

Feb. 6, 1962

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FORK LIFT UNIT

3,019,930

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3 Sheets-Sheet 1

Fig. 1

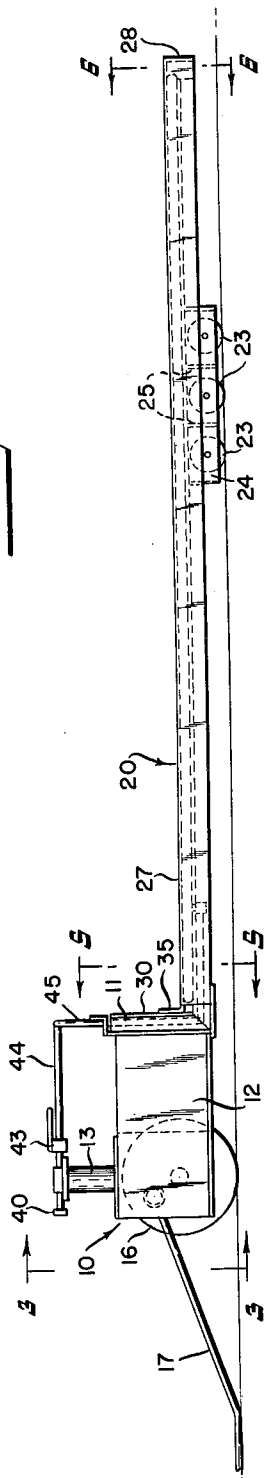
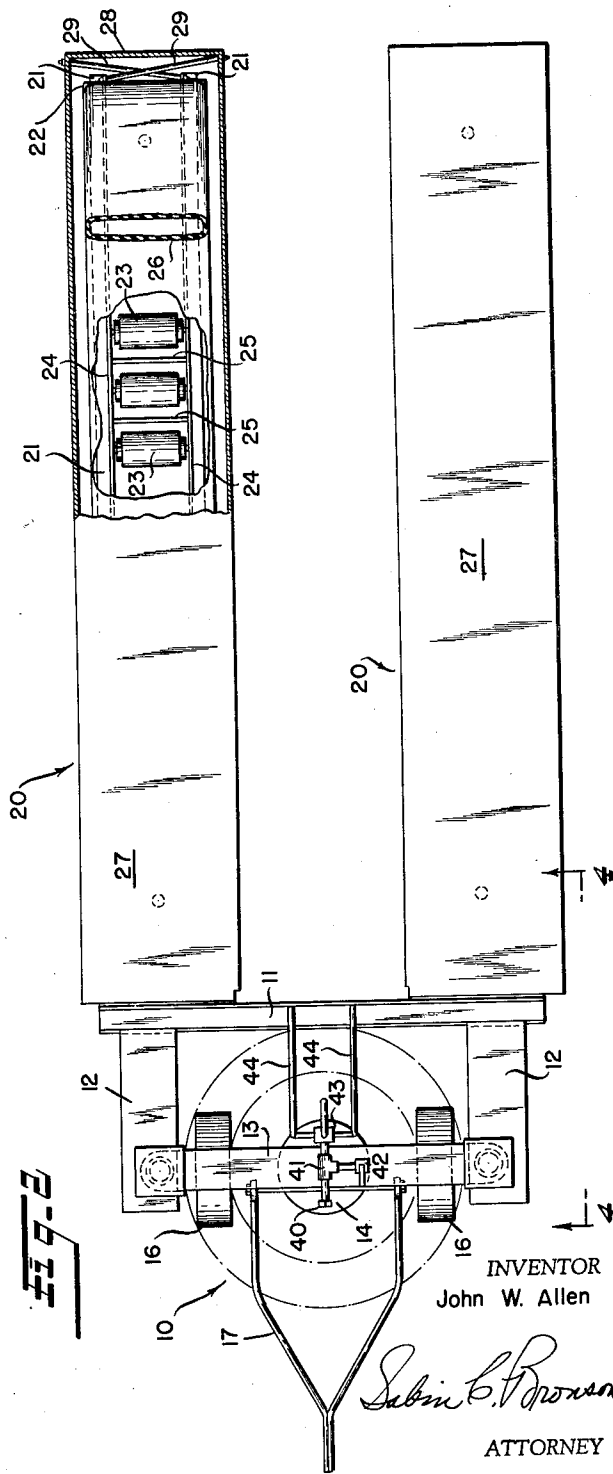


