Dec. 3, 1963 G. R. DEMPSTER ETAL 3,112,834

FRONT END LOADERS

Filed May 9, 1960 3 Sheets-Sheet 1

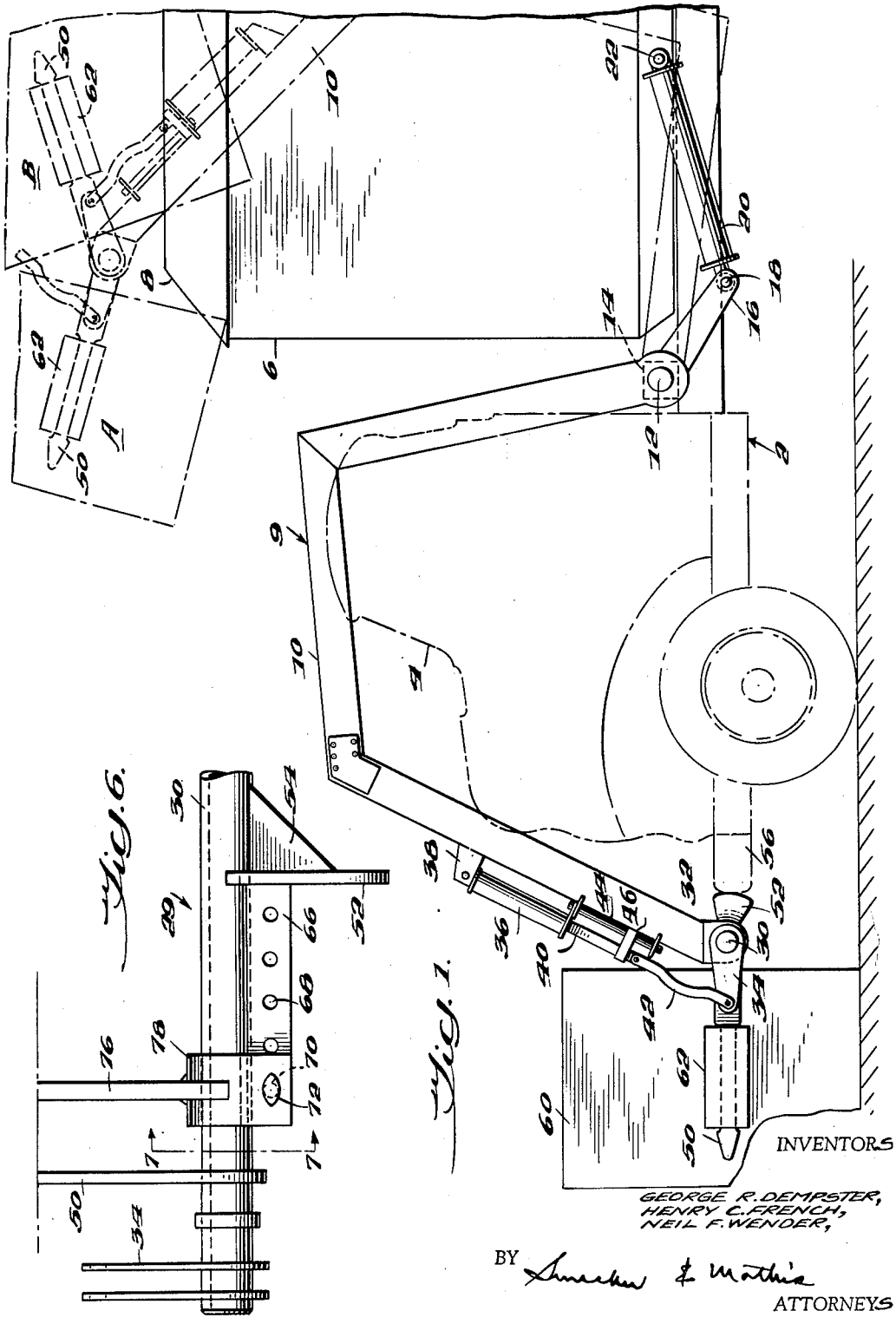


Fig. 1.

Fig. 6.

