Feb. 6, 1962 E. M. GARDNER ET AL 3,019,929

AUTOMATICALLY LOCKING LIFT FORK ATTACHMENT

Filed April 30, 1959

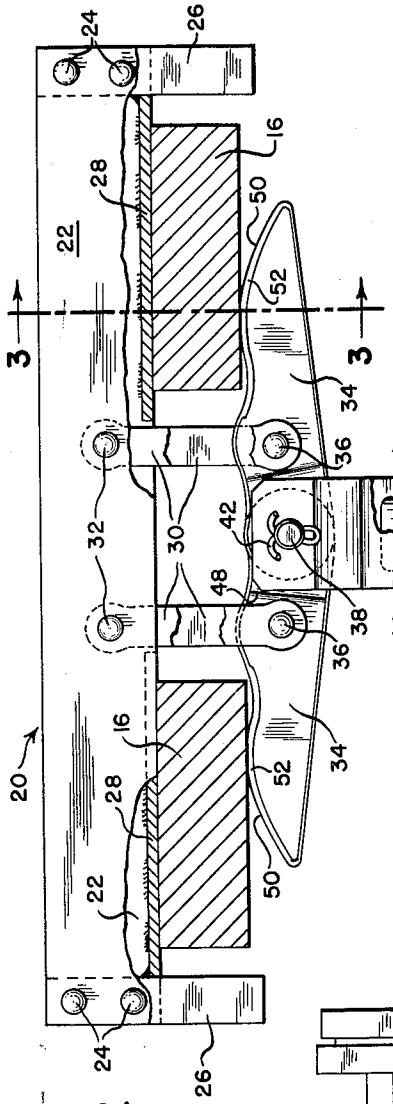


FIG. 2

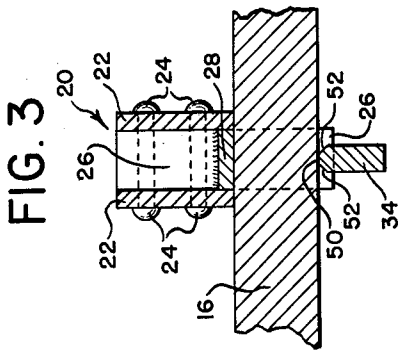


FIG. 3

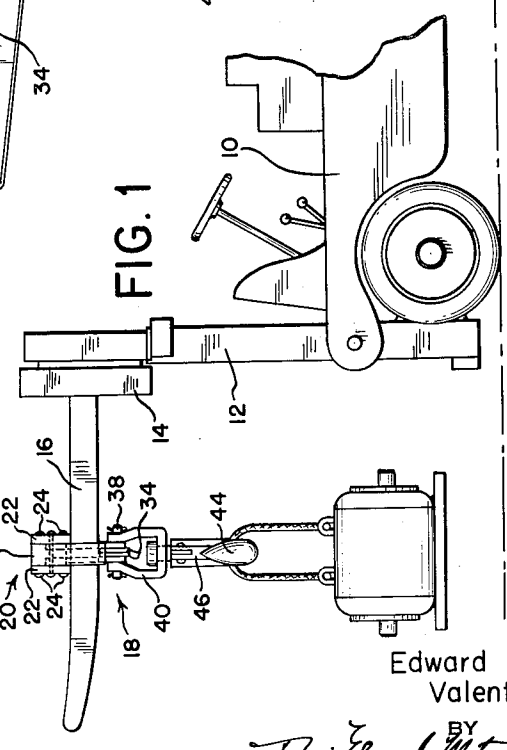


FIG. 1

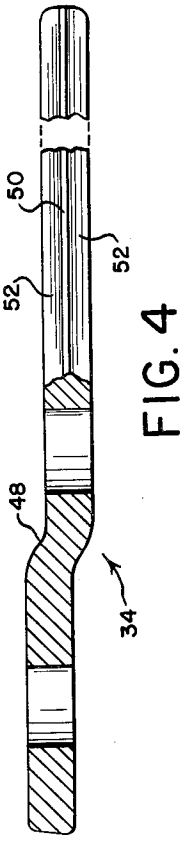


FIG. 4

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AUTOMATICALLY LOCKING LIFT FORK ATTACHMENT

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12 Claims. (Cl. 214—620)

Our invention relates to improvements in lifting attachments for industrial fork lift trucks and more particularly to a fork lift attachment including an automatic clamping device or structure for locking the lifting attachment to the forks of a lift truck.