Fig. 2



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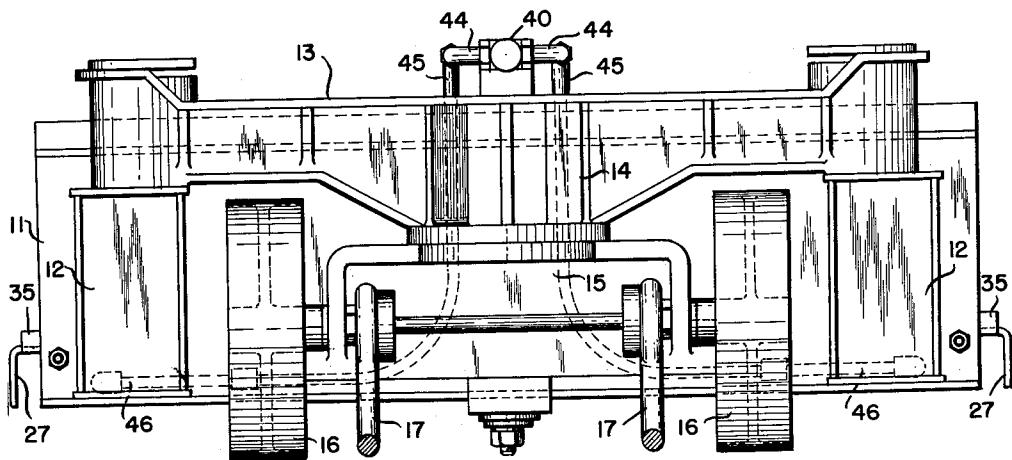


