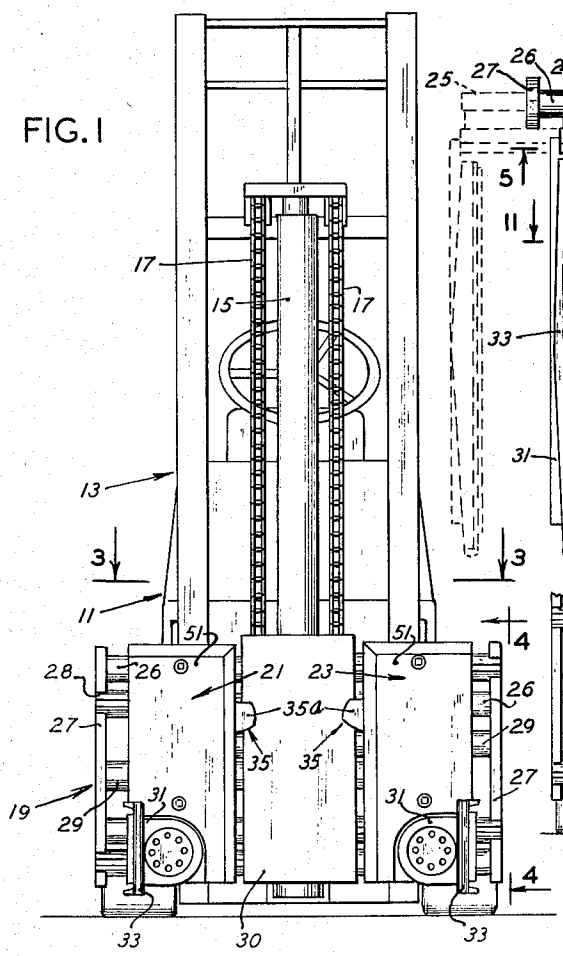
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SWIVELING ARM FOR LOAD CLAMP