INVENTORS
GEORGE R. DEMPSTER,
HENRY C. FRENCH,
NEIL F. WENDER,

BY Smucker & Mathis
ATTORNEYS

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FRONT END LOADERS

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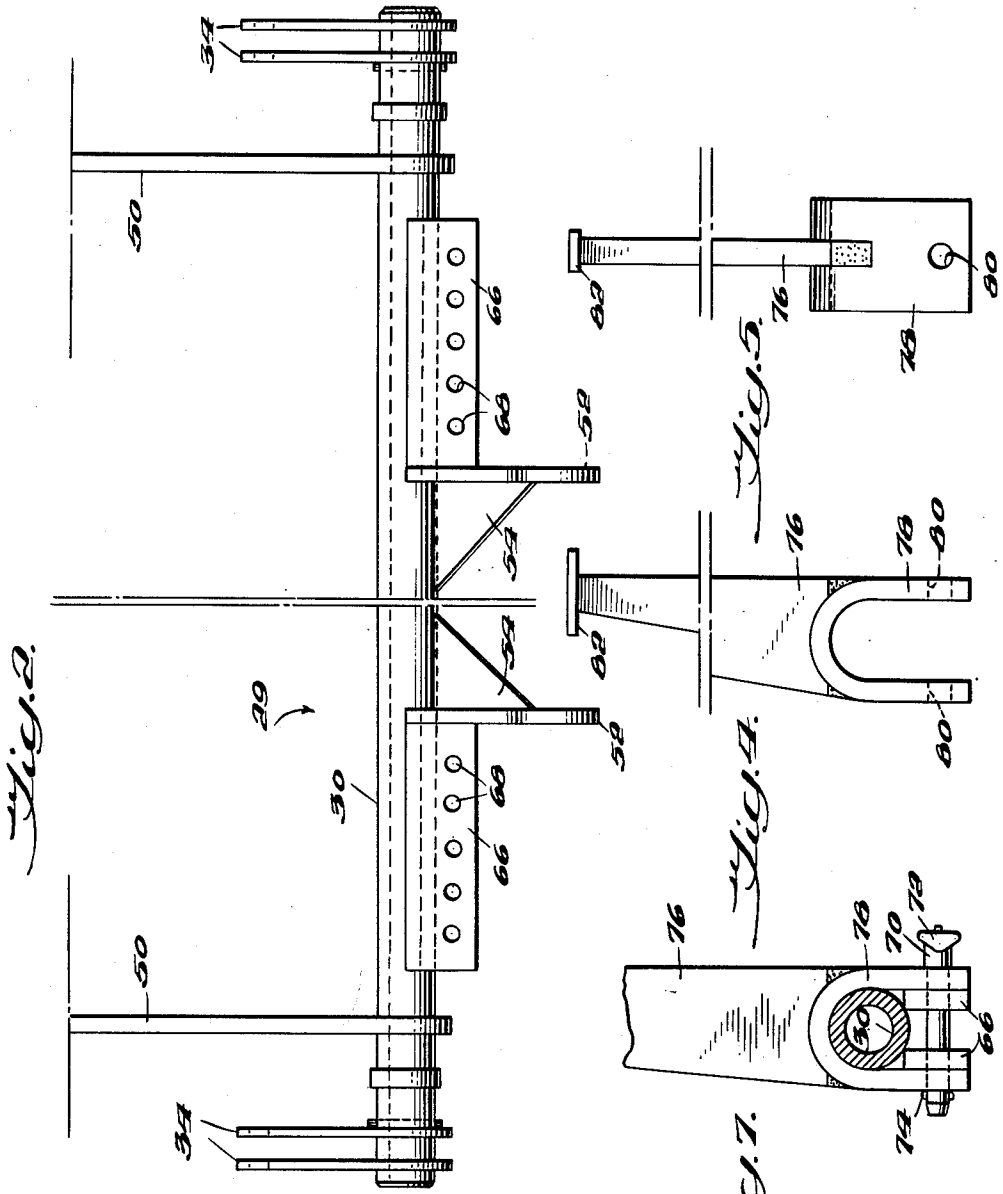


Fig. 2.