Fig. 3

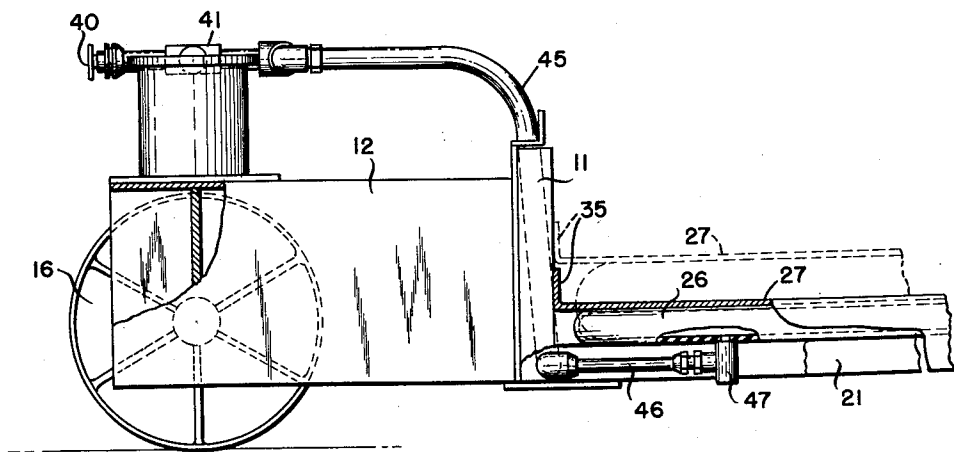


Fig. 4

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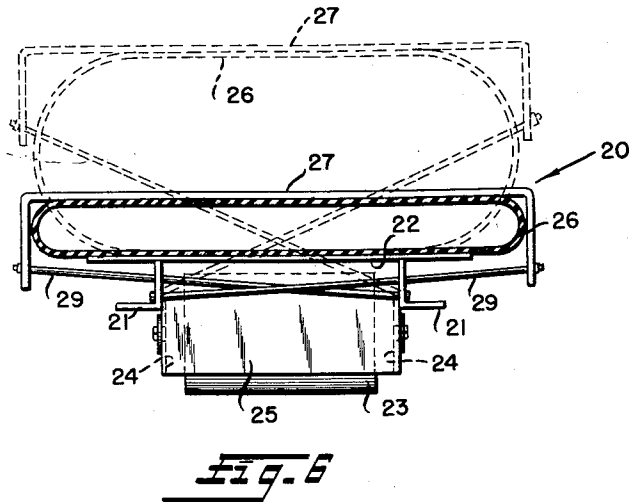
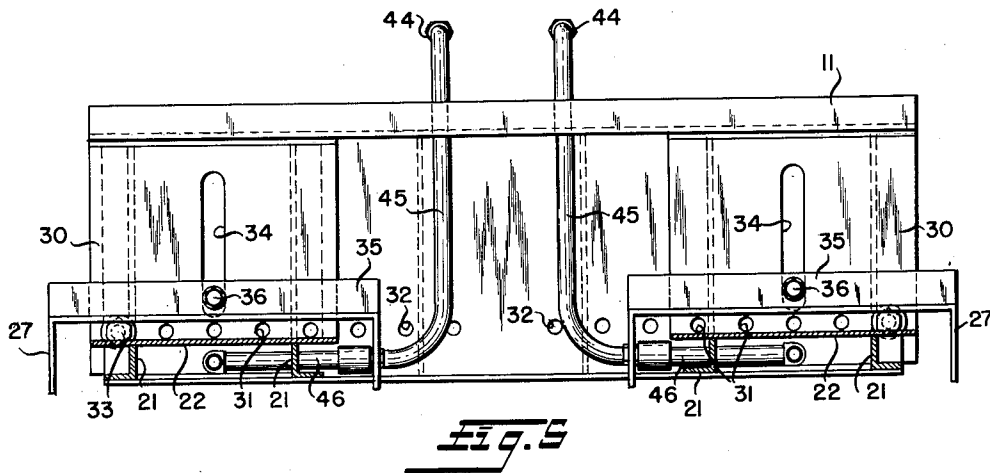
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3 Sheets-Sheet 3



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## FORK LIFT UNIT

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9 Claims. (Cl. 214-731)

The present invention relates to lift jacks and particularly to pneumatic lift jacks adapted for lifting and moving heavy objects. More specifically, the invention is directed to a fork lift unit of new and improved design which is in the form of a lift truck capable of mobile operation and including a plurality of pneumatic lift jacks in the form of forks each of which includes unique operational and design features.

It is a general object of the present invention to provide a fork lift unit of simple and rugged construction which can be readily utilized for lifting and effecting the transfer of heavy objects.

A further object is to provide a new and improved mobile fork lift unit provided with at least a pair of forwardly projecting pneumatically operated lifting forks of the expandable container type, the overall unit being of low-cost light weight design and further being exceptionally maneuverable by the provision of roller and wheel assemblies forming a part thereof, the mobility and maneuverability of the unit being such that the same is readily adapted for operation over floor or supporting surface openings without relying on the use of separate bridging means to support the same.

Still another object is to provide a new and improved fork lift unit wherein the lifting forks are of the expandable container or air bag type, the design of each lifting fork accommodating adjustable attachment thereof to the main truck portion of the unit to vary the spacing between lifting forks to accommodate variations in fork pocket spacing in a container or pallet.

Another object is to provide a new and improved fork lift unit of the type described in the foregoing objects, the unit comprising a mobile truck portion having attached thereto at least a pair of forwardly projecting lifting forks, each of the lifting forks including an expandable container or air bag for pneumatic operation thereof, the truck portion carrying container expansion means in communication with the container of each lifting fork for operation thereof, the expansion means being capable of selective or simultaneous operation of each lifting fork.

Additional objects and features of the invention pertain to the particular structure and arrangements thereof whereby the above identified objects are achieved. The invention, both as to its structure and the method of operation, will be better understood by reference to the following specification and drawings, forming a part thereof, wherein:

FIGURE 1 is a side elevation of the fork lift unit of the invention;

FIGURE 2 is a plan view of the unit of FIGURE 1 with one of the lifting forks thereof having portions partly broken away and partly sectioned;

FIGURE 3 is an end elevation of the unit of FIGURE 1 as viewed along line 3-3 therein;

FIGURE 4 is an enlarged fragmentary side elevation of the truck portion of the unit having portions thereof partly broken away and partly sectioned, this view being taken generally along line 4-4 in FIGURE 2;

FIGURE 5 is an enlarged section of the unit of FIGURE 1 taken generally along line 5-5 therein; and

FIGURE 6 is an enlarged section of a portion of the unit of FIGURE 1 taken generally along line 6-6 therein, this view further illustrating the operation of certain parts of a lifting fork in broken lines.