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FIG. 1



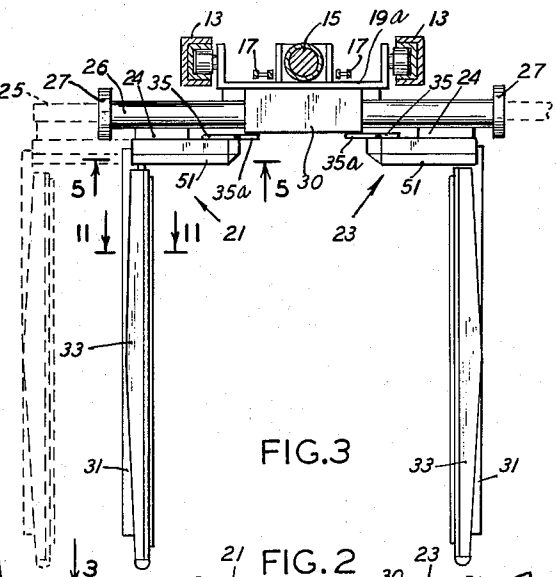


FIG. 3

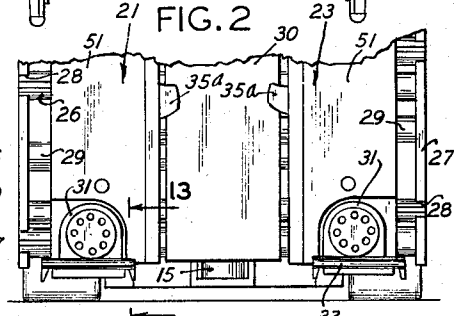


FIG. 2

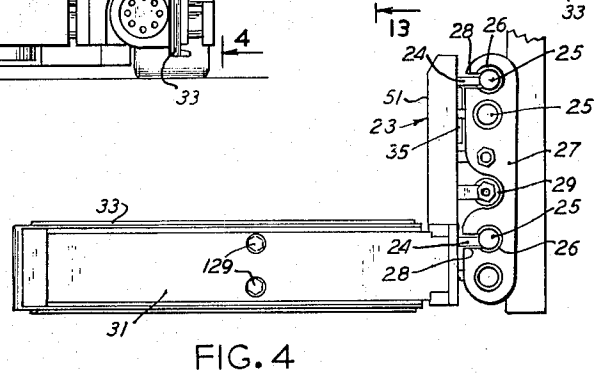


FIG. 4

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FIG. 7

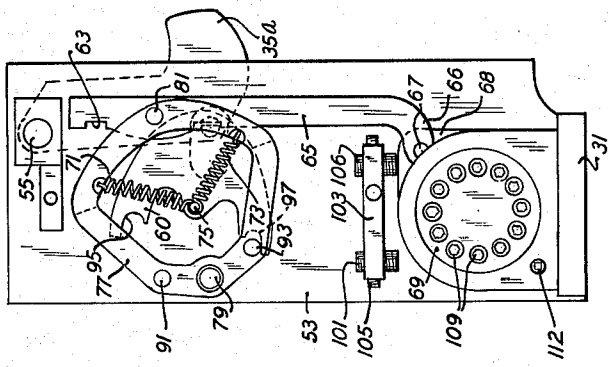


FIG. 6

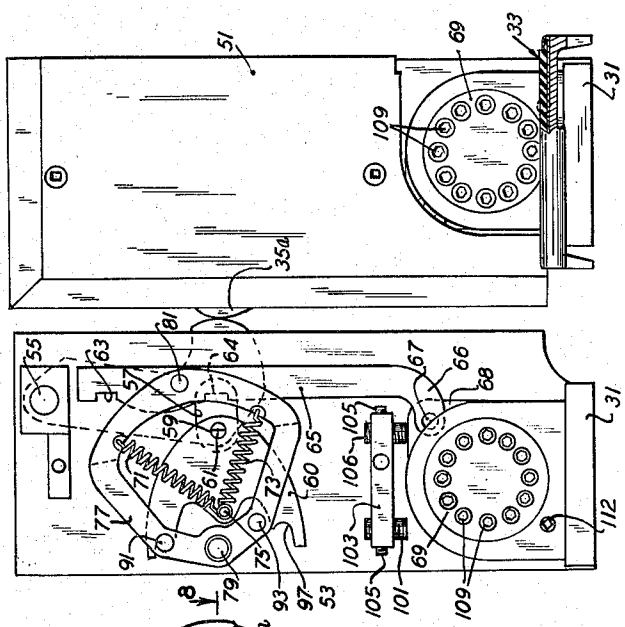


FIG. 5

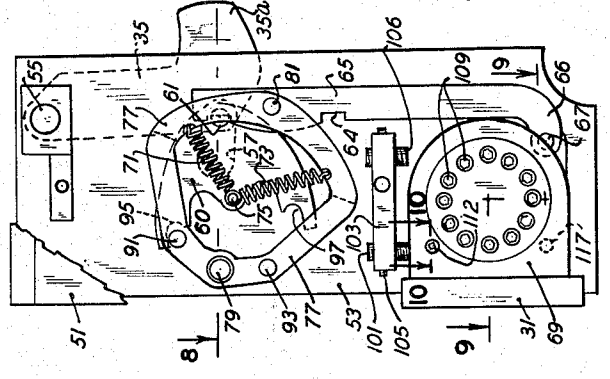
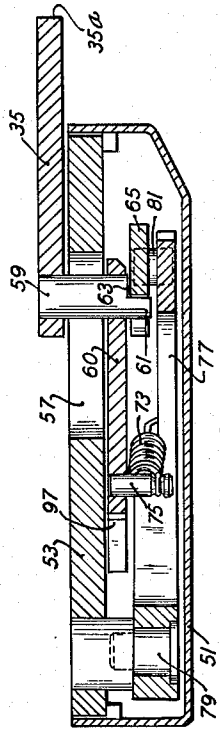


