March 13, 1962 W. L. SHIMMON 3,024,929

BOX TURNING DEVICE FOR FORK-LIFT TRUCKS

Filed Jan. 23, 1961 6 Sheets-Sheet 1

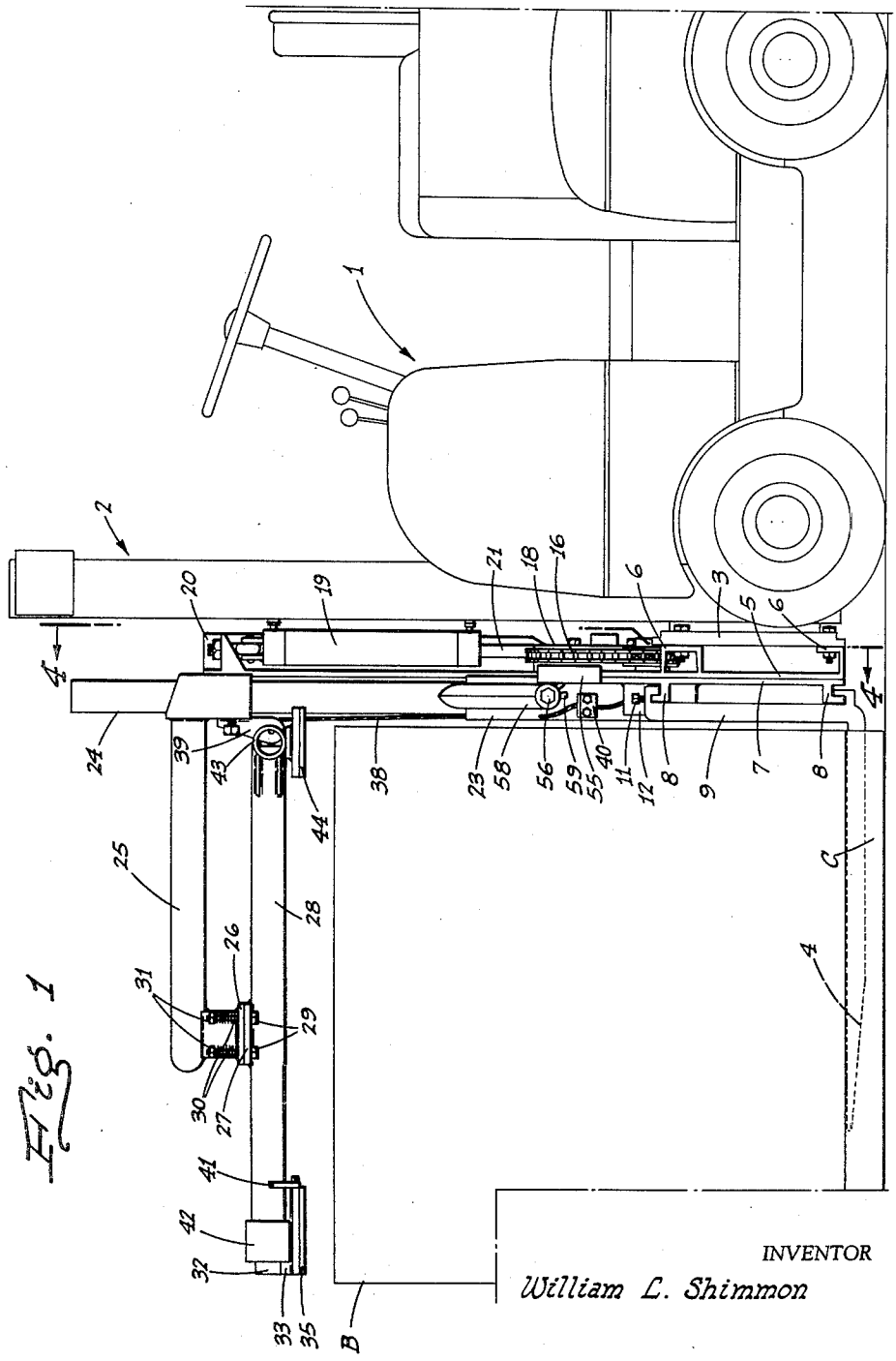

Fig. 1

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Fig. 2

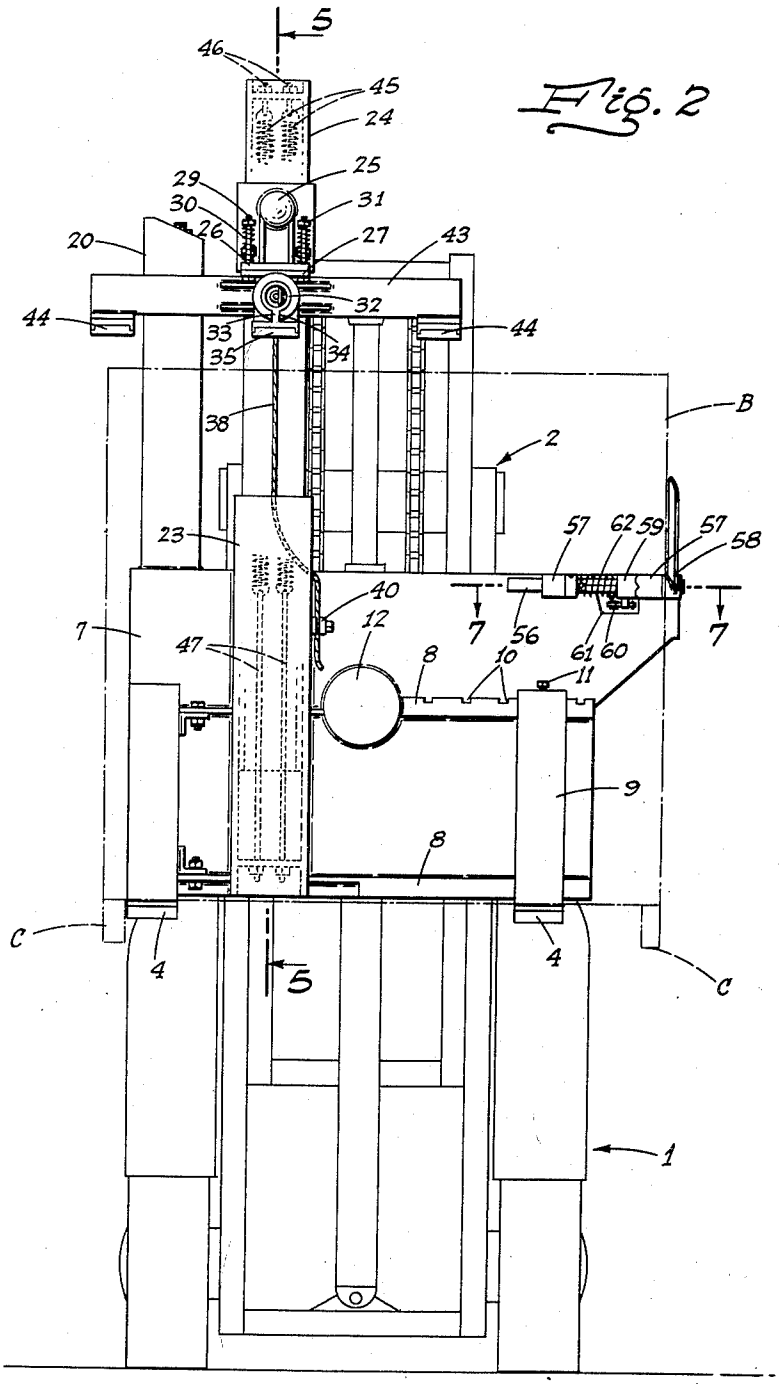

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Fig. 3

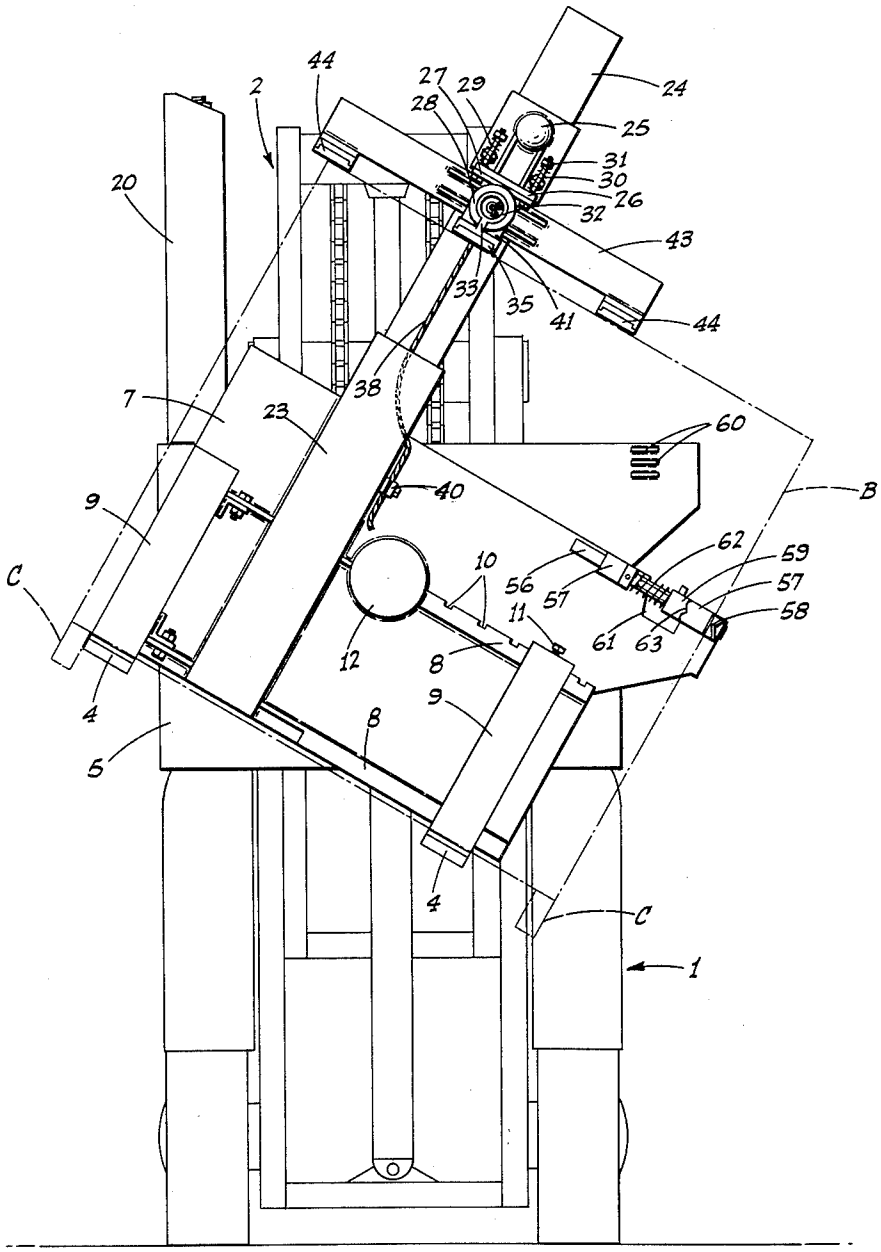

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Fig. 4

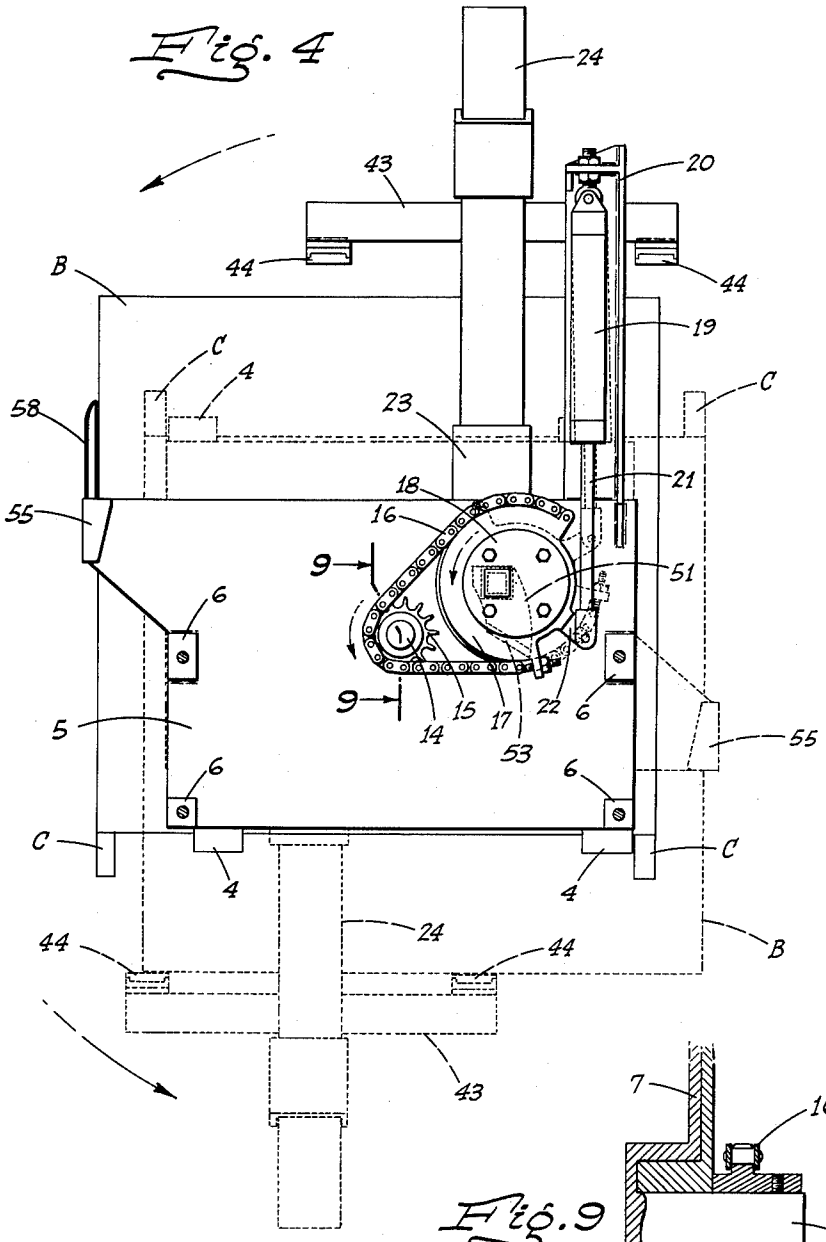

Fig. 9

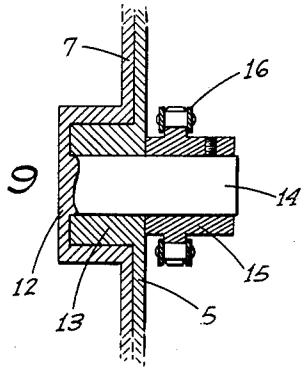

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Fig. 5

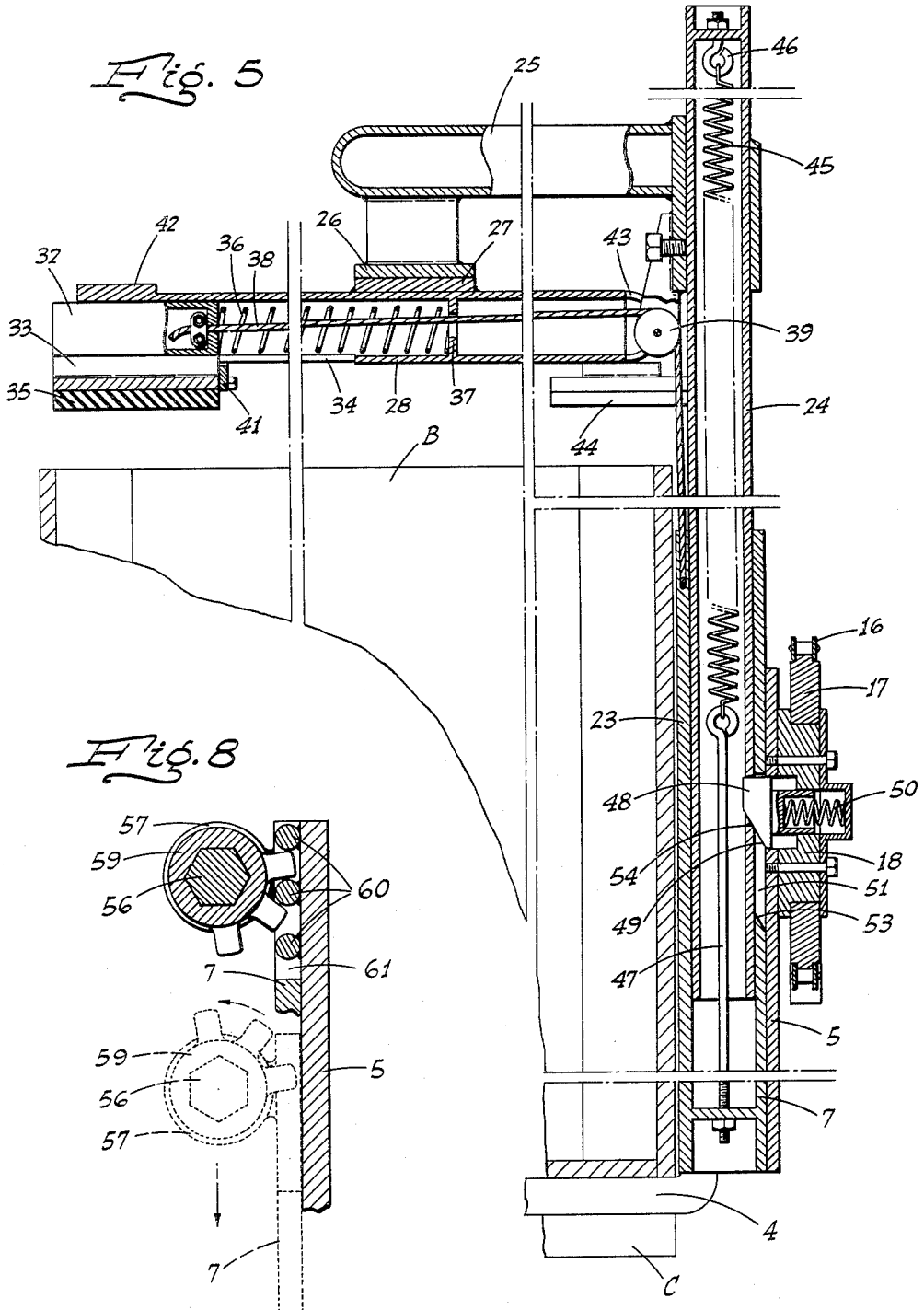

Fig. 8

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Fig. 6

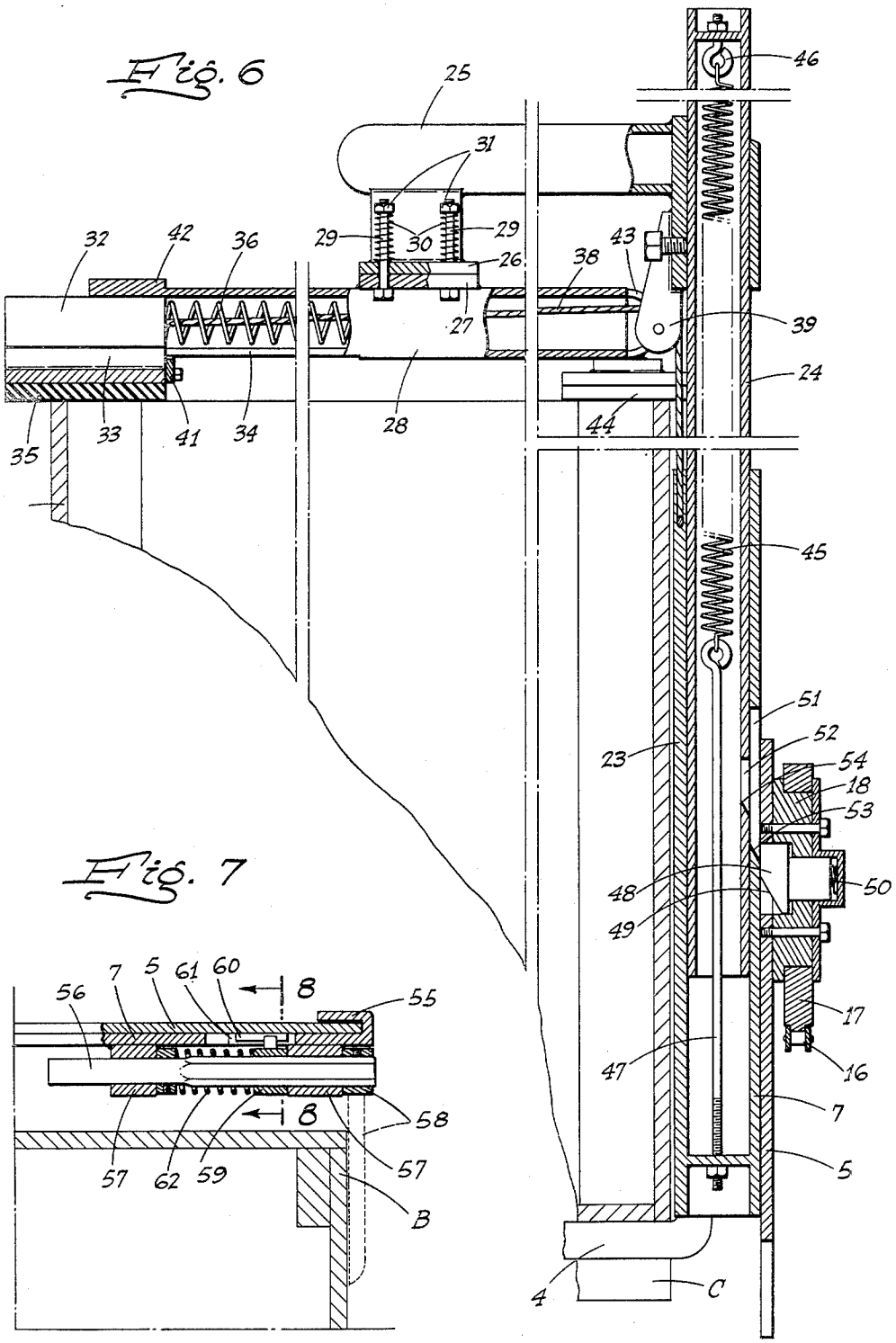

Fig. 7

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BOX TURNING DEVICE FOR FORK-LIFT TRUCKS

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7 Claims. (Cl. 214—313)

