

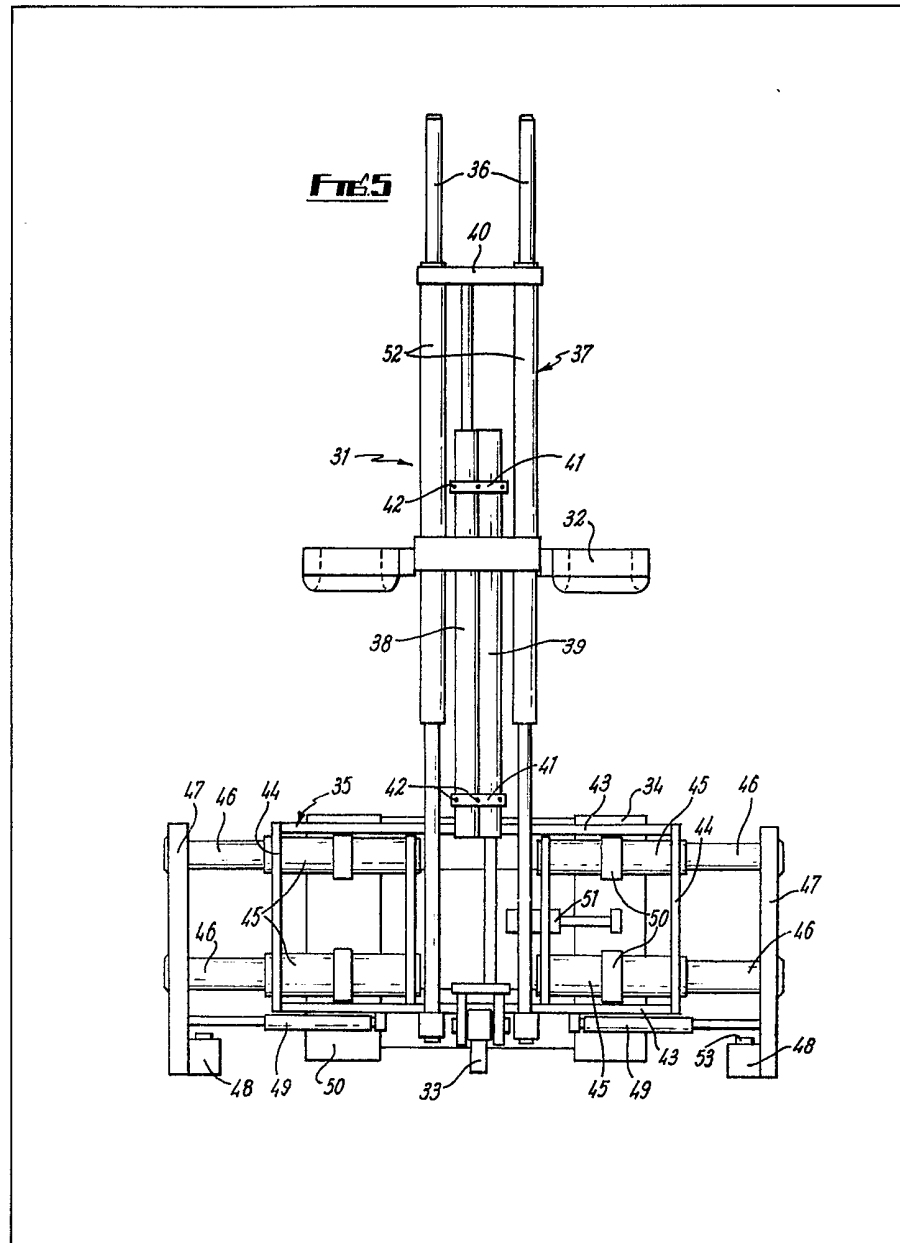
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(54) **Conveying apparatus**

(57) Apparatus (31) for attachment to a fork-lift truck (30) for the conveying of articles such as pallet loads, beer barrels or the like comprises a chassis (35), a load stabilizer device (32) slidably mounted on upstanding posts (36) of the chassis (35) and at least two double acting piston/cylinder devices (38, 39) for raising and lowering the stabilizer device (32). The cylinders of the piston/cylinder devices (38, 39) are secured to