FIG. 8



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FIG.9

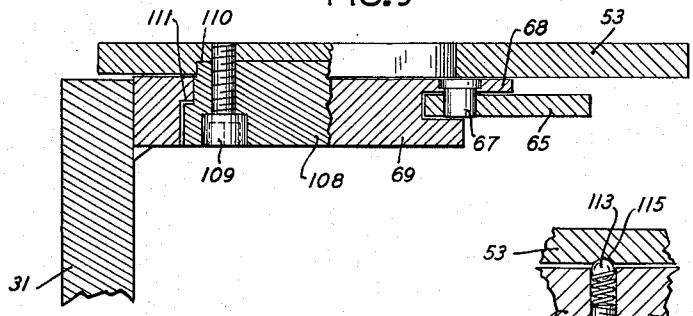


FIG.10

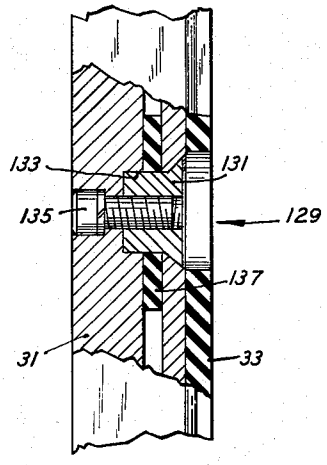


FIG. 12

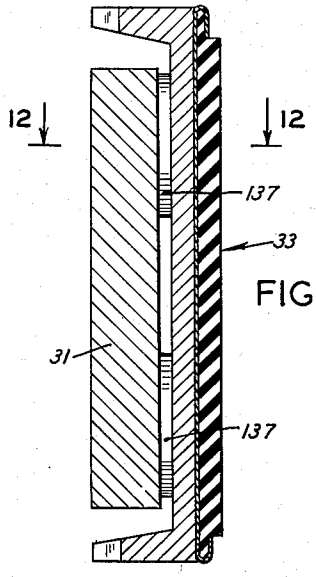


FIG.11

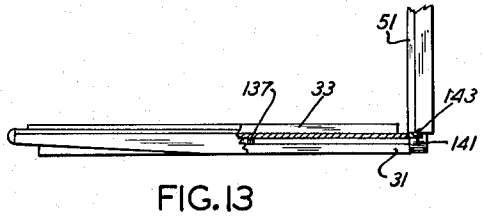


FIG.13

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3,182,837

SWIVELING ARM FOR LOAD CLAMP

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Continuation of application Ser. No. 718,540, Mar. 3, 1958. This application Nov. 22, 1963, Ser. No. 326,327

8 Claims. (Cl. 214—653)

The present invention relates to attachments for industrial lift trucks, and particularly to a multipurpose attachment of the general type disclosed in the Gerhardt Patent 2,671,571. This application is copending with and a continuation of our prior application entitled "Swiveling Arm for Load Clamp," Serial No. 718,540, filed March 3, 1958, now Patent No. 2,993,006, now abandoned.

The Gerhardt attachment includes a pair of broad face load clamping arms that are mounted for swiveling movement from vertical load clamping positions for gripping a load to horizontal load lifting positions for fitting under a load in the same manner as do fork arms. This enables a load to be gripped and lifted or merely lifted at the option of the operator.

One drawback of prior attachments of the type under consideration, is that the arms must be manually turned from vertical gripping positions to horizontal lifting positions and vice versa. This is a time consuming operation and also a difficult one since the arms are rather heavy and there is considerable frictional resistance to pivoting movement of the arms.

An object of the invention is to provide a load clamp attachment of the type under consideration in which the clamp arms are moved from one position to the other at the option of the operator as an incident to the clamping movement of the arms.

Another object of the invention is to provide a clamp attachment of the type under consideration in which the same means that moves the clamp arms back and forth for gripping a load is utilized for turning the arms from one position to another.

A further object is to provide such an attachment that is compact in a direction longitudinally of the truck so that a load on the arms is disposed in about the same position as is a load on arms that are manually turned.

There have been prior lift trucks and similar load handling vehicles having a movable carrier equipped with a plurality of movable members, at least one of which engages a load and is carried by another movable member. In the past, the members have been in part or in whole manually operated, or each member has been power operated by its own power means controlled from the body of the vehicle and supplied with energy by conduits extending from the body to the carrier over reeving means.