This invention relates to fork-lift trucks, and particularly to one adapted to engage, lift, and then dump a large bin or box containing bulk material or products of various kinds.

The major object of my invention is to provide a device for the purpose by means of which the box, while initially resting on the forks of the truck without any connecting means therebetween, will be positively held against the forks while the latter are being swung to an inverted position to discharge the contents of the box onto the floor or ground.

The box or bin holding means includes a plurality of cushion pads positioned for clamping or pressing engagement with the top edge of the box at spaced points thereon, but arranged to be clear of such edge when the box is in an upright position on the lift truck.

A further object of the invention is to provide automatically functioning means which will cause the pads to move into pressing engagement with the box as soon as the latter starts to rotate or tilt, with the forks, toward one side of the truck, and which will cause such engagement to be maintained until the box returns to its upright position, whereupon the pads will be automatically released from the box and lifted clear of the same.

By reason of the automatically functioning features of the device the operator of the truck, without leaving his station thereon, can operate the truck and the fork lift thereon; load a box thereon; lift and then invert the box for dumping; and subsequently discharge the box from the fork lift—all without having to pay attention to the holding or securing of the box in place on the forks while the latter are being manipulated to tilt and invert the box.

One of the clamping pads, when in operation, engages over the front top edge of the box, and projects ahead of the box somewhat, in order that it