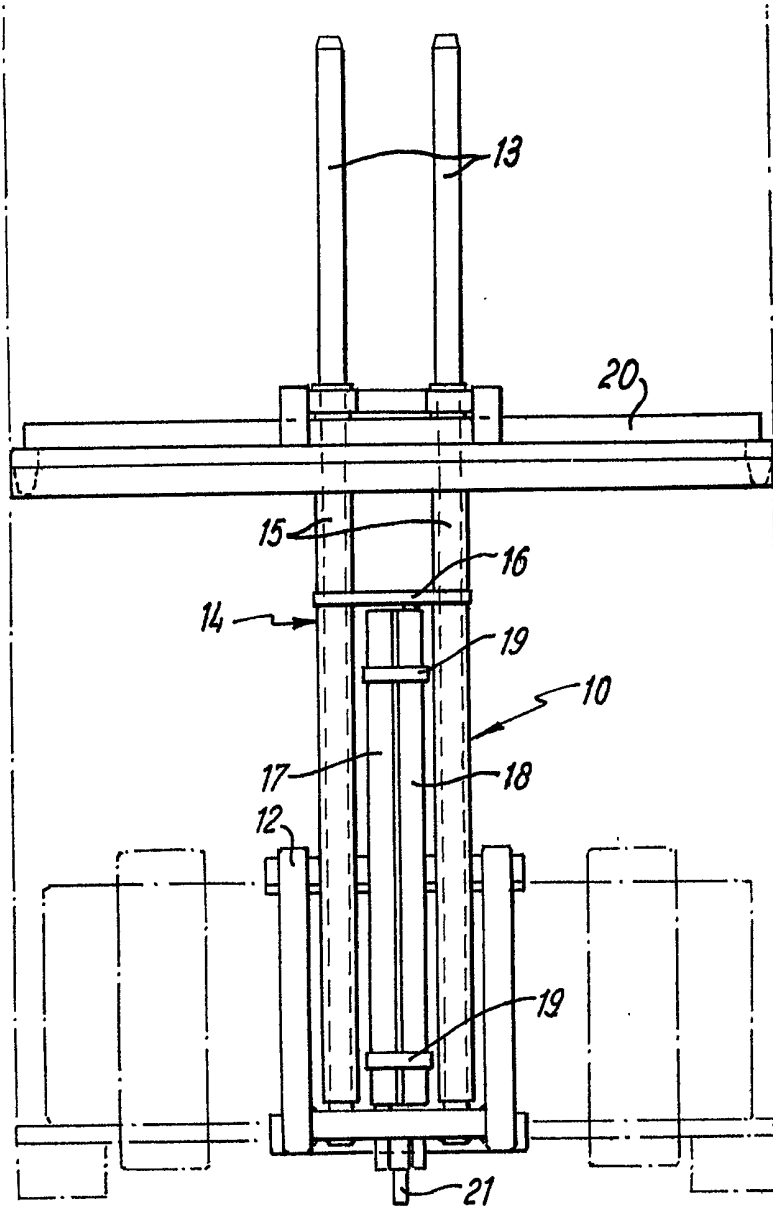
each other in side-by-side disposition with the pistons extending in opposed directions, giving a large range of load height which may be carried whilst the devices (38, 39) are contained within the dimensions of the apparatus (31). The load may be carried by tines (48, 33), the outer ones (48) of which are movable outwardly to accommodate differing sized loads and the inner one (33) being detachable or pivotal to an inop-