It is an object of the present invention to provide an apparatus of the general type set forth in the above paragraph, so constructed that no separate power means is needed for the load engaging member, thereby eliminating such power means and the conduits formerly required to supply energy to and/or control such power means.

Various other objects of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

FIG. 1 is a front view of a lift truck having an attachment of the subject invention, the load arms being in their vertical gripping positions;

FIG. 2 is a front view of the attachment showing the arms in their horizontal lifting positions;

FIG. 3 is a horizontal section of the attachment taken along line 3—3 of FIG. 1, showing the arms in full line in their inner gripping positions, and showing one arm in dotted lines in an outer gripping position;

FIG. 4 is a side view of the attachment with the arms in their gripping positions, the view being taken in the direction of arrows 4—4 of FIG. 1;

FIG. 5 is an enlarged front view of the left-hand arm unit with the cover broken away, showing the arm in its gripping position;

FIG. 6 is a view of the two arm units on the same scale as in FIG. 5, showing the arms as having been moved to their horizontal lifting positions;

FIG. 7 is a view of the left-hand unit showing the arm operating mechanism in a further stage of operation from that shown in FIG. 6;

FIG. 8 is an enlarged horizontal section taken along line 8—8 of FIG. 5;

FIG. 9 is an enlarged horizontal section through a load arm taken along line 9—9 of FIG. 5;

FIG. 10 is an enlarged horizontal section taken along line 10—10 of FIG. 5 showing an arm holding detent;

FIG. 11 is an enlarged vertical section through an arm taken along line 11—11 of FIG. 3;

FIG. 12 is a fragmentary horizontal section taken along line 12—12 of FIG. 11; and

FIG. 13 is a vertical view taken along line 13—13 of FIG. 2.

General description

Referring to the accompanying drawings, FIG. 1 discloses an industrial lift truck having a body 11, a vertical mast 13 at its front end, and a cylinder 15 and chain 17 for elevating an attachment or carriage 19 of the present invention.

The carriage includes a pair of arm units 21 and 21 each of which is connected by a pair of mounting pieces 24, as shown in FIGS. 3 and 4 to its own pair of slides 25 movable in a pair of guides 26 fixed to a carriage frame 19*a*. The guides are secured at their ends to spacers 27 and have slots 28 to accommodate the movement of the mounting pieces 24. The arm units are moved back and forth by hydraulic piston and cylinder units 29 in the same manner as are the arms disclosed in the Ehman Patent Re. 23,694. A guard 30 is provided at the center of the carriage and is secured to the carriage frame 27.

The arm units are of identical construction and each unit includes a broad face load-engaging arm made up of an arm support 31 and an arm pad 33, as best shown in FIG. 3. The load-engaging arms are mounted on base plates of the units so that they may pivot or swivel about horizontal longitudinal axes of the truck to position the arms with the broad faces thereof in the vertical positions shown in FIG. 1 or in the horizontal position shown in FIG. 2. In the vertical positions, the arms are adapted to be moved back and forth by operation of the hydraulic piston and cylinder units 29 to grip or release a load. In their horizontal positions, the arms are adapted to fit under a load and lift or lower the load upon upward or downward movement of the carriage.

The means for turning the arms from one position to another comprises a mechanism for each arm unit, each mechanism including an actuator 35, as shown in FIG.

pivot or swivel the arms, the arm units are moved ardly to their innermost positions by operation of the on and cylinder units 29 to bring the actuators into tting engagement with one another to force the actua- outwardly. This action operates other parts of the hanisms to pivot the arms from the positions they oc- ied prior to the engagement of the actuators to posi- s 90 degrees therefrom. The arrangement is such that n the arm units are again brought to their innermost itions, the actuators will again engage to pivot the s back to their original positions.