may accommodate itself to boxes of varying dimensions lengthwise of the truck. This amount of projection, if fixed or immovable, would prevent the boxes when being unloaded, and stacked in vertical tiers, from being disposed in close abutting relation to the boxes of a tier already in place.

It is therefore another object of this invention to provide automatically functioning means to move said one pad rearwardly from the vertical transverse plane of the front edge of the box whenever the pads are lifted clear of the box, so that no part then projects ahead of the box to prevent the same from being abutted against a vertical surface while being unloaded from the truck.

It is also an object of the invention to provide a practical, reliable, and durable box turning device for fork-lift trucks, and one which will be exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings:

FIG. 1 is a side elevation of the improved box turning device as mounted on a fork-lift truck, and with the box in its initial upright position adjacent the ground.

FIG. 2 is a front end elevation of the device with the box in a horizontal position but raised from the ground.

FIG. 3 is a similar view, but showing the box tilted somewhat.

FIG. 4 is a rear view of the device taken on line 4—4 of FIG. 1, but with the box in an elevated position; the fully inverted position of the box being indicated in dotted lines.

FIG. 5 is an enlarged fragmentary sectional elevation on line 5—5 of FIG. 2.

FIG. 6 is a similar view, but showing the box clamps as engaged with the box and with the box and its supporting structure tilted.

FIG. 7 is a fragmentary enlarged sectional plan taken on line 7—7 of FIG. 2.

FIG. 8 is a fragmentary enlarged vertical cross section on line 8—8 of FIG. 7.

FIG. 9 is a fragmentary enlarged section on line 9—9 of FIG. 4.