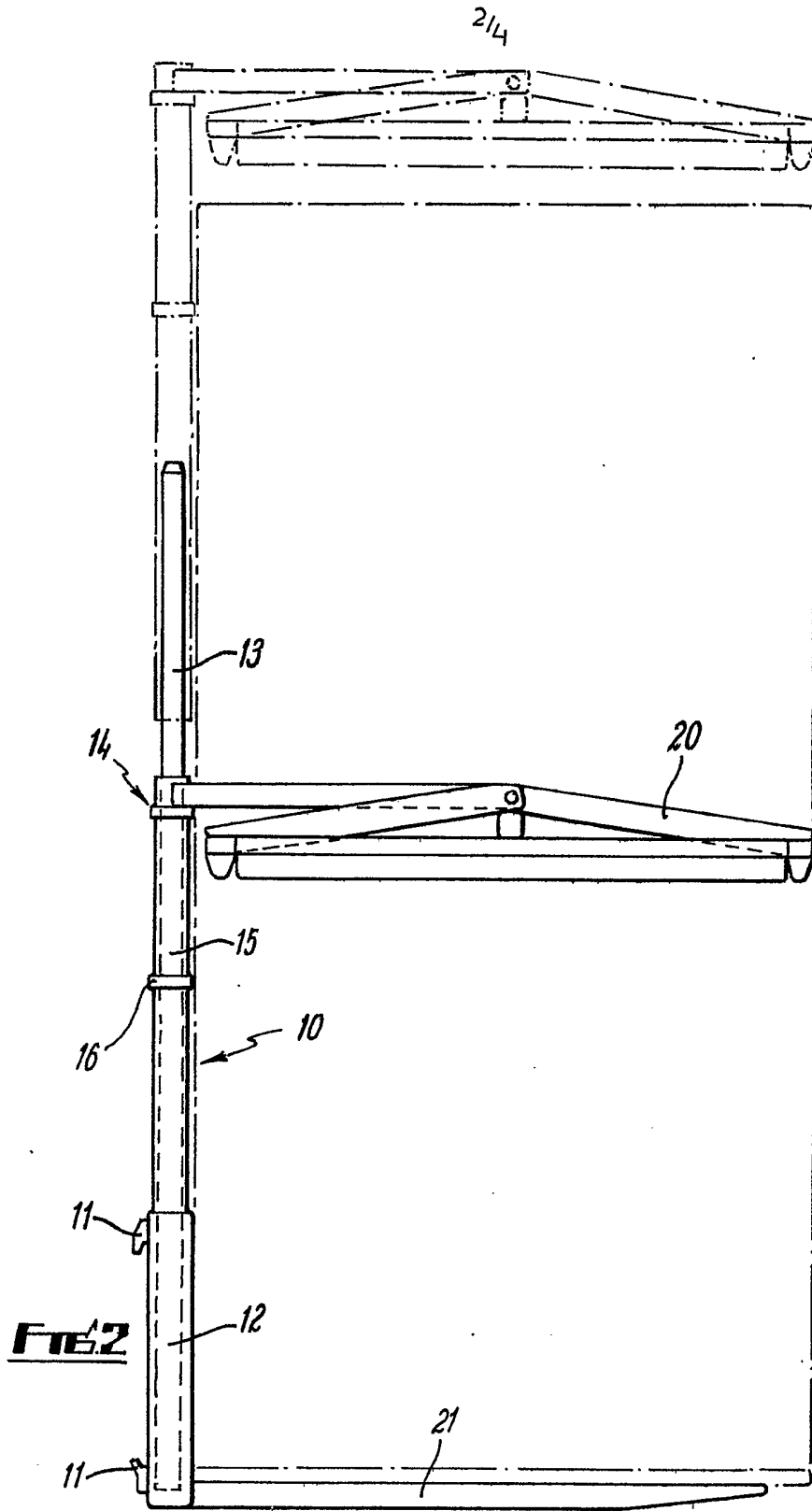
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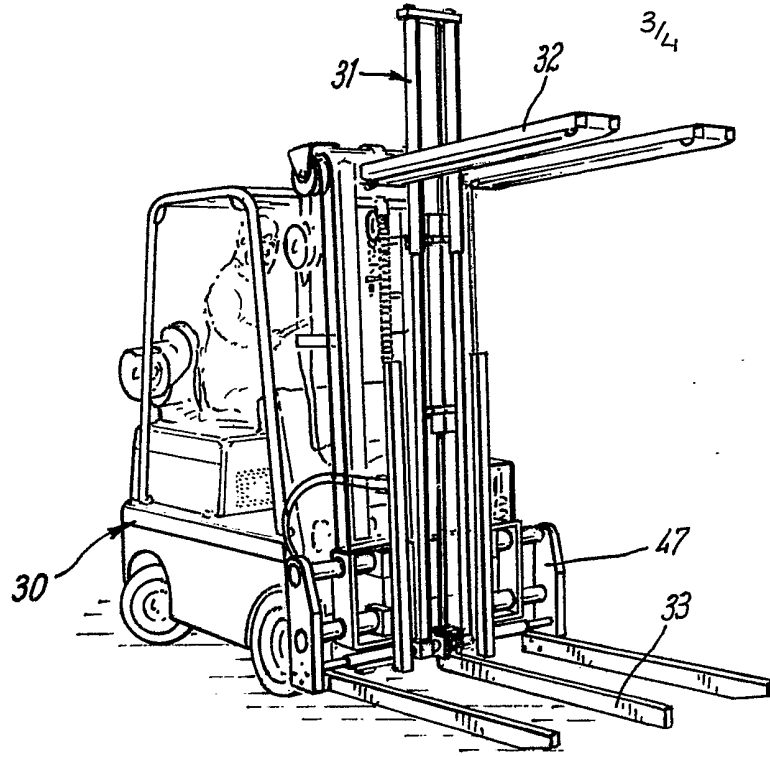