A number of attachments of different types have been provided for the forks of lift trucks for carrying out lifting operations and for other purposes. Most of these prior attachments must be placed on the forks and then some hand manipulated clamping device operated to secure the attachment to the forks of the truck. There is, therefore, the danger that the operator will forget to clamp the attachment to the forks.

The primary object of the present invention is to provide a lifting attachment for use on and for cooperating with the tines of a lift fork truck which includes structure for automatically clamping the attachment to the tines of the fork.

A further object of the invention is to provide an automatically-locking lift attachment for the tines of industrial fork lift trucks, which is automatically retained in place on the tines of the fork and in which the presence of a load on the lifting attachment increases the locking force by which the lifting attachment is clamped to the tines of the fork.

In accordance with our invention, we provide a combination of an industrial fork lift truck with a load-lifting attachment mounted on the tines of the truck and cooperatively connected thereto for picking up and transporting loads of various types. In this combination the attachment comprises a beam or other suitable support extending transversely across the upper portion of the tines of the lift fork, a load lifting hook supported from the beam beneath the tines for engaging and supporting the load to be lifted, means extending between the tines of the fork for supporting the lifting hook, said supporting means including means for automatically clamping the lifting attachment to the tines of the fork.

In accordance with a preferred construction, the hook-supporting means includes a pivoted lever arrangement provided with arms engaging the undersurfaces of the fork tines and actuated by the weight of the lifitng hook and the load thereon to clamp the attachment to the tines of the fork.

Our improved attachment is readily mounted on the fork tines of the lift truck and operates in such a manner that it is immediately automatically clamped to the tines by the weight of the lifting hook of the attachment. When the attachment is carrying a load, the clamping pressure is increased, so that there is no possibility of having the attachment come off the tines of the fork. The automatic locking attachment has the advantage that the operator need not be concerned about locking the attachment to the tines of the fork before picking up a load. Sometimes an operator forgets to operate a manually-operated clamp to such attachments and the attachment and the load slip off the tines causing damage. The automatic clamping and locking arrangement of the present invention avoids any possibility of such accidents. Furthermore, the automatic clamping attachment of the present invention saves time in the lifting and transporting of loads with lift fork trucks and avoids any damage or injury due to human error.

Additional features and advantages of the combination according to the invention are described hereinafter in connection with the accompanying drawings illustrating one embodiment of the invention.

In the drawings:

FIG. 1 is a broken side elevational view of a fork lift truck showing the improved attachment mounted on the tines of the fork and in turn carrying a load illustrated as an electric motor;

FIG. 2 is an enlarged front view with parts broken away and partly in section showing the improved attachment mounted on the tines of a lift fork truck;

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 2; and

FIG. 4 is a top view partly in broken longitudinal section of one of the locking levers of the attachment shown in FIG. 2.

Attachments made according to the invention are particularly useful in connection with lift fork trucks, since there are many articles which cannot be conveniently handled directly by the forks of the truck but which must be elevated and transported, for example, to a stack, pile or truck.

Referring to FIG. 1 of the drawings, a conventional type of lift truck is shown at 10, which truck may be provided with the usual equipment including steering wheel, seat for the driver and controls. The lift truck also includes a front lifting frame 12 provided with a vertically movable member 14 carrying the lifting fork comprising forwardly-projecting spaced tines 16. The fork lift truck illustrated is not intended to represent any particular type of fork lift truck, since the invention is intended to apply to any fork lift truck provided with spaced forwardly-projecting tines, which may be elevated or lowered in accordance with the operation to be performed.

The tines of the fork are of usual wide heavy construction and extend through the automatic clamping lifting attachment 18, as shown.

In FIG. 2 the attachment is shown as including a beam structure 20 extending transversely of and resting on the tines 16, the beam 20 being made up of spaced heavy steel bars or webs 22, the ends of which are riveted by rivets 24 to end blocks 26 which extend between the plates 22 and project below the bottom of the beam outside the tines 16. The downwardly-projecting portions of the blocks 26 prevent the beam from sliding laterally off the tines 16 of the fork. The beam also includes two bottom webs of sheet steel 28 welded between the webs 22 at the bottom of the beam. These webs extend respectively from the end blocks 26 to a point normally sufficient to extend over the fork tine and at the same time leave an open space at the bottom of the beam through which spaced pairs of supporting links 30 extend.