Referring now more particularly to the drawings, and to the characters of reference marked thereon, the box supporting and turning device is mounted on a conventional fork-lift truck, indicated generally at 1, which includes a vertical guideway structure 2 which supports a vertically movable transverse carriage 3 on which the load lifting forks 4 are ordinarily mounted.

In the present instance said forks are detached from carriage 3 and a rear transverse plate 5 is secured thereto; said plate 5 being maintained in forwardly spaced relation to carriage 3 by means of bosses 6 on the back side of said plate.

Another and relatively rotary front plate 7 is disposed in flush relation with the front face of plate 5, said plate 7 having transverse, vertically spaced guide and supporting rails 8 for the usual upstanding standards 9 formed at the rear ends of the forks 4. The fork at the left hand side of the structure—looking toward the rear, as in FIG. 2—is rigidly mounted in a fixed position at the corresponding ends of the guides 8, but the other fork may be adjusted along said guides, or transversely of the structure; the upper guide rail being notched along the same, as shown at 10, and the corresponding fork standard 8 having a set screw 11 engageable in any one at a time of said notches in holding relation. The forks may thus be set to hold a rectangular load supporting box or bin B of a suitable size.

Centrally of the width of the lower portion of said plate 7, and about on a level with the upper rail 8, the plate 7 is formed with a forwardly projecting cylindrical socket 12 in which a boss 13 on the rear plate 5 is turnable, as shown in FIG. 9. A stub shaft 14, rigid with the socket, projects rearwardly through the boss 13 and said plate 5 in turnable relation thereto, and on its rear end supports a sprocket pinion 15 which is rigidly secured to said shaft.

A chain 16 engages pinion 15 and is partially wrapped about, and at its ends is secured to, the periphery of a laterally offset rotary member 17, as shown in FIG. 4. This member is turnably mounted on a boss 18 fixed on the rear face of plate 5 on the downwardly movable side thereof.

The size of member 17 relative to said pinion is such that the latter will be rotated through a 180 degree arc with a relatively small arcuate rotation of said member 17. The latter is thus controllably rotated by means of a hydraulic ram 19 mounted on and depending from a support 20 secured on the plate 5. The ram is substantially tangent to member 17 and includes a depending piston rod 21 pivoted at its lower end on an ear 22 projecting radially from the portion of the member 17 between the chain ends.

The ram 19 is under the control of the operator of the lift truck, and in this manner the box B, after being loaded and raised to any desired height from the ground, may be inverted for dumping, and then returned to a normal upright position.

The box or bin B is not positively secured to the forks 4 in any way, merely resting thereon as said forks engage

under the bottom of a ground or floor supported box to lift the same. The bottom of the box is held clear of the ground by reason of longitudinal cleats C which are rigid with the box and extending along the side edges thereof. When a box is to be so engaged and lifted the truck is preferably manipulated so that the fixed fork 4 will be as close to the adjacent cleat as possible, as indicated in FIG. 2. The direction of tilting of the box in a downward direction is to that side thereof opposite said fixed fork so that the latter forms a stop for engagement by said adjacent cleat as the box is tilted, and prevents it from sliding off the forks.

In order to automatically clamp the box in place on the forks as the tilting movement takes place, the following structure is provided:

Rigid with the plate 7 on its forward face and disposed between the fixed fork 4 and the socket 12 is a normally vertical sleeve 23, preferably of rectangular cross section, and which forms a guide for a hollow standard 24 which is slidable therein and projects some distance above the sleeve and the supported box.

Rigid with and projecting forwardly from the standard above the box is an arm 25 which at its forward end is rigid with a horizontal pad 26 below the arm. This pad is normally engaged by another pad 27 rigid with a floating arm 28 which extends the full length of the box and of course above the same, as shown in FIG. 1. The pad 27 is vertically yieldably connected to the pad 26 by means of a plurality of bolts 29 which are loosely slidable through the upper pad 26 and project some distance above the same. Compression springs 30 are disposed about the bolts above pad 26 and engage said pad and stops 31 on the upper ends of the bolts.

At its forward end, the arm 28—which is tubular—is slidably engaged on the inside by a block 32 from which a neck 33 depends through a longitudinal slot 34 in the arm 28. A cushion pad 35 is secured on the lower edge of the neck to engage the front edge of the top of the box when the arm 28 is lowered by the lowering of the arm 25, as will be hereinafter seen.

A compression spring 36 in the arm 28 between the rear end of block 32 and a stop 37 in said arm (see FIG. 5) acts to push said block 32 and pad 35 forwardly so that the latter overhangs the box end, as shown in FIG. 6. The block and pad, however, are held rearwardly of said end of the box, when the arms are raised, by means of a cable 38. This cable is connected at one end to the rear end block 32 and extends thence through spring 36 and stop 37 to and about a guide pulley 39 mounted in fixed connection with the standard 24. From the pulley the cable extends downwardly to an anchor 40 on the sleeve 23.

It should be noted that the anchor is on one side of the sleeve, the walls of the latter being formed with a passage to direct the cable laterally and into alinement with the pulley and arm 28, as shown in FIG. 3. In this way nothing projects from the forward surface of the sleeve, and box B can abut the same without damage; the front edges of the fork standards 9 being substantially alined with the front edges of the sleeve 23, as shown in FIG. 1.