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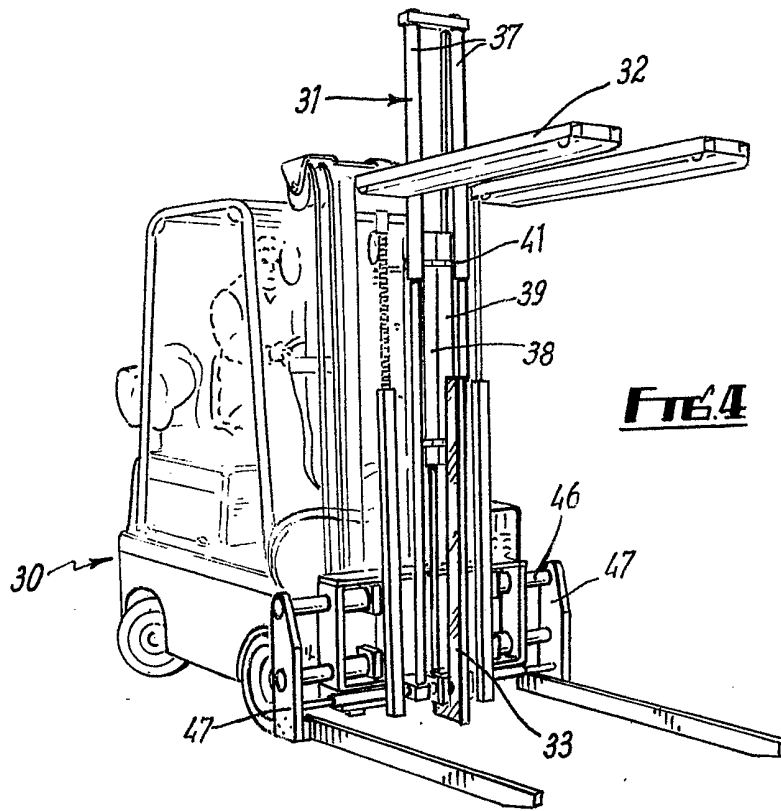
erative position if not required. The chassis (35) carrying the stabilizer device (32) and the tines (48, 33) may be movable laterally of a frame (34) for correct positioning of the load.