Detail construction

he internal mechanism for each unit is concealed by ver plate 51, which has been broken away in FIG. 5 the left-hand arm unit to disclose the construction of various parts which are mounted on a base plate 53. mounting pieces 24, previously mentioned, secure the plate to the associated slides 25.

he actuator 35 is behind the base plate 53 and is gen- ly of L shape. The upper portion of the leg of the ator is pivoted at 55 to the base plate. The foot or 35*a* of the actuator projects inwardly toward the er line of the truck to occupy a position to engage toe or foot of the other actuator when the arm units brought to their innermost positions.

eferring to FIGS. 5 and 8, the base plate 53 has a sverse oblong opening 57 formed therein, and extend- hrough this opening is a pivot pin 59 which is fixed to actuator 35 and slidably extends through the right- l end of a selector 60 which may be considered as g generally C-shaped. The pivot pin 59 has a portion ecting forwardly of the selector 60 and this portion it away to provide a latch lug 61 which fits within one he other of an upper notch 63 or a lower notch 64 ied in the upper end of an operating link 65. Notch best shown in FIG. 6, whereas notch 64 is best shown IG. 5.

he lower end of the link 65 has an outwardly extend- oe 66 pivoted at 67 to a projection 68 on a flange or k 69 forming a lateral extension of the arm support as shown in FIGS. 5 and 9. In the position of the s shown in FIG. 5, it is apparent that the load arm is against turning movement by the co-action of the lug 61 and the walls of the notch 63 of the link 65. he latch lug 61 is urged to remain in the notch 63 by ir of tension springs 71 and 73, which are hooked at left-hand ends around a pin 75 on the central por- of the selector 60 and diverge therefrom and are ed at their right-hand ends in holes formed in the -hand portions of a generally O-shaped crank member These springs also urge the actuator 35 inwardly or e right as the parts are shown in FIG. 5, because the lug 61 is a part of the pin 59 which is secured to the tor.

e crank member 77 is pivotally mounted at 79 on the plate 53 and is pivotally connected by a pin 81 to pper end of the link 65 at a point equal distance be- n the notches 63 and 64. The pin 81 is also located l distance between the right-hand ends of the springs d 73. Thus with the parts in the positions shown in 5, the pin 75 on the selector 60 is disposed above enter line between the pivots 79 and 81 and thus the g 73 is placed in greater tension than the spring 71. the spring 73 urges the selector to move in a counter- wise direction to hold the upper outer end of the tor 60 in engagement with a pin 91 provided on the member 77 adjacent the pivot 79. A similar pin provided on the crank member on the opposite side e pivot 79 and in a position so that the two pins 91 3 are symmetrically arranged on the crank member. FIG. 5 position of the parts, the lower outer end of lector is disposed in spaced relation to the lower pin

is pointed out that the selector member has a semi-

circular recess portion 95 formed in the upper end thereof to engage the pin 91 and the lower end has a similar semi-circular recess portion 97 to engage the pin 93 in a manner to be presently explained.

The operation of the mechanism is as follows. Referring to FIG. 5, when the actuator 35 is shoved inwardly by its engagement with the other actuator, as shown in FIG. 6, the actuator 35 carries the selector 60 to the left to cause a separation of the latch lug 61 and the notch 63. During this movement, the recess 95 on the upper end of the selector approaches the pin 91 and the walls of the recess engage the pin just after the latch lug 61 clears the notch 63. Further movement of the actuator 35 will cause continued movement of the selector to pivot the crank member 77 in a counterclockwise direction to elevate the link 65 through the medium of the pin 81 and cause the load arm to commence pivoting in a counterclockwise direction for movement from a vertical position to a horizontal position.

It is pointed out that the crank member 77 provides a mechanical advantage of the order of three and one-half to four-to-one, in the specific embodiment of the invention shown, so that the motion of the actuator 35 and the selector 60 is amplified or multiplied by the crank member.

During its movement toward the left the selector 60 in general maintains substantially the same orientation as shown in FIG. 5. However, as the pin 81 is elevated relative to the selector 60, the center line between the pins 79 and 81 passes above the pin 75 on the selector, as shown in FIG. 6, so that the spring 71 becomes tensioned greater than the spring 73 to urge the selector 60 upwardly tending to disengage the pin 91 from the recess 95. However, the lower lip of the recess, as the parts are shown in FIGS. 5 and 6, prevents such disengagement.