Two pairs of spaced links 30 extend into the beam between the side webs 22 and are respectively pivoted to the beam by rivets 32. Each rivet extends through the side webs 22 and through a pair of links 30 which links hang downwardly through the opening between the webs 28 and to a point somewhat below the bottom of the fork tines 16. The pairs of links 30 respectively straddle locking or clamping levers 34 extending generally in the same plane as the beam 20 and the lower end of each pair of links is pivoted to its lever 34 by a rivet 36. The two levers 34 have the general shape indicated and their outer ends extend under and engage the respective lower surfaces of the fork tines 16. The pairs of links 30 are pivoted to the levers 34 preferably at about one-third the length of the levers 34 from the inner ends of the levers.

The inner ends of the locking or clamping levers 34 are mounted in overlapping relationship and are provided with matching bores through which the clevis pin 38 of a clevis 40 extends. The inner ends of the levers 34 are

located between the sides of the clevis as illustrated, and the clevis pin 38 is secured in place by a cotter pin 42. The clevis 40 is part of a lifting hook structure and carries a swivel hook 44 swiveled in the bottom loop of the clevis, as illustrated, so that the hook may be turned in any direction during use. A spring-biased catch or retaining finger 46 is provided to prevent accidental removal of a chain or lifting link from the hook 44.

Each of the clamping levers 34 is made from heavy steel stock in approximately the shape shown, and each is provided with an offset bend 48 between the positions of the rivets 36 and the clevis pin 38, as shown in FIG. 4. The bend 48 of each lever 34 extends around the end of the other lever 34 so that the portions of the levers extending outwardly from the bends are in about the same vertical plane and fit readily between the pairs of links 30.

The outer end portion of each of the clamping levers 34 is provided with an upper arcuate edge 50, as shown in FIG. 2, tapered down to a point at the extreme end, while the lower edge of the lever is straight. Furthermore, the arcuate edge 50 is beveled back on each side with bevels 52, so that the edge 50 is relatively sharp for the purpose of increasing the effective contact pressure applied to the underside of the fork tines 16. In other words, the sharper the edge 50, the greater the pressure per square inch of that edge against the underside of the fork tines 16.

The upper edges 50 of the locking levers 34 are shaped in an arc or curve for further increasing the contact pressure with the fork tines and to provide for effective clamping regardless of the thickness of the tines at the point where the lifting attachment is mounted. Generally, the tines of fork lifting trucks are tapered at least over a considerable part of their length.

Since the clamping levers 34 are offset or bent laterally at 48 and since the inner end portions of the levers overlap, the outer end portions extend generally in the same vertical plane between the pairs of the downwardly-hanging links 30. The side webs 22 of the beam 20 are spaced so as to accommodate the pairs of links 30. When the links of each pair are spaced according to the thickness of the steel locking levers 34.

In operation, the attachment, as described above, is placed on the fork tines 16 by either lifting up on the hook 44 and clevis 40 or pulling down on the outer end of one of the clamping levers or arms 34 to pivot them on the rivets 36, so that there is room for the tines under the beam and above the arms 34. The beam is then slid back onto the tines of the fork and the levers 34 are permitted to engage the undersurface of the tines. In this condition the weight of the clevis 40 and hook 44 is sufficient to retain the attachment on the tines without a load, but when a load is engaged by the hook 44, as in FIG. 1, the attachment is firmly and automatically clamped to the fork tines 16 by the weight of the load acting through the toggle mechanism as described. During the manipulation of the clamp in placing it on the tines 16, the elevation of the clevis 40 relative to the beam 20 operates to move the rivets 36 apart and pivot the outer ends of the levers 34 downwardly. The weight applied to the clevis pin 38 by the clevis and hook or by a load is transferred through the levers 34 to the pairs of links 30 and to the beam 20 at a position substantially uniformly located between the fork tines 16. The weight also applies a clamping pressure to the tines of the fork by the leverage action of the levers or arms 34 so that the tines are clamped between the beam and levers.

The attachment structure, including its lifting mechanism, cooperates with the tines of the fork to provide an automatically locking arrangement which makes the attachment safe to use and which does not depend upon the operator to see that the attachment is safely secured to the tines of the fork, either before a load is applied to the hook or afterward. From the foregoing description, it will be apparent that certain modifications may be made in the structure of the attachment without departing from the spirit and scope of the invention as set out in the appended claims.