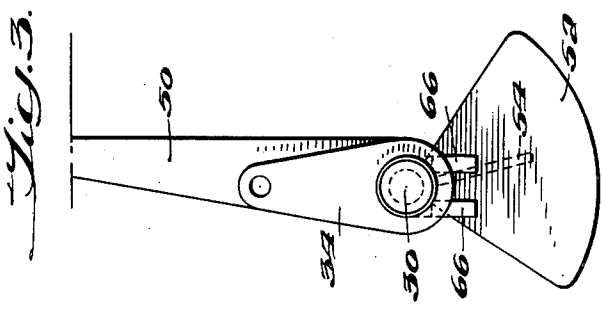


Fig. 3.

Fig. 5.

Fig. 4.

Fig. 7.

INVENTORS
GEORGE R. DEMPSTER,
HENRY C. FRENCH,
NEIL F. WENDER,

Smucker & Mathis

ATTORNEYS

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FRONT END LOADERS

Filed May 9, 1960 3 Sheets-Sheet 3

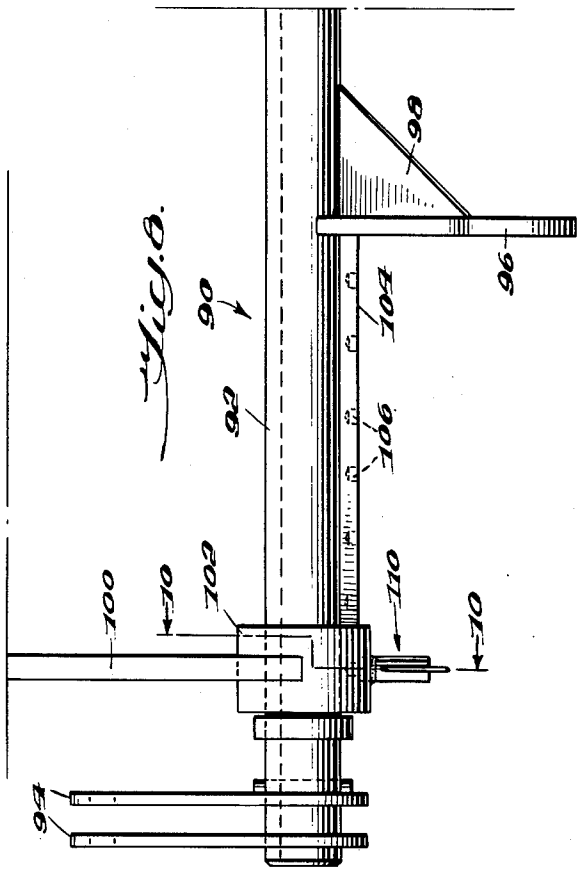


Fig. 8.

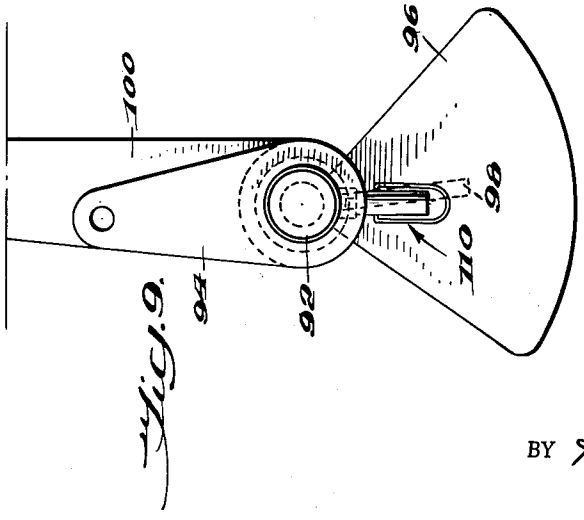


Fig. 9.

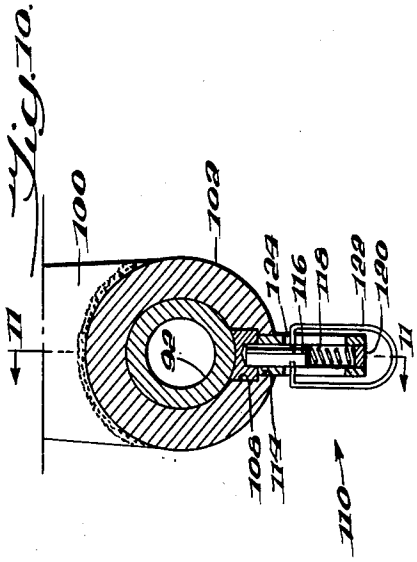


Fig. 10.

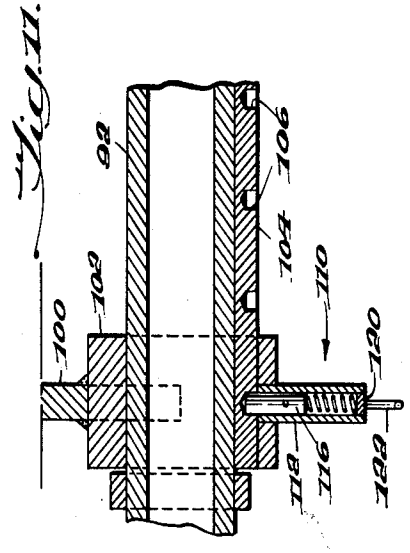


Fig. 11.

INVENTORS
GEORGE R. DEMPSTER,
HENRY C. FRENCH,
NEIL F. WENDER,

BY Dressler & Mathis

ATTORNEYS

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3,112,834
FRONT END LOADERS

George R. Dempster (% Dempster Brothers, Inc., P.O. Box 3127), Henry C. French, and Neil F. Wender, all of Knoxville, Tenn.; said French and said Wender assignors to Dempster Brothers, Inc., Knoxville, Tenn., a corporation of Tennessee

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2 Claims. (Cl. 214—302)

This invention relates to improvements in front end loaders of the character used for picking up containers at the front of a motor vehicle and dumping the contents therefrom into the body of the vehicle. More specifically, this invention relates to improvements in apparatus used in connection with the front end loaders whereby various size containers may be accommodated by the loading mechanism.

The general type of front end loader to which this invention is applied employs lifting arms pivotally mounted on the vehicle and extending forwardly in front of the cab of the vehicle in such position as to pick up a separable container that may be sitting on the ground or on a supporting surface at the front of the vehicle. Power means are commonly provided for operating the lifting arms so that the container may be swung to an elevated position above the body of the vehicle and the contents of the container then dumped into the body. The empty container thereafter may be swung back to the ground, or if desired, the container may be transported on the lifting arms to a different location, before being returned to the ground.

Front end loaders of this general type are described in Patent No. 2,900,096 to George R. Dempster and William A. Herpich. Such loading mechanism employs a horizontally extending member or torque tube to which fork-type apparatus is attached for effecting detachable engagement of the lifting mechanism and the separable container. It is common practice in using this mechanism to proceed from point to point where various containers are located and to empty the contents of the containers into the vehicle body. Frequently, however, all of the various containers are not of the same size. Consequently, a serious problem arises regarding suitable apparatus for providing a detachable connection between the lifting mechanism and various size containers.

Accordingly, it is the primary object of this invention to provide apparatus that serves to connect firmly and safely a separable container and the lifting mechanism of a front end loader, which apparatus is easily adjusted to accommodate containers of various sizes.

This may be accomplished, according to certain embodiments of the invention, by providing on a horizontally extending torque tube member, which is adapted to be placed adjacent to the container, a pair of fork arms that may be removably attached to the horizontal member. The spacing between the fork arms may be varied so that the arms may be placed adjacent opposite sides of a container regardless of its size. In one embodiment, the arms are supplied at one end with a U-shaped bracket that may be fitted over the horizontal member. A bolt may be fitted through holes in the brackets and through one pair of a series of holes provided in bar members attached to the torque tube member. The spacing between the arms may be adjusted by using different ones of the holes in the bar members.

In another embodiment, the arms are supplied at one end with a sleeve surrounding the torque tube member, which sleeve allows the arms to be moved to various positions along the tube. A latch device mounted on each sleeve includes a spring-biased plunger which may be manipulated so as to fit into one of a number of bores

along the torque tube member whereby the arms are firmly connected to the horizontal member at various positions in order to vary their spacing.

These embodiments of the invention are illustrated in the accompanying drawings, in which:

FIG. 1 is a side elevation view of a vehicle having a refuse receiving body thereon and equipped with a front end loading mechanism;

FIG. 2 is a plan view of a torque tube assembly;

FIG. 3 is an end view thereof;

FIGS. 4 and 5 are end and front views, respectively, of an auxiliary fork arm;

FIG. 6 is a fragmentary view of one end of the torque tube assembly illustrating a fork arm attached thereto;

FIG. 7 is a cross section view through line 7—7 in FIG. 6;

FIG. 8 is a fragmentary plan view of a modified torque arm assembly;

FIG. 9 is an end view thereof;

FIG. 10 is a cross section view through line 10—10 in FIG. 8; and

FIG. 11 is a cross section view through line 11—11 in FIG. 10.

In FIG. 1 there is illustrated the type of front end loading equipment to which this invention may be applied. It is customary to use a vehicle of the character generally indicated by the numeral 2 and which is self-propelled under control of an operator located in a cab 4.

A refuse body 6 is located on the vehicle chassis behind the cab 4 and may be of any suitable type adapted to receive refuse therein, such as garbage, trash and the like, and may be provided with packer mechanism for compressing the refuse as it is deposited in the body. It is preferred that the body 6 be provided with a filling opening or hopper, indicated at 8, in the top near the front, through which the refuse may be dumped. The character of the body otherwise may be varied as desired.

The lifting mechanism used in connection with the vehicle 2, is indicated in FIG. 1 by the numeral 9, and includes a pair of lifting arms 10 spaced apart a distance substantially corresponding with the width of the cab 4. For example, these lifting arms 10 may be of gooseneck shape or of inverted U-shape, so as to extend over the top and downwardly in front and back of the cab 4 at the front portion of the vehicle substantially as illustrated in FIG. 1.

At the back of the cab 4 the lower ends of the arms 10 are fixed on a rear, horizontal torque tube or rod 12 that extends substantially from one side of the vehicle 2 to the other. The tube 12 is journalled in bearing boxes 14 which are fixedly mounted on the vehicle chassis. In this manner the arms 10 are pivotally mounted to the vehicle 2. Lever arms 16 are fixed on the tube 12 and extend downwardly therefrom. The free ends of the lever arms 16 are pivotally connected at 18 with a suitable power device 20 which, for example, may be a conventional hydraulic cylinder assembly. Each power device 20 may be pivotally connected at 22 to the base of the body 6 on the vehicle chassis by means of a suitable bracket.

At the front of the vehicle 2, the lifting arms 10 are connected by a front torque tube assembly 29 comprising a torque tube member or rod 30 which is journalled in suitable bearing boxes 32 secured to the forward ends of the arms 10. On each outside end of the tube 30 there are fixed a pair of lever arms 34 (see FIGS. 1 and 2). A power device 36, for example, a conventional hydraulic cylinder assembly, is mounted on each of the arms 10 by a bracket 38 so that the power device 36 extends along the corresponding arm 10. The free end of a piston rod 40 of the power device 36 is connected to a link 42 which in turn is connected to the pair of lever arms 34 on the end of the tube 30. A guide rod 44 is mounted on

the lift arm 10 adjacent and parallel with the piston rod 40 and has slidable therealong a guide block 46 which is attached to the free end of piston rod 40 so as to hold the latter in proper alignment for operation of the adjacent lever arms 34.

A pair of fork members 50 are rigidly mounted near the opposite ends of the tube 30 (see FIGS. 1 and 2). Bumper plates 52 may be fixed to the tube 30 and strengthened by gussets 54 so as to engage the bumper 56 of the vehicle 2 when the arms 10 are in the position illustrated in FIG. 1.

One form of container which may be employed with the lifting mechanism 9 is indicated by the numeral 60 and has closed sides, a bottom and an open top. At opposite ends of the container, and secured to the end side thereof, are open ended pockets 62 which are of suitable size and shape so as to receive therein the forks 50 of the lifting mechanism 9.

The lifting mechanism is operated as follows in order to dump the contents of the container 60 into the body 6. The power devices 36 may be actuated under the force of hydraulic pressure to rotate the lever arms 34 which in turn rotate the torque tube 30 in the bearing boxes 32 so as to properly align the forks 50 for entrance into the sleeves 62 on the container 60. The arms 10 may be pivoted about the pivotal connection at 18 by operation of the power devices 20. In order to establish connection between the lifting mechanism 9 and the container 60 while it is on the ground in front of the vehicle 2, the vehicle is maneuvered into the proper position and then the power devices 20 and 36 are operated so that the forks enter and extend through the sleeves 62, as illustrated in FIG. 1 in full lines.

The power devices 20 are operated further to swing the arms 10 upwardly wherein the container 60 is hoisted over the cab 4 and into dumping position at the top and front of the body 6. Simultaneously, the forks 50 may be actuated by the power devices 36 to rotate slightly in a counterclockwise direction, with reference to FIG. 1, so that the container 60 may be kept tilted slightly toward the vehicle but substantially upright during its swinging movement to the top of the body 6. Once the container 60 is above the hopper 8 and in the position A, shown in broken lines, the forks 50 may be actuated to rotate in a clockwise direction far enough so that the container 60 is inverted to dump the contents thereof through its open top into the body 6, as shown by position B, in broken lines.

After dumping the contents, the power devices 36 are operated to rotate the forks 50 so that the container 60 will return to position A. Then the lifting arms 10 are lowered by proper actuation of the power device 20 to set the container down in front of the vehicle 2. The vehicle may then be backed up so that the forks 50 will move out of the sleeves 62.

The above description with respect to the lifting mechanism, vehicle and container is given for exemplary purposes only so as to facilitate a clear understanding of the invention. Other types of lifting mechanism and containers may be used in connection with the invention, as will be apparent as the description proceeds. Such other types are explained in detail in Patent No. 2,900,096, for example.

It not infrequently happens that the containers to be handled by the lifting mechanism are of different sizes. If the side to side dimensions of the container vary, provision must be made to accommodate such variances so that the torque tube assembly 29, including the forks thereon, may effect a releasable connection with the container.

In order to accomplish this, the torque tube member or bar 30 is equipped with two pairs of plates 66 rigidly fixed thereon adjacent the forks 50. Each pair of plates 66 is provided with a plurality of holes 68 extending parallel to the tube 30. The holes in the plates of each pair are aligned for receiving therethrough a suitable bolt 70 which may be formed with a head 72 and provided with a retaining device such as a removable pin 74.

A pair of auxiliary fork arms or fork members 76 are adapted to be fastened to the torque tube 30 at various positions therealong. To one end of each auxiliary fork 76 there is fixed as by welding a U-shaped bracket member 78 which is opened endwise and of such dimension as to fit snugly over the tube 30 and over the pair of plates 66, as illustrated in FIGS. 6 and 7. The bracket member 78 is provided with a pair of aligned holes 80 for receiving therethrough the bolt 70.

In this manner, the auxiliary forks 76 may be firmly fastened by means of the bolts 70 at various positions along the tube 30, such positions corresponding with the holes 68 in the plates 66. The auxiliary forks 76 extend away from the tube 30 substantially parallel to the forks 50. The spacing between the auxiliary forks 76 may be adjusted as necessary to accommodate the size of various containers so that the forks 76 may fit into the sleeves 62 mounted on the containers. When large size containers are encountered, the auxiliary forks 76 may be removed from the tube 30 so that the main forks 50 may be used.

The bracket member 78 ensures a non-rotatable connection between the forks 76 and the tube 30. The relatively large contact area between the inside faces of the bracket 78 and the plates 66 resists the tendency of the forks 76 to turn around the tube 30 as the tube is rotated so that there is a minimum amount of shear force applied to the bolts 70.

If desired, the outer end of each fork 76 may be provided with a small toe member 82 which will serve to aid in retaining the forks in the sleeves 62 during lifting and lowering movements of the container.

A modified form of adjustable auxiliary forks is illustrated in FIGS. 8–11, wherein the torque tube assembly 90 is generally the same as the torque tube assembly 29, previously described, except that the forks 50 are not mounted thereon.

The assembly 90 includes a torque tube or rod 92 having mounted on the ends thereof lever arms 94 for connection to a power device such as the power device 36. Bumper plates 96 may be fixed to the tube 92 and strengthened by gussets 98.

A pair of fork arms 100 are adapted to be adjusted to various positions on the tube 92. To one end of each fork 100 there is fixed as by welding a sleeve 102 having an interior diameter slightly larger than the tube 92. Mounted on the tube 92 there are a pair of bars 104 having provided therein a series of aligned bores or holes 106. The interior of each sleeve 102 is channelled at 108 so that one bar 104 is received therein to prevent rotation of the sleeve 102 around the tube 92. Each sleeve 102 is free to slide along the tube 92, being guided by the bar 104.

Each fork 100 is equipped with a latching device 110 comprising a cylinder 112 which fits into a bore 114 in the sleeve 102 and is secured to the sleeve as by welding. A plunger 116 is slidable in the cylinder 112 and forced toward the tube 92 by a coiled spring 118 which bears against the bottom of the plunger 116 and an end closure 120 of the cylinder 112. A handle 122 extends from outside the cylinder through slots 124 therein and is connected to the plunger 116 so that the plunger may be pulled away from the tube 92.

Each fork 100 may be moved along the tube 92 to various positions corresponding with the location of the bores 106. The springs 118 force the plungers 116 in the appropriate bores 106 to hold firmly the forks 100 in place. When it is desired to move the forks to a new position, the handles 122 may be pulled to draw the plungers 116 from the bores 106 so that the sleeves 102 may slide along the tube 92. Thus, the spacing between the forks 100 may be adjusted as necessary to accommodate the size of vari-

ous containers so that the forks **100** may fit into the sleeves **62** mounted on the containers.

The adjustable fork arm structure provides a relatively simple, inexpensive and convenient solution to the problem resulting from the fact that all containers encountered by front end loading mechanism are not of the same size. The adjustable fork arms may be spaced apart easily to fit containers of various dimensions. Although the fork arms are easily adjusted, they are nevertheless firmly and safely connected to the torque tube and very satisfactorily provide an adjustable, detachable connection between a front end loading mechanism and containers of various sizes.

While the invention has been illustrated and described in certain embodiments, it is recognized that other variations and changes may be made therein without departing from the invention as set forth in the claims.

We claim:

1. In a front end loader of the character described, the combination of a pair of lifting arms, a member which is generally circular in cross section pivotally connected with respect to and extending between the lifting arms, a pair of parallel fork arms adapted to detachably engage a container, and a connection between each fork arm and the member, said connection comprising plate means fixed on the member to extend radially therefrom opposite the fork arm and having a series of holes therein, a U-shaped bracket on each fork arm adapted to be fitted over the member and the plate means and having at least one hole therein, and a bolt insertable through respective holes in the plate means and the bracket, said plate means and said bracket cooperating to prevent rotational movement of the respective fork arm in either direction relative to the member.

2. In a front end loader of the character described, the combination of a pair of lifting arms, a member which is generally circular in cross section pivotally connected with respect to and extending between the lifting arms, a pair of parallel fork arms adapted to detachably engage a container, and a connection between each fork arm and the member, said connection comprising bar means fixed on the member to extend radially therefrom opposite the fork arm and having a series of holes therein, a sleeve on each fork arm surrounding the member and provided with a channel receiving the bar means, and latch means on the sleeve for cooperation with selective holes in the bar means to prevent movement of the fork arm along the member, said bar means and said sleeve cooperating to prevent rotational movement of the respective fork arm in either direction relative to the member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,364,128	Messinger	Jan. 4, 1921
1,518,561	Carroll	Dec. 9, 1924
1,835,431	Ryerson	Dec. 8, 1931
2,421,472	Way	June 3, 1947
2,582,663	Weiss	Jan. 15, 1952
2,620,935	Christiansen	Dec. 9, 1952
2,676,722	Ulinski	Apr. 27, 1954
2,824,655	Harbers	Feb. 25, 1958
2,900,096	Dempster et al.	Aug. 18, 1959
2,950,828	Irwin	Aug. 30, 1960
2,975,918	Sharp	Mar. 21, 1961
2,975,924	Kopanski	Mar. 21, 1961

FOREIGN PATENTS

575,111	Canada	May 5, 1959