When the actuator 35 has been moved fully outwardly or to the left, the link 65 will have been moved upwardly to a position to place the lower notch 64 of the link 65 in alignment with the path of travel of the lug 61, the latter being displaced to the left as clearly shown in FIG. 6 at this stage in the operation. Now, when the load arms are shifted away from one another, the springs 71 and 73 will move the selector and the actuator toward the right to separate the recess 95 and the pin 91. Since the spring 71 is tensioned greater than the spring 73, the counterclockwise force on the selector causes the selector to swing over center to bring the lower end of the selector into engagement with the pin 93 as shown in FIG. 7. Continued release of the actuator is accompanied by continued movement of the selector to the right to bring the latch lug 61 into engagement with the notch 64 to lock the load arm in its horizontal position. Of course, the right hand load arm has been similarly turned during the turning of the left-hand load arm.

A subsequent engagement of the actuators, as caused by again bringing the arm units to their innermost positions, will cause a load arm to swing in a clockwise rather than a counterclockwise direction because the lower pin 93 will be engaged by the recessed portion 97 at the lower end of the selector as is apparent from FIG. 7. Thus the load arm will be moved from its horizontal to its vertical position. Such movement will leave the selector in its FIG. 5 position, so that a still subsequent engagement of the actuators will cause a return of the load arm to its horizontal position. If follows that the selector conditions the mechanism to return the load arm to the position it previously occupied each time the arm is moved from one position to another.

The fit of the latch lug 61 within the notches 63 and 64 is rather loose to assure that the latch lug will always enter the notches and also to allow slight adjustment of the vertical position of the load arm. To achieve this adjustment, and adjusting screw 101 threads through a bar 103 secured to the base plate 53 and is disposed to engage the upper surface of the flange 69 of the arm support when the latter is disposed in its vertical position as

shown in FIG. 5. A set screw **105** holds the adjusting screw **101** in a desired adjusted position.

By threading the screw **101** in one direction or another, the final vertical rest position of the load arm can be altered so that the flat faces of the arms are truly parallel with one another or have a desired camber. Since the position of the load arm determines the position of the link **65** and thus determines the positions of the notches **63** and **64**, it is apparent that the loose fit of the latch lug **61** within the notches **63** and **64** is necessary.

A second adjusting screw **106** is provided in the bar **103** and the lower end of this screw engages the projection **68** on the flange **69** to determine the horizontal position of the load arm.

Referring to FIG. 9, the flange **69** of the arm support **31** is pivotally mounted on the base plate **53** in the following manner. A disk-shaped retainer plate **108** fits through a countersunk bore in the flange **69** and into a circular recess formed in the base plate **53**. Bolts **109** extend through the retainer plate **108** and thread into the base plate. The retainer plate has an end face **110** engaging the base plate and shoulders **111** lightly engaging the flange **69** whereby the flange **69** may be turned relative to the retainer plate **108**.

An additional latching arrangement is shown for releasably latching a load arm in both its vertical and its horizontal position. This arrangement functions to lock the arms as soon as an arm reaches its new position rather than having to await the release of the actuators as in the case of the lug **61** and notches **63** and **64**. This assures that the arms will not have turned during the lateral movement of the arm units while releasing the actuators. However, the functional resistance to movement of the arms will in most cases be sufficient to prevent such turning.

Referring to FIGS. 5 and 10, the latching arrangement comprises a spring-pressed detent unit **112** mounted in the flange **69**, and, as is clearly shown in FIG. 5, the ball **113** of the detent unit fits within a recess **115** formed in the base plate, when the load arm is in its vertical position. A second recess at **117**, shown in FIG. 5, is provided in the base plate and is located so that the ball will snap into this notch when the load arm has pivoted from its vertical position shown to its horizontal position.

In order to enable adjustment of the vertical and horizontal rest positions of the load arm under the control of screws **101** and **106**, the detent unit may be made adjustable so that the position of the ball can be correlated to the positions of the screws **101** and **106**. However, the recesses **115** and **117** may be made sufficiently large to receive the ball in any position of adjustment of the screws **101** and **106** to achieve a similar result.