What we claim as new is:

1. The combination of an industrial fork-lift truck with a load-lifting attachment mounted on the tines of the fork and cooperatively connected thereto to pick up and transport loads, said attachment comprising a beam extending transversely on the upper portion of the tines of the fork, a load-engaging means beneath the beam for engaging and supporting a load to be lifted and transported, pairs of spaced supporting links pivoted to the beam and extending downwardly between the tines of the fork, a lever pivoted intermediate its ends between each pair of supporting links below the position of the tines, the inner ends of the levers overlapping between the pairs of links, pivot means extending through said overlapping ends of said levers and supporting the loading-engaging means, said levers each including an arm extending laterally from its pair of supporting links, said arms extending respectively under and in contact with the adjacent tines of the fork and pressed into looking engagement therewith by the weight of the load-engaging means and of the load carried by the load-engaging means, whereby said attachment is automatically actuated to lock itself to the tines of the fork.

2. The combination as claimed in claim 1, in which the arm of each lever is provided with an arcuate narrow edge engaging the fork tine.

3. The combination as claimed in claim 1, in which each lever is a flat bar mounted edgewise, the upper edge of the extending arm of which is sharpened and has a convex arch thereby providing a high pressure per unit of contact area between the arm and the fork tine engaged thereby.

4. A load-lifting attachment for the fork tines of industrial fork-lift trucks for lifting and transporting loads, comprising a beam for extending transversely on the upper portion of the tines of the fork, a load-engaging means beneath the beam for engaging and supporting a load to be lifted and transported, and a combined load-supporting structure and locking means carried by the beam and arranged to extend downwardly therefrom, the load-engaging means being connected to said combined structure and locking means, said locking means including means engaging at least one of the fork tines for automatically locking the load-lifting attachment to the tines of the fork, said locking means being actuated by the weight of the load-engaging means and by the weight of any load carried thereon for effecting its automatic locking.

5. A load-lifting attachment as claimed in claim 4, in which the combined load-supporting structure and locking means comprise a leverage mechanism including means for engaging each of the tines of the fork of the fork-lift truck.

6. A load-lifting attachment as claimed in claim 5, in which each tine-engaging means comprises a lever pivotally mounted with respect to the beam, the inner ends of said levers being pivoted together by a pivot means connected to the load-engaging means.

7. A load-lifting attachment as claimed in claim 6, in which each lever includes an arm provided with a narrow arched upper edge for engaging the undersurface of the tines of the fork.

8. A load-lifting attachment as claimed in claim 7, in which the load-engaging means includes a clevis in which the inner ends of the levers are pivotally mounted on the pin of the clevis.

9. A load-lifting attachment as claimed in claim 4, in which the combined load-supporting structure and locking means comprise a toggle mechanism including means for locking the beam to each of the tines of the fork of the fork-lift truck.

10. In a lifting attachment for use with industrial transporting fork-lift trucks having fork tines to engage and support a load to be lifted and transported by the such trucks, said attachment including a beam adapted to extend transversely of and rest on the tines of the fork, the improvement comprising a load-supporting structure attached to the beam and arranged to extend downwardly therefrom, and a load-engaging means carried by the load-supporting structure and extending downwardly therefrom when in use, said load-supporting structure including means cooperating with the fork tines and the weight of the load-engaging means and the weight of any load engaged thereby and supported by the beam on the tines of the fork for automatically securing the lifting attachment to the tines of the fork.

11. A load-lifting attachment as claimed in claim 4, in which the combined load-supporting structure and locking means includes a lever pivotally mounted with respect to the beam, one end of the lever extending under and engaging a tine of the fork, when the load-lifting attachment is mounted on the tines of a fork lift truck.

12. In a lifting attachment for use with industrial transporting fork-lift trucks having fork tines to engage and support a load to be lifted and transported by the such

trucks, said attachment including a beam adapted to extend transversely of and rest on the tines of the fork when in use, the improvement comprising a combined load-supporting and locking structure attached to the beam and arranged to extend downwardly therefrom, and a load-engaging means carried by the load-supporting structure and extending downwardly therefrom when the attachment is in use, said combined load-supporting and locking structure including a lever means engaging the underside of at least one of the fork tines and actuated by the weight of the load-engaging means and the weight of any load engaged thereby and supported by the beam on the tines of the fork for automatically clamping the beam to said one tine of the fork.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,019,929 February 6, 1962

Edward Merrill Gardner et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, lines 19 and 20, for "loading-engaging" read -- load-engaging --; line 23, for "looking" read -- locking -

Signed and sealed this 19th day of June 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents