units to provide relative vertical movement between said container and said arms, means on said elevator units adapted for attachment to said container for restraining the movement of the container when the elevator units are tilted and the arms are extended to the lower container supporting surface, and means on said arms and said elevator units for moving said shipping container along the arms between the transfer unit and the lower supporting surface.

17. A detachable elevator unit for supporting and transferring a shipping container between a conveying vehicle and the unit comprising means on opposite ends of the elevator unit to move the elevator unit vertically and to tilt the elevator unit in the direction of transfer of the shipping container, a laterally extensible arm mounted on the elevator unit and movable therewith, said arm being adapted for lateral movement to extended position over the conveying vehicle and for supporting the container when the arm is extended and the outer end thereof is supported by the conveying vehicle, hydraulic jack means on the elevator unit for lifting a container supported thereon relative to said unit whereby the arm may be extended and retracted

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without obstruction by the container, and hydraulic jack means on said arm for contacting the conveying vehicle and moving the arm vertically when the arm is extended and disposed over the conveying vehicle.

18. A detachable elevator unit for supporting and transferring a shipping container between a conveying vehicle and said unit comprising hydraulic jack means on opposite ends of the elevator unit to move the elevator unit vertically and to tilt the elevator unit in the direction of transfer of the shipping container, a laterally extensible arm mounted on the elevator unit and movable therewith, said arm being adapted for lateral movement to extended position over the conveying vehicle and for supporting the container when the arm is extended and the outer end thereof is supported by the conveying vehicle, a plurality of spaced rollers on the upper surface of the elevator unit adapted to engage the container in supporting position, a plurality of spaced rollers on the upper surface of the arm disposed in the same plane as the rollers on said elevator unit and adapted to engage the container in supporting position, hydraulic jack means on the elevator unit adapted to lift a container supported thereon relative to said unit whereby the arm may be extended and retracted without obstruction by the container, and hydraulic jack means on said arm adapted to contact the conveying vehicle and to move the arm vertically when the arm is extended and disposed over the conveying vehicle.

19. A detachable elevator unit as defined in claim 18 and further characterized in that means is provided for driving the rollers on said arm and said elevator unit, and the drive means for the rollers on said arm is operable only when the arm is in fully extended or fully retracted position thereby preventing movement of the container along the arm when the arm is partially extended.

20. In combination, a vehicle supported transfer unit adapted to support and transfer a shipping container, said transfer unit having a pair of elevator units mounted thereon adapted to move the container vertically while fully supporting the container thereon, an extensible arm on each of the elevator units movable vertically with the elevator units and adapted for movement in a generally horizontal plane relative to the elevator units and on each side thereof, a conveying vehicle for transporting the container disposed alongside the vehicle transfer unit, said conveying vehicle comprising a frame having a pair of spaced transverse support members thereon disposed in transverse alignment with the extensible arms and adapted to support the outer ends of the arms when they are extended, said frame having pairs of longitudinally extending telescoping members adjustably connected to each other between the transverse support members whereby the distance between the transverse support members may be varied to accommodate the spacing of said elevator units on the transfer unit, fluid pressure means on each end of each arm to support the outer ends of the arms when the arms are extended and adapted to move downwardly from the bottom of the arms, and means for moving the container between the transfer unit and the conveying vehicle along the arms after the arms are extended and supported at their outer ends on the support members of said conveying vehicle.

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