Now referring to FIGS. 3, 4, 11 and 12, each load arm pad **33** is connected at approximately its center to the central portion of the arm support **31** by a pair of connecting assemblies **129** which provide for slight pivotal movement of the pad relative to the arm support in a horizontal plane. Each assembly includes a headed retaining nut **131** extending through the pad and accommodated by a recess **133** in the support, and a bolt **135** received through the support and threaded into the nut. An annular cushion **137** surrounds the nut **131** and is arranged between the pad and arm. Thus the pad may pivot slightly relative to the arm support by compressing one side of the cushion.

The purpose of this movement is to enable the inner ends of the pads to move outwardly relative to one another as a load is being gripped to distribute the pressure applied to the load. That is, as the load arms grip a load, the outer ends of the arms tend to flex outwardly, which action would place a greater force on the load at the inner ends of the arms that at the outer ends, were it not for the adjustment feature of the pads.

When the arms are used as lifting arms, instead of gripping arms, it is desirable that the adjustability of the arm pads be eliminated. This is accomplished in the pre ent invention by providing a stop lug **141** as shown i FIG. 13 on each pad **33** which is adapted to engage th lower edge **143** of the cover **51** when the load arm swung from its vertical to its horizontal position. Th engagement prevents the rear end of the pad **33** fro being deflected upwardly when a load is lifted by the loa arms. The center of gravity of the load in substantiall all instances will be disposed forwardly of the pivot a semblies **129**, which are located somewhat closer to th right-hand ends of the pads **33** than the left-hand ends the parts are shown in FIG. 4.

The term "bodily" as used in the claims is meant t convey the meaning of movement of the member in que tion as a whole or altogether and entirely as in the secon definition of the second entry of the word "bodily" i Webster's Third New International Dictionary, to wit: "2 as a body: as a whole: ALTOGETHER, ENTIREL [the first of 160 homes to be moved bodily from th village—N.Y. Times]." Thus, bodily movement is t be constrasted with other movement which leaves a mem ber or a part thereof in the same general position aft movement that it had prior to movement.

Having described the invention in what is considere to be preferred embodiment thereof, it is desired that be understood that the invention is not to be limited oth than by the provision of the following claims.

We claim:

1. In a lift truck having a body and a mast,
a main carriage movable along said mast,
a pair of sub-carriages mounted on said main carriag for bodily movement relative to said main carriag and to one another from outer positions to inner pos tions,
a pair of load-engaging arms mounted one on each c said sub-carriages in positions projecting away ther from and for turning movement about axes paralle to their longitudinal axes,
an arm turning mechanism for each sub-carriage an mounted thereon, each mechanism having an act ating member operable when actuated for causin said mechanism to turn the associated arm,
said actuating members being spaced from one a other at all times except when said sub-carriages a at their innermost positions,
said actuating members being aligned with one a other so that they engage one another when said sul carriages are at their inner positions to actuate the respective mechanisms one way, and
said mechanisms including means responsive to the a tuation of said members, to condition said mech nisms for turning said arms the opposite way upo a subsequent actuation of said actuating members.

2. In a lift truck having a body and a mast,
a main carriage movable along said mast,
a sub-carriage mounted on said main carriage for mov ment relative thereto,
a load-engaging means mounted on said sub-carriag for movement from a first position to a second pos tion,
a link pivotally connected to said load-engaging mean
a crank member pivotally connected to said link an pivotally mounted on said sub-carriage for movemen from a first position to a second position for accor ingly moving said load-engaging means,
a selector member having a first general position and second general position,
an actuator pivotally mounted on said sub-carriage an pivotally connected to said selector member in a ma ner such that actuation of said actuator causes mov ment of said selector member toward the pivotal ax of said crank member,
said selector member having portions for engaging sai crank member on one side of the latter's pivot axis when said selector member is in one of its gener positions to pivot said crank member one way,

nd having another portion for engaging said crank member on the other side of the latter's pivotal axis when said selector member is in its other general position for pivoting said crank member the opposite way,

nd resilient means connecting said crank member and selector member and operable when such selector member is in one of its general positions and is moving said crank member one way to urge said selector member to occupy its other general position so that when said actuator is released, and said selector member separated from the crank member, said selector member can assume its other general position to condition it for operating said crank member its other way upon a subsequent actuation of said actuator.