The purpose of the above spring and cable controlled cushion pad mounting is to enable the pad to be held retracted—in a horizontal direction—from the box end when raised clear of the box. This allows a box as discharged from the forks 4 to be abutted close against a stack of boxes previously discharged, without the pad 35 first abutting such stack; the arm 28 also terminating short of the front end of the box.

In order to prevent the block 32 from being pushed too far forwardly by the spring, should the cable 38 become unduly slack, said block is provided with a stop element 41 secured on the neck 33 below the arm 28 and which projects upwardly alongside said arm and is

engageable against a shoulder 42 formed on the forward end of the arm 28.

At its rear end arm 28 is formed with a transverse arm 43, extending equal distances on both sides of arm 28, and which at its ends supports cushion pads 44 to engage the top edge of the box B at its rear end, thus providing—with pad 35—a three-point clamping unit for box engagement.

A pair of heavy transversely spaced tension springs 45 are disposed in the standard 24, each being anchored at its upper end to the standard adjacent the upper end thereof, as at 46, and at the lower end being connected to a vertically adjustable pull rod 47 which is anchored at its lower end to the sleeve 23 adjacent the lower end thereof.

These springs—if unrestrained—act, through the standard 24 and arm 25, to lower the cushion pad unit into clamping engagement with the box.

Until the plate 7, and the box supported in connection therewith, is swung somewhat from its normal horizontal position the springs 45 are held inactive and the standard 24 maintained in a raised position by means of the following structure:

Slidably mounted in the boss 18 centrally thereof is a latch member 48 of rectangular form in section and having a downwardly and rearwardly sloping front edge 49. The latch is normally advanced by a spring 50, and when the plate 7 is in its initial position projects through a longitudinal slot 51 extending through the plate 7 and into a fitting opening or recess 52 in the rear face of the standard 24; the lower edges of the slot and opening being cut on a slope corresponding to that of the latch, as shown at 53 and 54, respectively.

By reason of this arrangement, with the initial rotation of the plate 7, together with the box B, the standard 24, and all parts connected thereto, the latch remains in the opening 52, holding the standard 24 up until—with such rotation—the lower tapered end of the slot 51 reaches the relatively stationary latch 48. Because of the lower sloping edge 53 of said slot, the latch is then forced out of the slot and also out of the opening 52, to a fully retracted position, as shown in FIG. 6, so that with further downward rotation or tilting of the plate 7 and box B the latch bears against the rearward face of said plate. This of course frees the standard 24 and allows the springs 45 to act and pull the standard 24 down, and the cushion pads into clamping engagement with the top of the box.

This downward movement of the standard 24 lowers the pulley 39 also, so that the cable 38 is thus slackened, allowing the spring 36 to advance the block 32 and the pad 35 to a position overhanging the box end—a position occupied before the standard is lowered sufficiently to cause the clamping pads to engage the box.

The box is thus firmly held against the lift forks even when fully inverted. Upon the ram 19 being actuated to reverse the rotation of plate 7 and the box B and return the same to their initial position, the standard 24 remains in its lowered position and the box remains clamped until the latch 48 alines with the lower end of the slot 51 and—urged by the spring 50—enters such slot. Shortly thereafter, upon continued relative movement of the latch along said slot, the latch alines with the still lowered opening 52 in the standard 24. With the final amount of return movement of the plate 7 to its initial position, the standard 24 is relatively lifted by the latch, thus raising the clamping pads from the box. With such lifting of the standard the cable 38 is tensioned, pulling the block 32 and pad 35 rearwardly and clear of the vertical plane of the front end of the box. The return rotation of the plate is positively stopped by the engagement of a hook-like stop 55 on one side edge of the plate 7, with the adjacent edge of the plate 5, as shown in FIG. 7.

I have also provided an automatically functioning de-

vice to prevent lateral tilting of the box on the forks as the latter are being initially tilted and before the clamping pads become effective. This device, which is shown particularly in FIGS. 3, 7, and 8, comprises a transversely extending, axially immovable stub shaft **56** turnably mounted in bearings **57** secured on the front face of the plate **7** adjacent its upper edge, or well below the top of the box, on the initially leading or downwardly movable side thereof.

A radial arm **58** is secured on the outer end of the shaft, which is disposed in a transverse plane just clear of the adjacent side edge of the box B, as shown in FIG. 7, and is normally maintained in an upstanding position clear of the box, as shown in FIG. 1.

Slidable but non-turnable on the shaft between the bearings is a segmental pinion **59** whose teeth are engageable with rack teeth **60** projecting from the rear face of plate **5**; the plate **7** between the shaft bearings being cut away to its upper edge, as at **61**, to expose said rack teeth for engagement by the pinion.

A spring **62** on the shaft **56** engages the hub of the pinion and urges the same laterally out and into pressing engagement with the adjacent face of the outer bearing **57**; said adjacent face and that of the pinion hub being cooperatingly notched, as shown at **63** in FIG. 3, to yieldably hold the pinion against rotation.