$\frac{1}{4}$ **FIG. 1**





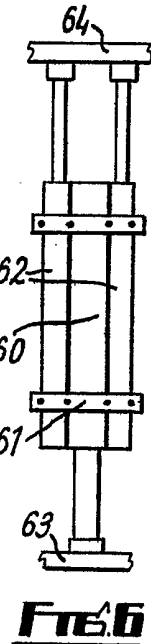
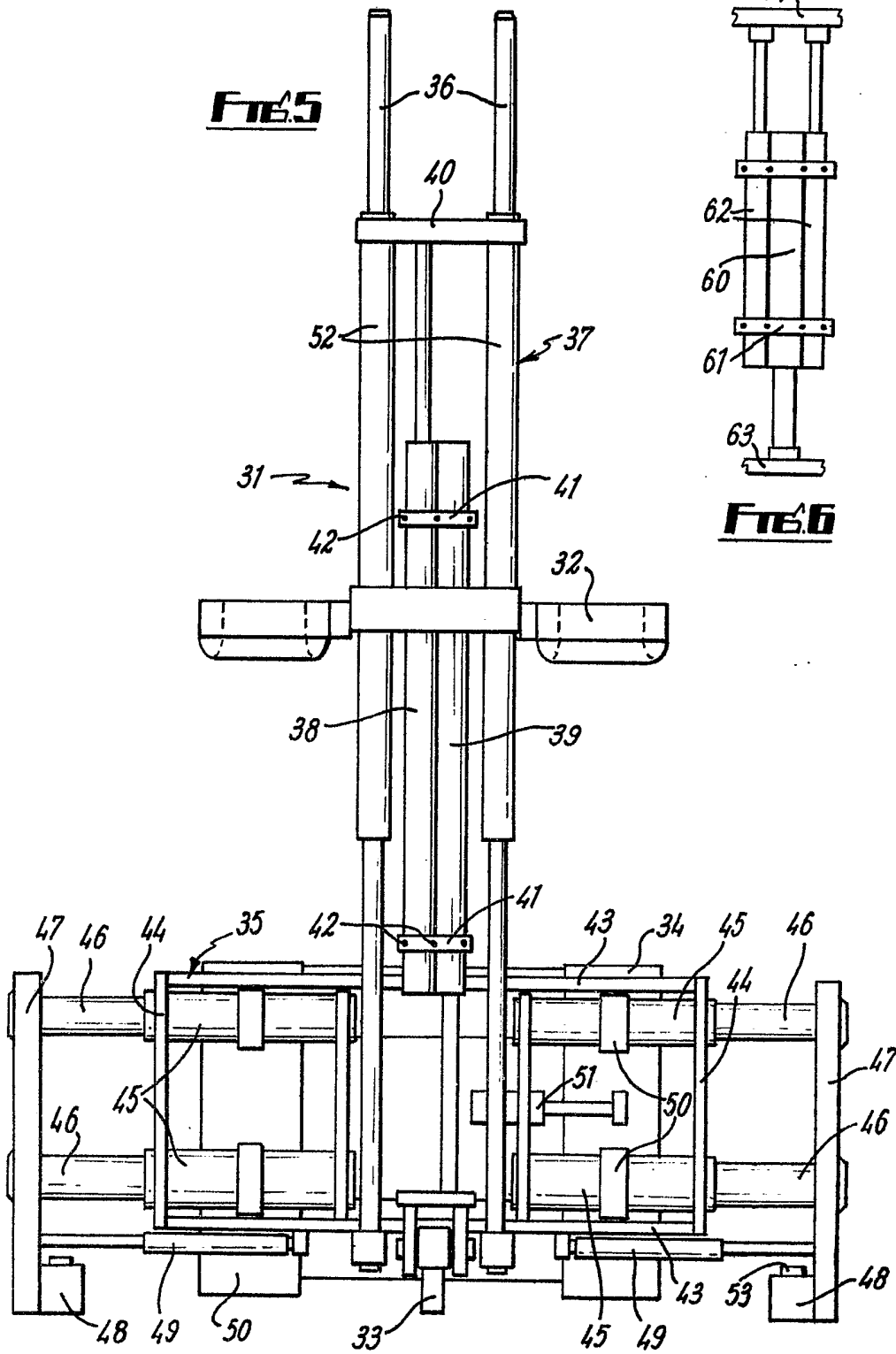
**Fig 3**



**Fig 4**

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**FIG. 5**



## SPECIFICATION

**Conveying apparatus**

5 This invention relates to conveying apparatus, and in particular to apparatus for use in conveying articles by means of a fork lift truck. The apparatus of the invention has particular application to the lifting and transporting of articles such as beer barrels which

10 may have varying width in a vertical direction, as well as straight sided articles and pallets.

For transporting such articles it is customary to provide a plurality of tines, usually two or three, extending forwardly of the fork lift truck and the

15 lateral spacing of such tines may be adjustable so as to accommodate articles of different size between the tines. However, particularly in the case of stacks of articles, there is a tendency for one or more articles to tip and fall from the tines. In order to

20 counteract such a tendency a load stabilizer may be provided. Such a load stabilizer takes the form of a plate or the like which is pressed against the top of the articles being carried before lifting the same so as to prevent tilting thereof as the articles are

25 transported.

Known load stabilizers are of appreciable weight and are supported on the front of the chassis on which the tines are mounted. In consequence the weight of the stabilizer and its location forward of the front wheels of the truck represent a severe limitation on the usable payload of the vehicle. A further disadvantage of known arrangements is that in order to accommodate a large range of load sizes hydraulic piston/cylinder devices are used which of

30 necessity have a long stroke. This means that if the piston/cylinder device is contained within the overall dimensions of the vehicle, small loads cannot be accommodated since the cylinder size restricts the lowering of the stabilizer. If small loads are to be accommodated the large cylinder required to provide an adequate stroke must be disposed largely

40 outside the overall dimensions of the vehicle. In either case there are disadvantages.

In order to overcome such disadvantages it has been proposed to use double extension piston/cylinder devices. However in the context of load stabilizers for fork lift trucks it is essential that the piston/cylinder devices are double acting so that pressure can be applied to the top of the load being

50 carried. The provision of double acting double extension piston/cylinder devices is expensive and leads to very large diameter cylinders, and in consequence does not provide a satisfactory solution to the problem.