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Considering now the structure of the mobile pneumatic fork lift unit in accordance with the invention and referring primarily to FIGURES 1 and 2, the unit basically comprises a truck portion 10 and a pair of pneumatically operated lifting forks 20 attached to and projecting forwardly from the truck portion 10. As best shown in FIGURES 2 and 3, the truck portion 10 includes a generally U-shaped main frame formed from a transverse frame member 11 having laterally spaced frame members 12 suitably attached thereto and extending rearwardly therefrom. A yoke-like frame member 13 is suitably mounted at its ends to the frame members 12 and extends therebetween generally above the same. The yoke 13 as is best shown in FIGURE 3 includes a central wheel unit journal portion 14 having suitably pivotally journaled therein a wheel truck unit 15 comprising a pair of wheels 16. The wheel truck unit 15 further includes a fork-like guide means in the form of an elongated forwardly projecting handle 17 suitably pivotally mounted thereon.

Referring particularly to FIGURES 2, 5 and 6, each lifting fork 20 includes base plate means formed from a pair of laterally spaced, longitudinally extending angle side plates 21 interconnected across their top edges by a flat top plate 22 suitably attached to said edges of the side plates 21. The bottom horizontal flange portions of the side plates 21 project outwardly to function as guard edges to protect the bottom portions of each lifting fork from damage. The base plate means is in the form of an inverted downwardly opening channel having suitably mounted therein a roller assembly for mobile support of each lifting fork 20. The roller assembly includes a plurality of rollers 23 suitably journaled in longitudinally extending side plates 24 which are attached to the side plates 21 of the base plate structure of each lifting fork and depend downwardly therefrom. As best illustrated in FIGURES 1 and 2, the depending roller mounting side plates 24 are transversely reinforced by plates 25 to impart adequate strength to the roller assembly for the support of each lifting fork.

The top plate 22 of each lifting fork 20 supports thereon an expandable container 26 which is in the form of an inflatable bag fabricated from suitable flexible and expandable material such as heavy cloth coated with a sealer such as, for example, a nylon cloth bag coated with neoprene. In its substantially deflated condition as shown in FIGURE 6, the bag 26 is generally flat and overlaps the top plate 22 of the base plate means beyond both side edges thereof. The bag 26 is protectively encased across the top and downwardly over the opposite sides thereof by a cover plate 27 which is in the form of an inverted, downwardly opening channel member. The cover plate 27 is substantially wider than the base plate means and the depending sides thereof extend downwardly adequately to completely enclose the bag 26 in its deflated condition and thus fully protect the same.

Each lifting fork 20 is suitably attached to the truck portion 10 in a manner to be described. The various parts of each lifting fork 20 described above, with the exception of the rollers 23, extend at least substantially the full length of each lifting fork. The end of the cover plate 27 furthestmost from the truck portion 12 is provided with a transverse depending plate portion 28 (FIGURES 1 and 2) which protectively shields the end of the bag 26. The cover plate 27 and base plate means extend slightly beyond the outermost end of the bag 26 and are interconnected by guide means in the form of crossed tie flexible cables 29 which, as best shown in FIGURE 6, are suitably connected at opposite ends to opposite side flange portions of the side plates 21 of the base plate means and of the cover plate 27. The apertures (not

shown) through which the ends of the tie cables 29 extend at their points of attachment are of substantially larger diameter than that of the tie cables to permit pivoting of the cables relative to their end connections. In this manner the cables 29 will permit upward movement of the cover plate 27 relative to the base plate means during inflation of the bag 26 while controllably guiding the cover plate 27 to prevent undesirable lateral shifting of the cover plate 27 and maintain the same in protective covering relation on the bag 26. The functioning of the cables 29 is clearly illustrated in FIGURE 6 wherein inflated bag positioning of the cover plate 27 and cables 29 is shown in broken lines.

FIGURE 5 illustrates the attachment of the lifting forks 20 to the truck portion 10. The top plate 22 of each base plate means at its end adjacent the truck portion 10 is provided with an upstanding attachment flange 30 provided with a plurality of transversely spaced apertures 31 which are aligned with corresponding apertures 32 formed in the transverse frame member 11 of the truck portion 10. Any number of bolt-like fasteners 33 may be used in detachably connecting each lifting fork 20 to the transverse frame member 11 of the truck portion 10. By the provision of a plurality of apertures 32 in the transverse frame member 11, the spacing between the lifting forks 20 may be rather substantially varied. Thus one or more of the lifting forks 20 may be moved toward or away from one another as long as the apertures 31 of the flanges 30 of the base plate means become aligned with a suitable number of apertures 32 in the transverse member 11 of the truck portion 10 for attachment purposes.

The flange plates 30 extend substantially upwardly and each is provided with a vertical guide slot 34. The end of each cover plate 27 adjacent a flange 30 is provided with an upstanding integral end flange 35 carrying a bolt-like guide means 36 which extends into the guide slot 34. Thus upon inflation of the bag 26 and vertical lifting of the cover plate 27, the end of the cover plate adjacent the truck portion 10 is guided vertically by the guide 36 received within the guide slot 34.

Container expansion means used with the fork truck unit of the present invention may be of any suitable type. Preferably, as shown in FIGURES 1-4, the expansion means includes an inlet valve 40 suitably mounted on the yoke 14 and in communication with a T 41 (FIGURE 2) which connects an air release valve 42 into the piping system of the expansion means. The expansion means further includes a 3-way valve 43 mounted to control the delivery of air through branch air lines 44 for inflation of the individual bags 26 of the lifting forks 20. As best shown in FIGURE 5, the lines 44 include flexible line portions 45 which extend downwardly across the transverse frame member 11 of the truck portion into communication with air line portions 46 which are suitably mounted in the base plate means of each lifting fork 20. Referring to FIGURE 4, the lines 46 communicate with an air inlet coupling 47 suitably attached to the bag 26 to deliver air thereinto for inflation of the bag and to remove air therefrom during deflation of the bag. The provision of the flexible line portions 45 permit variable spacing of the lifting forks 20 in the manner previously described without necessitating air line disconnection.

The fork lift unit described above is fully and efficiently mobile by reason of the cooperative functioning of the wheel unit 15 and the roller assemblies including the rollers 23 of the lifting forks 20. It is preferred that the relatively large number of rollers 23 be used to reduce the concentration of load on the floor surface during operative lifting use of the unit. The rollers 23 are located and arranged to equally bear the lifting load of the unit applied thereto. The unit is highly mobile due to the pivotal mounting of the wheel truck 15 and with the provision of the roller assemblies on the lifting forks 20, the unit will efficiently operate over floor openings or short gaps be-

tween a loading dock or flat car without the necessity of using a separate bridging element. With adjustment of the spacing between the lifting forks 20, the unit is not limited to use with fork pockets of specified spacing in different types of containers or pallets. The air bags 26 provide uniform lifting pressure to a load and distribute the load throughout the entire length of the lifting forks. Inflation of the air bags as well as deflation thereof may be selectively controlled by the 3-way valve 43. Operation of this valve will provide for inflation or deflation of any single designated lifting fork 20 as well as provide for simultaneous and uniform inflation or deflation of both of the lifting forks 20.

While the embodiment described herein is at present considered to be preferred, it is appreciated that variations and modifications may be made therein. Accordingly, it is intended to cover in the appended claims all such modifications and variations as fall within the true spirit and scope of the invention.

I claim:

1. A fork lift unit for lifting and moving heavy objects, comprising a truck portion having at least a pair of forwardly projecting lifting forks attached thereto, each of said forks including a base channel member, an elongated expandable container supported on said channel member, and a cover plate overlying said container for movement relative to said base plate means upon expansion of said container, and adjustable means attaching said lifting forks to said truck portion whereby the spacing between said lifting forks may be varied, said truck portion carrying container expansion means in communication with the container of each lifting fork for operation thereof.

2. The fork lift unit of claim 1, wherein said truck unit includes a U-shaped frame having a yoke-like means mounted across the leg portions thereof, a wheel unit pivotally mounted on said yoke-like means, and wheel unit guide means attached to said wheel unit.

3. The fork lift unit of claim 1, wherein the base plate means of each lifting fork is in the form of an inverted downwardly opening channel, a roller assembly mounted in said channel spaced from said truck portion to aid said truck portion in mobile support of said lifting fork, the end of said channel adjacent said truck portion having an upstanding flange attached to said truck portion by means of said connection means, said cover plate having first guide means attached to the flange of said base plate means and further guide means interconnecting said cover plate and base plate means near the outer end of said lifting fork to control vertical movement of said cover plate relative to said base plate means during operation of said container.

4. The fork lift unit of claim 1, wherein the base plate means of each lifting fork is in the form of an inverted downwardly opening channel, a roller assembly mounted in said channel spaced from said truck portion to aid said truck portion in mobile support of said lifting fork, the end of said channel adjacent said truck portion having an upstanding flange attached to said truck portion by means of said connection means, said cover plate being in the form of an inverted downwardly opening channel protectively encasing said container and having first guide means slidably received in slot means formed in the flange of said base plate means and further guide means in the form of crossed pivotal tie members interconnecting said cover plate and base plate means near the outer end of said lifting fork to control vertical movement of said cover plate relative to said base plate means during operation of said container.

5. A fork lift unit for lifting and moving heavy objects, comprising a truck portion having at least a pair of forwardly projecting elongated lifting forks attached thereto, each of said forks including an inverted channel base plate member an expandable container supported thereon, and a cover plate overlying said container for movement relative to said base plate member upon ex-

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pansion of said container, and adjustable means attaching said lifting forks to said truck portion whereby the spacing between said lifting forks may be varied, said truck portion carrying container expansion means in communication with the container of each lifting fork for operation thereof, said expansion means including a three-way valve for selective and simultaneous operation of said containers.

6. A fork lift unit for lifting and moving heavy objects comprising a truck portion having at least a pair of forwardly projecting lifting forks attached thereto, each of said forks including an elongated base channel member, an elongated expandable container supported thereon, and an elongated cover channel plate member on said container mounted for movement relative to said base channel member upon expansion of said container, said truck portion carrying container expansion means in communication with the container of each lifting fork for operation thereof, said last mentioned means including a three-way valve for selective and simultaneous control of said containers.

7. A fork lift unit for lifting and moving heavy objects comprising a truck portion having at least a pair of forwardly projecting elongated narrow lifting forks attached thereto, each of said forks including an elongated downwardly facing channel base plate member, an elongated expandable container supported on said base plate member, a cover plate overlying said container and mounted for movement relative to said base plate member upon expansion of said container, means carried by the truck portion in communication with each container for selectively expanding the container of each lifting fork for operation thereof, a U-shaped frame having yoke-like means mounted across the leg portions thereof, a wheel unit mounted on said yoke like means, and guide means attached to said wheel unit.

8. A fork lift unit for lifting and moving heavy objects comprising a truck portion having at least a pair of forwardly projecting lifting forks attached thereto, each of said forks including base plate means, an expandable container supported thereon, a cover plate on said container mounted for movement relative to said base plate means upon expansion of said container, said truck portion carrying container expansion means in communication with the container of each lifting fork

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for operation thereof, the base plate means of each lifting fork being in the form of an inverted downwardly opening channel, a roller assembly mounted in said channel spaced from said truck portion to aid said truck portion in mobile support of said lifting fork, the end of said channel adjacent said truck portion having an upstanding flange attached to said truck portion, said cover plate having first guide means attached to the flange of said base plate means, and further guide means interconnecting said cover plate and base plate means near the outer end of said lifting fork to control vertical movement of said cover plate relative to said base plate means during operation of said container.

9. A fork lift unit for lifting and moving heavy objects comprising a truck portion having at least a pair of forwardly projecting lifting forks attached thereto, each of said forks including base plate means, an expandable container supported thereon, a cover plate on said container mounted for movement relative to said base plate means upon expansion of said container, said truck portion carrying container expansion means in communication with the container of each lifting fork for operation thereof, the base plate means of each lifting fork being in the form of an inverted downwardly opening channel, a roller assembly mounted in said channel spaced from said truck portion to aid said truck portion in mobile support of said lifting fork, the end of said channel adjacent said truck portion having an upstanding flange attached to said truck portion, said cover plate being in the form of an inverted downwardly opening channel protectively encasing said container and having first guide means slidably received in slot means formed in the flange of said base plate means, and further guide means in the form of crossed pivotal tie members interconnecting said cover plate and base plate means near the outer end of said lifting fork to control vertical movement of said cover plate relative to said base plate means during operation of said container.

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