When plate **7** is in its initial or normal position the pinion **59** is engaged with the rack; the arm **58** being then in its retracted or vertical position. As the plate **7** is lowered relative to plate **5** as said plate is swung in a box inverting direction, the pinion is rotated in an anti-clockwise direction, causing the arm **58** to be likewise swung down to a horizontal position directly overlying the adjacent side of the box. The pinion and rack are arranged so that a 90 degree rotation only of the shaft will be had before the pinion leaves the rack upon downward movement of the corresponding portion of the plate **7**; the engagement of the notched edges **63** of the pinion hub and adjacent shaft bearing then holding the arm **58** in a box overlying position. Upon the retractive or upward return movement of plate **7** the pinion finally reengages the rack and is rotated in a clockwise direction to return the arm **58** to its initial out-of-the-way position.

From the foregoing description it will be readily seen that there has been produced such a device as will substantially fulfill the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention the following is claimed as new and useful and upon which Letters Patent are desired:

1. In a fork-lift truck having a vertically movable carriage, a rear transverse plate secured on the carriage, a front transverse plate pivotally mounted on the rear plate for rotation about a horizontal axis lengthwise of the truck, lift forks mounted on and projecting forwardly from the front plate adjacent the lower edge thereof, means to oscillate the front plate through a predetermined arc from a horizontal position of the forks, a load receiving box separate from and adapted to be supported on the forks, a plurality of pads positioned to engage the top of the box at spaced points thereon, a normally horizontal arm unit extending over the box and from which the pads depend in supported relation, a standard depending from the rear end of the arm unit, a sleeve fixed with the front plate in which the standard is slidable, spring means between the standard and sleeve acting to lower the standard, and cooperating means on the rear and front plates and the standard preventing such lowering of the standard as long as the forks are in such horizontal position.

2. A structure, as in claim 1, in which said last named means comprises a spring advanced latch mounted on the rear plate for forward movement relative thereto and disposed in laterally offset relation to the axis of rotation of the front plate on the side thereof opposite the side which moves downwardly when a rotative movement is initiated, the standard having a recess in which the front portion of the latch fits when the standard is in a raised position and the pads are inactive, and means to retract the latch from the recess upon such downward movement of said side of the front plate.

3. A structure, as in claim 1, in which said last named means comprises a spring advanced latch mounted on the rear plate for forward movement relative thereto and disposed in laterally offset relation to the axis of rotation of the front plate on the side thereof opposite the side which moves downwardly when a rotative movement is initiated, the standard having a recess in which the front portion of the latch fits when the standard is in a raised position and the pads are inactive, the front plate having a slot through which the latch projects and depending from said latch a predetermined distance when the box is in an initial upright position and the standard is raised, the front edge of the latch having a downwardly and rearwardly sloping edge and the lower edges of the recess and slot having a corresponding slope whereby upon a predetermined amount of relative rotation of the plates the latch will be retracted from the recess upon engagement of the sloping edge of the latch with that of the slot.

4. A structure, as in claim 1, in which the foremost one of the pads is adapted to overlie and project ahead of the front edge of the box when in a box engaging position, means mounting said pad on the arm unit for longitudinal horizontal movement relative to the box, means acting to advance the pad into said overlying position for box engagement when the standard is lowered, and means functioning upon upward movement of the standard to retract the pad to a point rearwardly of the front edge of the box.

5. A structure, as in claim 1, in which the foremost one of the pads is adapted to overlie and project ahead of the front edge of the box when in a box engaging position, means mounting said pad on the arm unit for longitudinal horizontal movement relative to the box, spring means acting on the pad to advance the same to such overlying position, a cable connected to and projecting rearwardly from the pad, a pulley fixed with the standard over which the cable is trained to extend downwardly therefrom, the cable at its lower end being anchored on the sleeve and being tensioned and acting to pull back on the pad against the advancing action of the spring when the standard is raised.

6. In a fork-lift truck having a vertically movable carriage, a rear transverse plate secured on the carriage, a front transverse plate pivotally mounted on the rear plate for rotation about a horizontal axis lengthwise of the truck, lift forks mounted on and projecting forwardly from the front plate adjacent the lower edge thereof, means to oscillate the front plate through a predetermined arc from a horizontal position of the forks, a load receiving box separate from and adapted to be supported on the forks, automatically functioning means mounted in connection with the plates to clamp the box against the forks upon rotation of the front plate and forks from such horizontal position of the latter, an arm disposed in a vertical longitudinal plane laterally out from but adjacent the side of the box which initially turns down with the front plate, means mounting the arm on the front plate for rotation about a horizontal transverse axis below the top of the box, the arm being vertical and clear of the box when the latter is in an upright position on the forks, and cooperating means between the arm mounting means and the rear plate for rotating the arm to a box-side over-

lapping position upon initial rotation of the front plate from its initial position.

7. A structure, as in claim 6, in which said mounting means includes a shaft and said cooperating means comprises a pinion on the shaft, and a vertical rack on and projecting forwardly from the rear plate and engaging the pinion.

References Cited in the file of this patent

UNITED STATES PATENTS

500,997	Dahl	July 4, 1893
1,757,932	Case	May 6, 1930
2,335,572	Schroeder	Nov. 30, 1943
2,690,272	Quayle	Sept. 28, 1954
2,827,184	Mueller	Mar. 18, 1958
2,875,912	Thresher et al.	Mar. 3, 1959
2,926,803	Collins	Mar. 1, 1960
2,979,217	Tomasovich	Apr. 11, 1961