It is an object of the present invention to provide conveying apparatus for use with a fork lift truck in which such disadvantages are avoided or mitigated to a substantial extent.

The invention provides apparatus for use in conveying articles, said apparatus comprising a chassis, a load stabilizer device mounted on said chassis for movement relative thereto towards and away therefrom, and means for effecting said movement comprising a plurality of piston/cylinder devices

65 having their cylinders secured to each other in

side-by-side disposition and the pistons of at least two of said devices extending in opposed directions.

Two piston/cylinder devices may be provided with their cylinders secured to each other in side-by-side disposition and their pistons extending in opposed directions in which case the devices may have substantially the same diameters and strokes. Alternatively three piston/cylinder devices may be provided, in which case they may be disposed with two

70 outer devices having substantially the same diameters and strokes and their pistons extending in one direction and an inner device disposed between the two outer devices, having substantially the same stroke but being of larger diameter than the two

75 outer devices, and having its piston extending in the opposite direction to those of the two outer devices. Preferably the two outer devices have in combination substantially the same load capacity as said inner device.

The apparatus may comprise supporting means for said articles, and said supporting means may be mounted on said chassis, and may comprise a plurality of tines. The supporting means may comprise two tines disposed in spaced, substantially

85 parallel disposition. The apparatus may also include a third tine disposed between said two tines, in which case said third tine may be hingedly secured to said chassis so as to be pivotal between operative and inoperative positions in which it is substantially

90 parallel with and transverse to the said two tines respectively.

The invention also provides a fork lift truck having apparatus as aforesaid mounted thereon. The apparatus may be fixedly mounted thereon or alternatively

100 the chassis of said apparatus may be mounted on a frame of said fork lift truck for lateral displacement relative to said frame.

The invention will now be further described with reference to the accompanying drawings in which:-

105 *Figure 1* is a front elevation of a first embodiment, *Figure 2* is a side elevation of the embodiment of *Figure 1*,

*Figure 3* and *4* are perspective views of a fork lift truck incorporating a second embodiment with a centre tine in operative and inoperative positions respectively,

*Figure 5* is a front elevation of the embodiment of *Figures 3* and *4* and

*Figure 6* is a scrap view of an alternative arrangement of piston/cylinder device for use in either of the above embodiments.

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Referring now to *Figures 1* and *2* there is shown apparatus 10 which is adapted for mounting on a frame of a fork lift truck (partly shown in dashed lines in *Figure 1*) by means of mounting attachments 11 as shown in *Figure 2*. The apparatus 10 comprises a chassis 12 on which are mounted two upstanding posts 13. A carriage 14 comprises two tubes 15 secured in spaced parallel disposition by a cross

120 beam 16. Tubes 15 are a sliding fit on posts 13 so that the carriage 14 is sliding fit on posts 13 so that the carriage 14 is slidable towards and away from chassis 12. This movement is effected by two piston/cylinder devices 17, 18, the cylinders of which are secured to each other in side-by-side disposition

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by yokes 19. The piston of device 17 extends downwardly and is secured to the chassis 12. The piston of device 18 extends upwardly and is secured to cross beam 16. Attached to the carriage 14 at the upper ends of tubes 15 is a load stabilizer 20 which occupies the position shown in full lines in Figure 2 when devices 17, 18 are retracted and occupies the position shown in dashed lines in Figure 2 when the devices 17, 18 are extended.

The devices 17, 18 are double acting so that pressure may be applied to the top of a load during lifting and transportation thereof. By means of the arrangement shown the range of height of load which may be carried by a fork lift truck using the stabilizer 20 is twice the stroke of each piston/cylinder device 17, 18. In consequence the devices 17, 18 may be contained within the dimensions of the apparatus 10 whilst providing a relatively large range of height of load which may be carried. Furthermore the devices 17, 18 are relatively small and inexpensive devices by comparison with equivalent double acting double extension devices proposed heretofore.

With the device 10 in use the load would be carried by the tines of the fork lift truck to which the device is attached. Such an arrangement may be adequate for pallet supported loads and certain other types of loads. However for other types of loads, for example beer barrels, a third central tine may be required. In the embodiment of Figures 1 and 2 a central tine 21 is provided. The tine 21 is hingedly mounted at the base of the chassis 12 so that it can be pivoted to a vertical position adjacent the devices 17, 18 when not required. Alternatively the tine 21 may be detachable for this purpose.

Referring now to Figures 3 and 4 there is shown a fork lift truck 30 with a second embodiment 31 of apparatus in accordance with the invention mounted thereon. The figures 3 and 4 illustrate the apparatus 31 with the load stabilizer 32 in the raised position and with a central tine 33 in the operative and inoperative positions respectively. The details of the apparatus 31 are more clearly shown in Figure 5.

In Figure 5 the load stabilizer 32 is in an intermediate position and the central tine 33 is in the operative position. The apparatus 31 is mounted by means of a frame 34 on a fork lift truck and comprises a chassis 35 on which central tine 33 is hingedly mounted.

Also mounted on chassis 35 are two posts 36 on which the carriage 37 is slidably retained. Carriage 37 is of similar construction to carriage 14 of the embodiment of Figures 1 and 2 and carries the load stabilizer 32 in like manner. The piston/cylinder devices 38, 39 raise and lower the stabilizer 32 as in the previous embodiment, the piston of device 38 being connected to cross beam 40 and the piston of device 39 being connected to chassis 35. The cylinders of devices 38, 39 are secured to each other in side-by-side disposition by yokes 41 through which bolts 42 pass. In order to further secure the cylinders of devices 38, 39 against relative movement in a longitudinal direction the bolts 42 engage grooves (not shown) provided in the walls of the cylinders.

The chassis 35 is of rectangular configuration and

comprises top and bottom beams 43 and two pairs of upright webs 44. At each side of the chassis 35, between the respective pair of webs 44 are mounted two tubes 45. Slidably received in the tubes 45 are rods or inner tubes 46 on which a sidearm 47 is mounted, and each sidearm 47 carries a tine 48 at its lower end. The sidearms 47 and tines 48 may be moved inwardly or outwardly by means of piston/cylinder devices 49 each of which is secured to a sidearm 47 and the chassis 35.

The tubes 45 are engaged in bearings 50 which are mounted on the frame 34, and a further piston/cylinder device 51 is attached to the frame 34 and to the chassis 35.

In general the apparatus 31 will be disposed centrally with respect to the fore and aft centre line of the fork lift truck to which it is attached. A load is approached with the central tine 33 in its operative or inoperative position as required by the nature of the load. The lateral disposition of the outer tines 48 may be adjusted by actuation of devices 49 if a pallet load is to be lifted. Alternatively the tines 48 may be moved to the outside of the load, for example in the case of beer barrels and then caused to be moved inwardly to grip the load. If the stabilizer 32 is not required the devices 38, 39 may be extended fully so that the stabilizer does not interfere with the load. If however the stabilizer is required the devices 38, 39 are retracted to apply a pressure to the top of the load. The load may then be transferred as required. If the fork lift truck is not positioned accurately with respect to the unloading station the whole apparatus 31 may be moved laterally by actuation of device 51 which causes movement laterally relative to frame 34 of chassis 35 together with tines 33 and 48, posts 36 and stabilizer 32. By this means the load may be moved laterally for accurate positioning prior to unloading.

In the embodiment shown in Figures 1 and 2 the stabilizer 20 is attached to the top of tubes 15 so that there is little structure above the top of the load when the largest size of load is being carried. This is of particular importance in the case of loading curtain sided transport vehicles which could otherwise not be loaded to capacity with light but large loads. However, in that embodiment very small loads cannot be carried if the stabilizer is required to maintain stability of the load. In the embodiment of Figures 3 to 5 smaller loads may be carried using the stabilizer 32 since it is secured to tubes 52 of carriage 37 at a mid location. The height of the tubes 52 above stabilizer 32, together with the cylinder length of devices 38, 39 governs the lowest height of the stabilizer 32 and hence the smallest load to be carried whilst making use of the stabilizer. The cylinder length of devices 38, 39 and hence their stroke, governs the largest height of loads which can be carried. In this regard, to give a large range of movement of the stabilizer 32 without excessively long piston/cylinder devices 38, 39, a more compact and simple arrangement is achieved with the stabilizer 32 attached to the tubes 52 and the latter sliding on fixed posts 36 than with the reverse arrangement of fixed tubes and movable posts.

The tines 48 may have stops 53 welded thereto



near to their attachment to side arms 47 to limit the positioning of a load rearwardly, thus protecting the apparatus 31 and the associated fluid pressure lines from damage by the load. In the case of the

5 embodiment of Figures 1 and 2, which may be considered as a detachable accessory for a fork lift truck, the fluid pressure lines to the devices 17, 18 preferably include self-sealing quick release coupling for connection to the hydraulic circuit of the  
10 fork lift truck.

Referring now to Figure 6 there is shown an alternative arrangement for the piston/cylinder devices to those 17, 18 of Figures 1 and 2 or 38, 39 of Figure 5. In this case a central device 60 is secured by  
15 yokes 61 to two outer devices 62. The central device 60 extends downwardly and its piston is secured to a chassis 63 corresponding with chassis 12 or 35 of the previous embodiments. The outer devices 62 extend upwardly and their pistons are connected to a cross  
20 beam 64 corresponding with cross beams 16 or 40 of the previous embodiments. Whilst in the previous embodiments the two devices concerned were of substantially the same diameter and stroke, in this embodiment the devices have substantially the  
25 same stroke, but the outer devices 62 are of like diameter but which is smaller than that of the central device 60. The devices 62 in combination have the same load characteristics as the central device 60. Other combinations of devices may be used if  
30 desired, the combination of Figure 6 having a reduced tendency to provide an unbalanced loading on the cross beam 64 than the arrangement of Figures 1 or 5.

### 35 CLAIMS (filed on 16.2.83)

1. Apparatus for use in conveying articles comprising a chassis, a load stabilizer device mounted on said chassis for movement relative thereto to-  
40 wards and away therefrom, and means operable to effect said movement comprising a plurality of piston/cylinder devices having their cylinders secured to each other in side-by-side disposition and the pistons of at least two of said devices extending  
45 in opposed directions.

2. Apparatus according to claim 1 wherein said stabilizer device is slidably mounted on posts up-  
standing from said chassis.

3. Apparatus according to claim 1 or claim 2  
50 comprising two piston/cylinder devices having their cylinders secured to each other in side-by-side disposition and their pistons extending in opposed directions.

4. Apparatus according to claim 3 wherein said  
55 piston/cylinder devices have substantially the same diameter.

5. Apparatus according to claim 4 wherein said piston/cylinder devices have substantially the same  
stroke.

6. Apparatus according to claim 1 or claim 2  
65 comprising three piston/cylinder devices having their cylinders secured to each other, two of said devices having their pistons extending in one direction opposed to that in which the piston of the other  
of said devices extends.

7. Apparatus according to claim 6 wherein said two devices are of like diameter and stroke.

8. Apparatus according to claim 7 wherein said other device is of like stroke to that of said two  
70 devices.

9. Apparatus according to claim 7 or claim 8 wherein said other device is of larger diameter than said two devices.

10. Apparatus according to claim 9 wherein said  
75 two devices have in combination substantially the same load capacity as said other device.

11. Apparatus according to claim 10 wherein said two devices are disposed on opposed sides of said other device.

12. Apparatus according to any one of claims 1 to 11 wherein each of said piston/cylinder devices is double acting.

13. Apparatus according to any one of claims 1 to 12 comprising supporting means for said articles.

85 14. Apparatus according to claim 13 wherein said supporting means is mounted on said chassis.

15. Apparatus according to claim 13 or claim 14 wherein said supporting means comprises a plurality of tines.

90 16. Apparatus according to claim 15 wherein said supporting means comprises two tines mounted in spaced, substantially parallel disposition.

17. Apparatus according to claim 16 wherein the spacing of said tines is adjustable.

95 18. Apparatus according to claim 16 or claim 17 wherein said supporting means comprises a third tine mounted between said two tines.

19. Apparatus according to claim 18 wherein said third tine is mounted so as to be pivotal  
100 between operative and inoperative positions in which it extends respectively substantially parallel with and transverse to said two tines.

20. Apparatus according to claim 18 wherein said third tine is detachably mounted.

105 21. A fork-lift truck having apparatus according to any one of claims 1 to 20 mounted thereon.

22. A fork-lift truck according to claim 21 wherein said chassis is mounted on a frame of said truck for lateral displacement relative to said frame.

110 23. A fork-lift truck according to claim 22 including means for effecting said lateral displacement.

24. Apparatus for use in conveying articles substantially as hereinbefore described with reference to Figures 1 and 2, or Figures 3, 4 and 5 or those  
115 Figures as modified by Figure 6.

25. A fork lift truck substantially as hereinbefore described with reference to or as illustrated in Figures 3 and 4 or those Figures as modified by Figures 1 and 2 or Figure 5 or Figure 6.