. An attachment for a lift truck having a mast,
id attachment comprising frame means,
ounting means for mounting said frame means on the mast for vertical movement therealong,
pair of support members,
eans mounting said support members on said frame means for a predetermined range of bodily movement along predetermined paths relative to said frame means and to one another,
otor means carried by said frame means for so moving said support member,
pair of load-engaging members mounted one each on said support members for movement relative to said support members to assume different load-engaging positions relative to loads,
eans mounted on said support members actuated in response to movement of said support members through a minor portion of said range of movement for effecting such relative movement of said load-engaging members,
eans for latching said load-engaging members against such relative movement during the remainder of said range of bodily movement,
nd means responsive to movement of said support members only within said minor portion of said range of movement for unlatching said load-engaging members.

. An attachment for a lift truck having a mast,
id attachment comprising a frame,
ounting means for mounting said frame on the mast for vertical movement therealong,
pair of support members,
eans mounting said support members on said frame for a predetermined range of movement along predetermined paths,
eans for so moving said support members,
pair of load-engaging members mounted one each on said support members for movement relative to said support members to assume different load-engaging positions relative to loads,
eans on said support members actuated in response to movement of said support members through a minor portion of said range of movement for effecting such relative movement of said load-engaging members,
id means for latching said load-engaging members against such relative movement during the remainder of said range of movement.

In an attachment for a lift truck having a mast,
id attachment comprising,
frame,
ounting means for mounting said frame on the mast for vertical movement therealong,
pair of load-engaging members,
her mounting means mounting said members on said frame for bodily movement relative to one another along predetermined paths back and forth between first and second extreme positions, and also mounting said load-engaging members for pivoting about predetermined axes,

motor means carried by said frame for effecting such bodily movement,
means on said other mounting means for preventing pivoting movement of said load-engaging members during the major portions of their bodily movement relative to one another,
and means operable in response to bodily movement of said load-engaging members just prior to their reaching said first extreme positions, for effecting pivoting movement thereof.

6. In an attachment for a lift truck having a mast,
said attachment comprising,
a frame,
mounting means for mounting said frame on the mast for vertical movement therealong,
a pair of load-engaging members,
other mounting means mounting said members on said frame for bodily movement relative to said frame and to one another along predetermined paths back and forth between first and second extreme positions, and also mounting said load-engaging members for pivoting movement relative to said frame about predetermined axes,
motor means carried by said frame for effecting such bodily movement and for varying the distance between the axes of said members,
means on said other mounting means for preventing pivoting movement of said load-engaging members during the major portions of their bodily movement,
and means on said other mounting means and engageable with each other and operable in response to bodily movement of said load-engaging members just prior to their reaching said first extreme positions for effecting pivoting movement thereof one way and operable after said load-engaging members have left their first extreme positions and in response to said load-engaging members again reaching said first extreme positions for effecting pivoting movement thereof the opposite way.

7. In an attachment for a lift truck having a pair of supports mounted for movement toward and away from one another,
motor means mechanically connected to said supports for effecting such movement,
a pair of load-engaging arms mounted on said supports for pivoting movement relative to said supports about axes which extend parallel to one another and longitudinally of the truck,
a mechanical linkage on each support operatively connected to the arm on such support,
said linkages being normally separated from one another but being engageable with one another as said supports are moved close to one another to cause pivoting movement of said arms about said axes.

8. In a lift truck having a wheeled body and a mast,
a main carriage movable along said mast,
means for so moving said carriage,
a pair of load engaging arms,
mounting means mounting said arms on said carriage for movement in a manner to vary the orientation of said arms relative to said carriage and to one another,
said mounting means also mounting said arms for bodily movement relative to said carriage and to one another,
power means carried by said carriage for causing such bodily movement of said arms to facilitate engagement of said arms with a load,
and auxiliary means carried by said mounting means and engageable with each other and operable during a portion of the movement of said mounting means for varying the orientation of said arm in one way relative to said frame during one such portion, and a different way during a subsequent portion.

(References on following page)

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