

Feb. 5, 1952

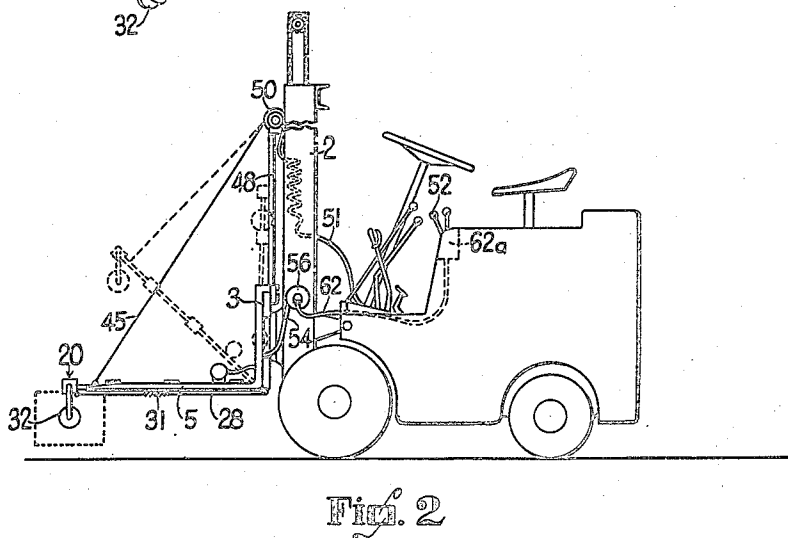
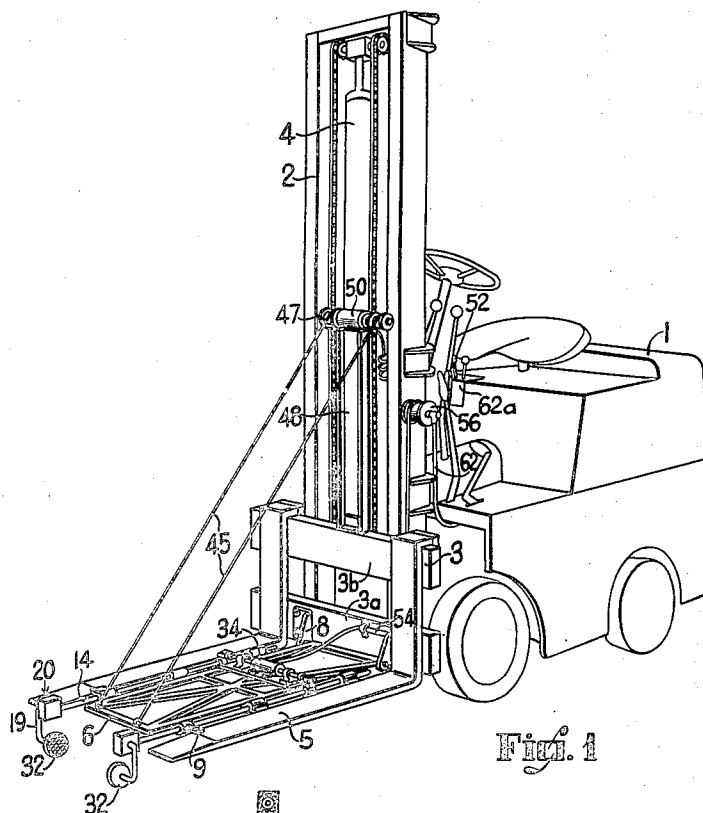
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2,584,870

ATTACHMENT FOR FORK LIFT TRUCKS

Filed June 15, 1948

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

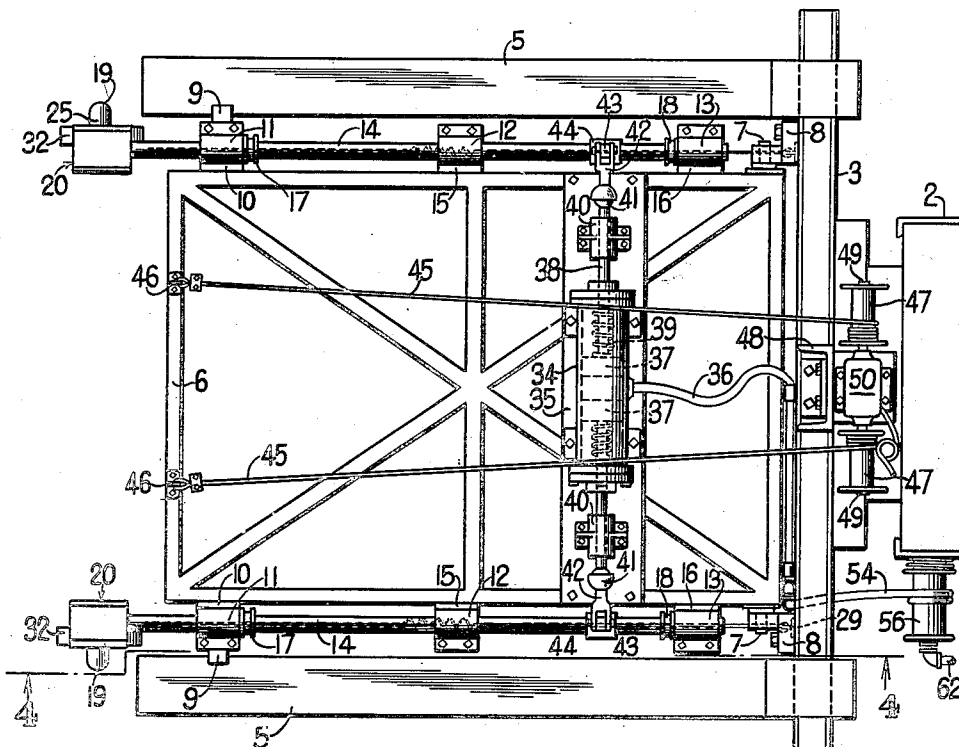


Fig. 3

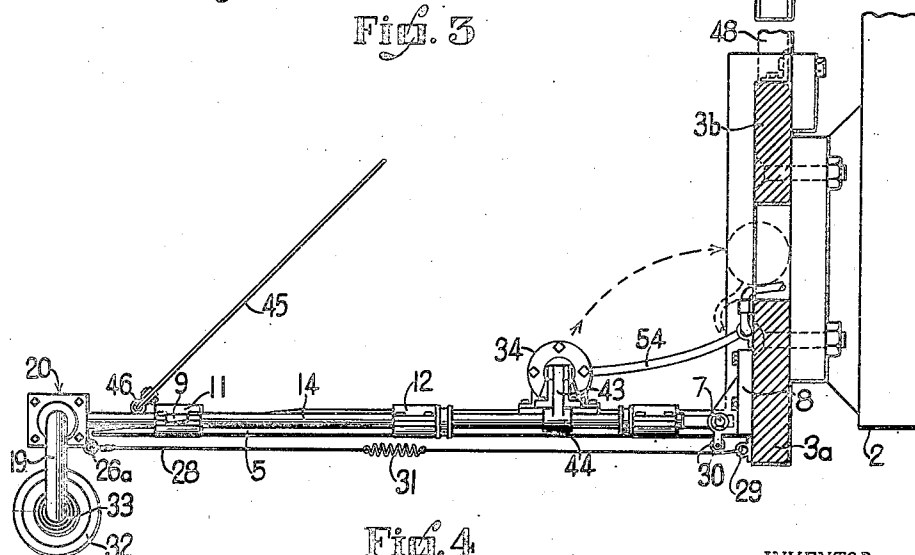


Fig. 4

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4 Sheets-Sheet 3

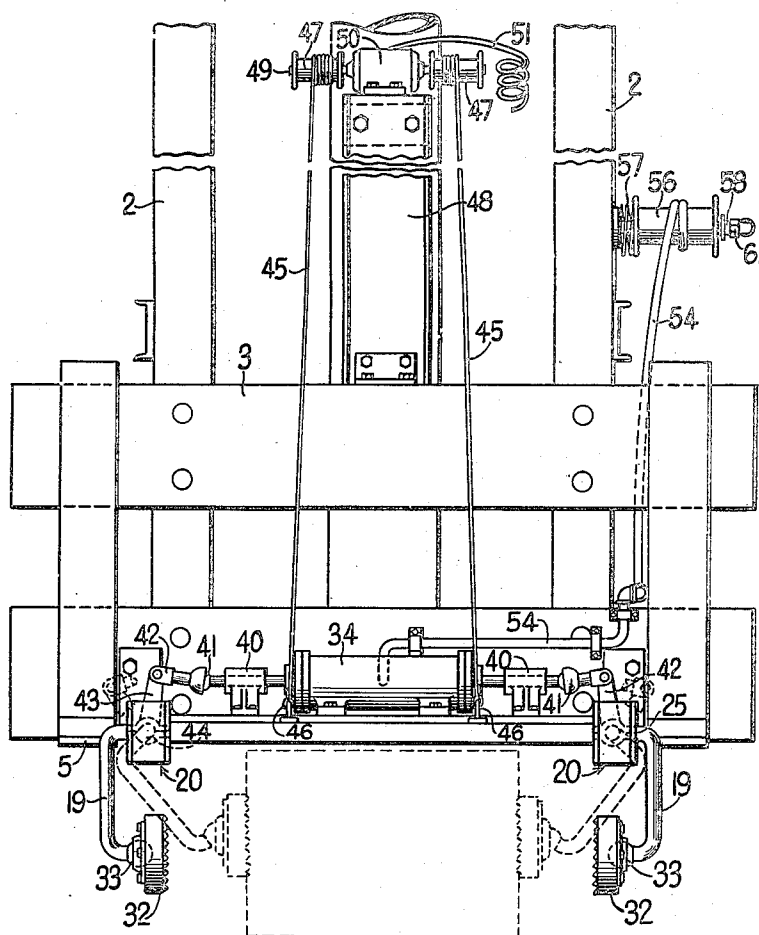


FIG. 5

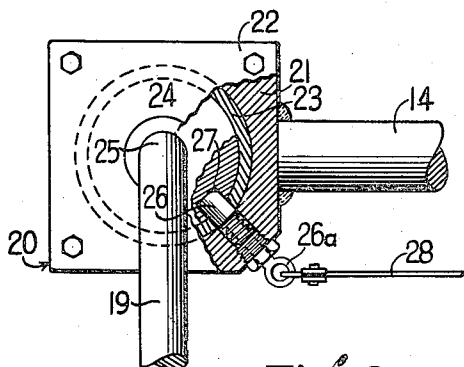


FIG. 6

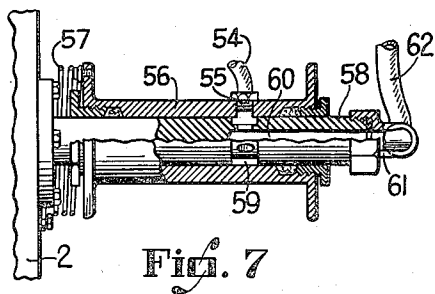


FIG. 7

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4 Sheets-Sheet 4

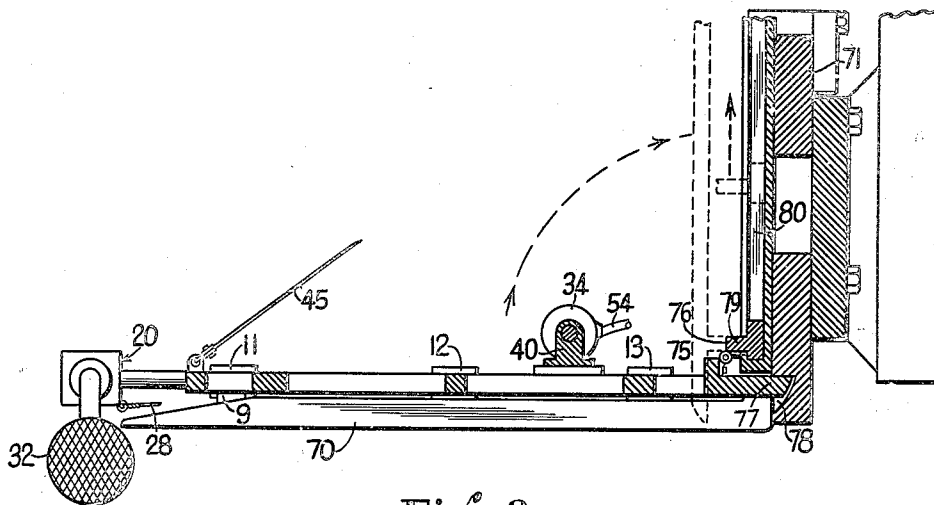


Fig. 8

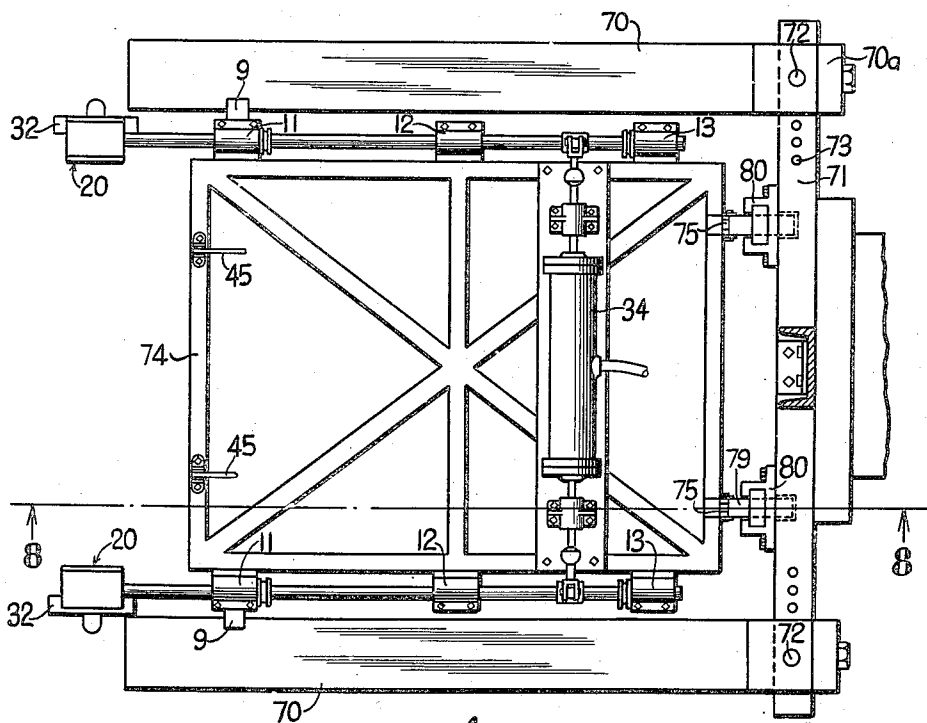


Fig. 9

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ATTACHMENT FOR FORK LIFT TRUCKS

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8 Claims. (Cl. 214-113)

1 My invention relates to an attachment for fork-lift trucks. It has to do, more particularly, with an attachment for use on the usual fork-lift truck for the purpose of lifting articles onto pallets in order to load such pallets for subsequent handling by the fork-lift truck.

In the last few years, as is well known, fork-lift trucks for lifting palletized articles or material have come into common usage. However, in most cases, before the fork-lift truck can handle the pallet, the pallet must be loaded with the articles or material by manual labor. This is one phase of material handling with fork-lift trucks which still requires manual labor and where there is an opportunity of cutting labor costs by the use of mechanical equipment. It has been proposed to provide industrial trucks which are provided with attachments for gripping boxes or other articles. However, with this type of prior art truck, it is not possible for the same truck to handle pallets since it is no longer a fork-lift truck due to the special attachments provided thereon. There is a need in the material-handling art for an industrial truck which not only can load pallets but also can subsequently handle the pallets.

One of the objects of my invention is to provide a fork-lift truck which in its main design and structure is similar to the fork-lift trucks now commonly in use but which is provided with an attachment which can be used for handling articles to load them on pallets which can be subsequently handled by the fork-lift truck in the usual manner.

Another object of my invention is to provide a fork-lift truck with an attachment of the type indicated which may be moved quickly to operative or inoperative position and which is of such a nature that it will not interfere with the usual pallet handling operation of the truck when the attachment is in operative position.

Still another object of my invention is to provide an attachment of the type indicated which is of a very simple yet sturdy structure, which can be made at a low cost and which can be installed simply and easily on the usual fork-lift truck.

Various other objects will be apparent.

In its preferred form, my invention contemplates the provision of an attachment which includes a frame adapted to be carried by the usual vertically movable carriage of a fork-lift truck which also carries the forwardly projecting forks. This frame has one end pivoted to the carriage between the inner ends of the forks for vertical movement between a substantially vertical posi-

2 tion, where it is out of the way and will not interfere with the usual functioning of the forks, to a substantially horizontal position, where it projects forwardly between the forks in substantially the horizontal plane thereof. When in the latter position, the attachment is adapted to grip various articles to be loaded on pallets. For this purpose, the frame carries a pair of gripping arms which depend from the frame when it is in horizontal position. These arms are moved, preferably by hydraulic means, after being associated with an article to firmly grip the article. The carriage of the fork-lift truck may then be moved to lift the attachment with the article which it carries and move it to the proper height and the entire truck may be moved in the usual way to position the article wherever desired, for example, on a pallet. A pallet may be loaded in this way and then the pallet may be handled by the same fork-lift truck provided the frame of the attachment is raised to inoperative vertical position where it does not interfere with the usual functioning of the forks. The gripping arms are so carried by the frame that when it is raised into inoperative position, they fold back against the frame to a non-interfering position.

The preferred embodiment of my invention is illustrated in the accompanying drawings wherein similar characters of reference designate corresponding parts and wherein:

Figure 1 is a perspective view of a fork-lift truck having my attachment mounted thereon.

Figure 2 is a side elevational view of the truck of Figure 1 illustrating the functioning of the attachment.

Figure 3 is a plan view illustrating in detail the attachment and the associated parts of the truck.

Figure 4 is a vertical sectional view taken substantially along line 4-4 of Figure 3.

Figure 5 is a front elevational view of the structure shown in Figures 3 and 4 and illustrating by dotted lines how the article-gripping arms are moved into gripping relationship with the article.

Figure 6 is a detail in elevation, partly broken away, illustrating the locking mechanism for the article-gripping arms.

Figure 7 is a detail, mainly in section, of a spring-wound drum upon which a flexible conduit is wound and unwound as the attachment moves between its two positions, the conduit being used for supplying hydraulic fluid to the hydraulic cylinder of the attachment.

Figure 8 is a vertical sectional view taken along line 8-8 of Figure 9 and illustrating a modification of my invention.

3

Figure 9 is a plan view of the structure shown in Figure 8.

With reference to the drawings, I have illustrated in Figures 1 and 2 a fork-lift truck which in the main is of usual structure. It includes the vehicle 1 which supports the mast 2 at its forward side in the usual manner for forward and rearward swinging movement. A carriage 3 is mounted on the mast 2 in the usual manner being moved vertically thereon by the usual hydraulic cylinder 4. The carriage 3 carries the spaced forwardly projecting horizontally disposed forks 5. These two forks 5 are secured to the carriage 3 at their rear ends in the usual manner.

The attachment which I provide comprises a frame 6 of metal which is illustrated best in Figures 2, 3 and 4. This frame 6 may be formed as desired from metal but should be of sturdy construction similar to that illustrated in the drawings. One end of this frame is provided with pivot pins 7 on its opposite sides which rotatably fit in pivot brackets 8 which are provided at opposite sides of the frame and are secured to the lower transverse member 3a of the carriage 3. Thus, the frame 6 is mounted for vertical swinging movement and may be moved from a position, as shown in Figure 1, where it is in substantially the same plane as the forks 5, to a position where it is substantially vertically disposed, as shown by the dotted lines in Figure 2, back against the carriage 3 and substantially parallel to the mast 2. It will be apparent that the frame 6 is sufficiently narrow to fit between the forks when in its lowermost position and that the brackets 8 extend forwardly so that the frame can move vertically therebetween when it approaches vertical position and can move backwardly into contact with the upper transverse member 3b of the carriage which will serve as a stop. To limit downward swinging movement of the frame and to aid in supporting the weight of articles lifted by the attachment, the frame at each side of its outer end is provided with outwardly extending ears 9 which are formed integrally with brackets 10 that are bolted or welded or otherwise rigidly secured to the frame 6.

The brackets 10 include sleeves 11 and these sleeves cooperate with additional sleeves 12 and 13 arranged at each side of the frame in supporting rotatable rods 14. The sleeves 12 are disposed intermediate the length of the frame while the sleeves 13 are disposed at the inner end of the frame. The sleeves 12 and the sleeves 13 are formed as part of brackets 15 and 16, respectively, which are secured to the side portions of the frame in the same manner that the brackets 10 are secured thereto. The rods 14 extend the full length of the frame and project beyond the outer end of the frame, as shown best in Figure 3. The rods are rotatably mounted in the sleeves at each side of the frame and are prevented from moving axially of the sleeves in either direction by means of collars 17 engaging the inner sides of sleeves 10 and collars 18 engaging the inner sides of sleeves 13.

The rods 14 at their outer ends are adapted to carry the article-engaging and gripping arms 19. Each of these arms 19 is pivoted at its inner end to the outer end of a rod 14 by means of a pivot and lock structure 20 which is illustrated best in Figure 6. This structure 20 comprises a stationary bearing housing 21 which is welded to the outer end of the rod 14. The outer side of the housing is closed by a removable plate 22. Within the housing 21 a bearing bushing 23 is disposed

4

and within the bushing is rotatably mounted a cylindrical bearing 24. This bearing 24 is keyed to or formed as a part of the inturned upper end 25 of the arm 19. Thus, swinging of the arms 19 in vertical planes parallel with the planes of the rods 14 will be permitted when members 24 rotate in bushings 23. A spring-pressed plunger 26 is carried by the housing 21 of each unit 20 for locking the arm 19 in its vertical depending position substantially perpendicular to the plane of the frame 6. The inner end of this plunger extends through an opening in the bushing 23 into a socket 27 in bearing member 24 when the arm 19 is in vertical position. As the arm 19 swings into its vertical position, the inner end of the plunger 26 will snap into the socket 27 and lock the arm in this position. Means is provided for automatically releasing the plunger locks when the frame 6 is raised. This means comprises a cable 28 which is connected to the outer end of the plunger and which is anchored in the manner shown in Figure 4 at 29 to the lower transverse member 3a of the carriage 3. A roller 30 carried by the bracket 8 engages the top of the cable adjacent anchoring point 29. The cable has a spring 31 interposed therein. Whenever the frame 6 is swung vertically the distance between the point 29 and the point 26a, where the cable is anchoring point 29 to plunger 26, is increased. This will result in pulling the plunger from the socket 27 and allowing the arms 19 to swing rearwardly as the frame 6 is moved upwardly and rearwardly. The spring 31 permits a certain degree of stretching of the cable but is sufficiently strong to permit the necessary pull to be exerted on the plunger 26 to release it.

Each of the arms 19 has its lower end inwardly turned and provided with a serrated gripping jaw 32 which is mounted thereon by a ball and socket joint 33, as shown best in Figure 5. For moving the jaws 32 towards each other I provide hydraulic actuated mechanism. This mechanism includes a double acting hydraulic cylinder 34 which is carried by the frame 6 towards the inner end thereof by means of a transverse support 35 which is attached to the frame, as shown best in Figure 3. A hydraulic line 36 communicates with the cylinder 34 midway between its ends for supplying fluid between the two pistons 37 thereof. Each piston has an outwardly projecting rod 38 and a spring 39 is associated with this rod within the cylinder for normally maintaining the rod at its innermost position. Hydraulic fluid supplied to the cylinder 34 by the line 36 overcomes this spring pressure and moves the rods 38 outwardly in opposite directions. Outside the cylinder 34 the rods are slidably mounted in sleeves carried by brackets 40 which are secured to the support 35. The outer end of each of the rods 38 is connected by a ball and socket joint 41 to the inner end of a link 42. This link 42, as shown best in Figure 5, has its outer end pivoted to a rocker arm 43 which has a sleeve 44 on its lower end through which the rod 14 passes and to which it is keyed. Thus, it will be apparent that movement of the piston rods 38 will rock the rods 14 about their own axes and will result in swinging movement of the arms 19 towards and away from each other since the bearing housings 21 will also rotate with the rods 14. Thus, the jaws 32 will be moved towards and away from each other.

For moving the frame 6 from horizontal operative position to vertical inoperative position, I

5

provide the cable arrangement illustrated in Figures 1 to 5. This cable arrangement includes a pair of cables 45 one end of each of which is anchored at 46 to the outer end of the frame 6 at a point spaced inwardly from the side thereof. The other end of each cable is passed around and anchored to a sheave 47 which is carried on an upstanding arm 48 provided on the carriage 3. The sheaves 47 are carried by the oppositely extending portions 49 of the shaft of an electric motor 50 which is mounted on the upper end of arm 48. An electric conduit 51 leads from this motor 50 to a suitable control switch 52 provided at a convenient location on the vehicle 1 adjacent the driver's seat. The arm 48 will move vertically with the carriage and, therefore, the conduit 51 is of the type which automatically extends and contracts as necessary. An arrangement is provided for the hydraulic conduit 36 for permitting vertical movement of the carriage and includes a flexible section 54 of such conduit. One end of this section is anchored as at 55 to a drum 56, as shown in Figure 7. This drum is maintained in one position by a torsion spring 57. The shaft 58 upon which the drum 56 is mounted is carried by the mast 2 and is provided with a groove 59 of annular form which communicates with a passageway 60 within the shaft. The outer end of the shaft 58 is provided with a coupling 61 by means of which the passageway 60 communicates with another conduit 62 which is connected to a control valve 62a and on vehicle 1 and then to a source of hydraulic fluid under pressure. This source may be a pump provided on the vehicle 1 and operated by the power unit thereof. As the frame 6 moves vertically, the conduit 54 will wind on or pay out from the drum 56 automatically.

When the truck with my attachment thereon is to be used for moving pallets, the frame 6 is raised to vertical position as shown by dotted lines in Figure 2 which is accomplished by controlling motor 60 to wind up the cables 45. The conduit 54 for the hydraulic cylinder 34 will wind on the drum 56. The plunger locks 26 will be released by means of cables 28 and the arms 19 will be swung back into substantially vertical position against the frame 6. The forks 5 may now be used in the usual manner to lift pallets without any interference from my attachment. When carriage 3 moves vertically, the conduit 51 for the motor will extend or contract.

When the truck is to be used for loading pallets or handling articles, the frame 6 is lowered by actuating motor 50 to permit the cables 45 to pay out and to permit the frame 6 to swing downwardly by gravity into horizontal position where the ears 9 will rest on the forks 5. During this downward movement, the conduit 54 will pay out from the drum 56 and the arms 19 will gradually swing by gravity force into vertical position at which time the plungers 26 will snap into the sockets 27 and will lock the arms 19 in vertical position. If the truck is now moved to a position where the arms 19 straddle the article to be gripped, the hydraulic cylinder 34 can be actuated to swing the gripping jaws 32 towards each other into engagement with the article as shown in Figure 2. The carriage 3 may then be moved vertically to lift the article and the truck may be moved to position the article on a pallet or wherever desired. The article can be released merely by releasing the hydraulic pressure since the springs 39 will return the jaws to their original positions swung outwardly away from each

6

other as far as possible. When the attachment is not to be used, it may again be swung up into vertical position where it will be out of the way and permit proper functioning of the forks 5.

In Figures 8 and 9, I illustrate a modification of my attachment which permits of greater lateral adjustment of the forks on the carriage when my attachment is in inoperative position.

The forks 70 are shown as being laterally adjustable on the carriage 71 by means of pins 72 which can fit into any of selected openings 73 formed in the fork supports of the carriage. However, in moving the forks to their innermost positions, there would be interference with the frame 74 of the attachment unless it were moved out of the way. For this purpose, I provide an arrangement for moving the frame completely above the forks.

The frame 74 and associated parts are substantially the same as the corresponding parts of the attachment previously described. The one end of the frame is provided with hinge connections 75 which include cooperating portions 76 that contact with each other to limit upward swinging of the frame to vertical position, as shown by the dotted lines in Figure 8. The frame is permitted to swing down into horizontal position and when the attachment is in its lowermost position, lugs 77 formed on the inner part of the frame will extend into sockets 78 formed in the carriage 71. These lugs and cooperating sockets serve to limit downward swinging movement of the frame and also aid in preventing lateral swinging movement or vibration of the frame.

The hinge connections 75 are associated with brackets 79 which have guide portions thereon that slidably fit into the vertical guideways 80 carried by the carriage 71 at the front side thereof. A cable arrangement like that previously described will be provided for moving the frame 74 between its various positions.

Assuming the frame 74 to be in horizontal position, as in full lines in Figure 8, if the cables are wound up, the frame will first swing on hinges 75 up into vertical position where further swinging will be prevented by contact of stops 76 as indicated by dotted lines in Figure 8. Further pull on the cables will move the entire frame vertically, the brackets 79 sliding along guides 80. The frame may be moved to the top of guides 80 at which time it will be completely above the forks 70 including the upstanding parts 70a thereof, it being understood that guides 80 will extend above these upstanding parts.

Release of the cables will first permit downward bodily movement of the frame, and then downward swinging movement of it when it reaches the bottom of guides 80. When the frame again reaches horizontal position, the lugs 78 will preclude further movement.

It will be understood that when the frame 74 is moved to its uppermost position, lateral adjustment of the forks 70 will be permitted without interference with the frame.

It will be apparent from the above description that I have provided an attachment in combination with a fork-lift truck having many advantages. With this attachment articles or material may be loaded on pallets and then subsequently the pallets can be handled by the same truck.

Having thus described my invention, what I claim is:

1. In combination with a fork-lift truck having a guideway with a movable carriage thereon

which supports projecting forks, a frame pivoted at one end to said carriage for movement about a horizontal axis from a horizontal position between said forks to a vertical position in contact with the carriage so as not to interfere with the normal functioning thereof, means mounted on the carriage for moving the frame between its two positions, spaced arms carried by the outer end of said frame and pivoted for movement towards each other, said arms carrying article-gripping jaws on their lower ends, means carried by the frame for swinging said arms towards and away from each other and comprising hydraulic means and said means for moving the frame between its two positions comprising cables connected to the outer end of said frame and anchored to a drum carried by said carriage.

2. The combination of claim 1 wherein the arms are carried by rods which extend along said frame and are rotatably carried thereby and wherein the hydraulic means includes a double-acting cylinder carried by said frame, said cylinder being disposed transversely of said frame and having oppositely projecting piston rods, springs associated with said rods for normally withdrawing them within the cylinder, and means for supplying fluid to said cylinder to force said piston rods outwardly against the action of the springs and thereby rotate said arm-carrying rods to swing said arms towards each other.

3. The combination of claim 2 wherein a flexible conduit is connected to said cylinder and to a control valve provided on a stationary part of the truck, said conduit being anchored to a drum mounted on said stationary part, and means associated with said drum for normally rotating it to a position where the conduit is wound thereon but permitting paying out of said conduit.

4. The combination of claim 3 wherein an electric motor is associated with the cable drum for winding and unwinding the cable therefrom.

5. The combination of claim 4 wherein the gripping arms are mounted on the outer ends of the rotatable rods for swinging movement in vertical planes as the frame is moved between its two positions, locks associated with said arms for locking them automatically in depending position when the frame reaches horizontal position, and means for automatically releasing such locks as the frame approaches vertical position.

6. The combination of claim 5 wherein the inner ends of the arms are carried by rotatable

bearings supported by said rotatable rods, plunger locks associated with said bearings for cooperating with sockets therein, and means for automatically releasing said plunger locks as said frame moves into vertical position, said means comprising cables connected to said plungers and anchored to points on the carriage below the pivot points of said frame.

7. In combination with a fork-lift truck having a guideway with a movable carriage thereon which supports projecting forks, a support pivoted to the carriage for movement about a horizontal axis between a horizontal position in association with the forks and a vertical position away from the forks so as not to interfere with the normal functioning thereof, means carried by said support for engaging an article when the support is in association with said forks, the pivot structure for connecting the support to the carriage including stops for limiting swinging movement of the frame relative to the carriage, said pivot structure being carried by vertically movable guides slidably mounted in vertical guideways on the carriage.

8. The combination of claim 7 wherein the forks include upstanding portions and are laterally adjustable on the carriage, and said vertical guideways extend above said upstanding portions.

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