May 19, 1970 W. E. HOWARD 3,512,670

NINETY DEGREE TURNING ATTACHMENT FOR FORKLIFT TRUCK

Filed Dec. 27, 1968 3 Sheets-Sheet 1

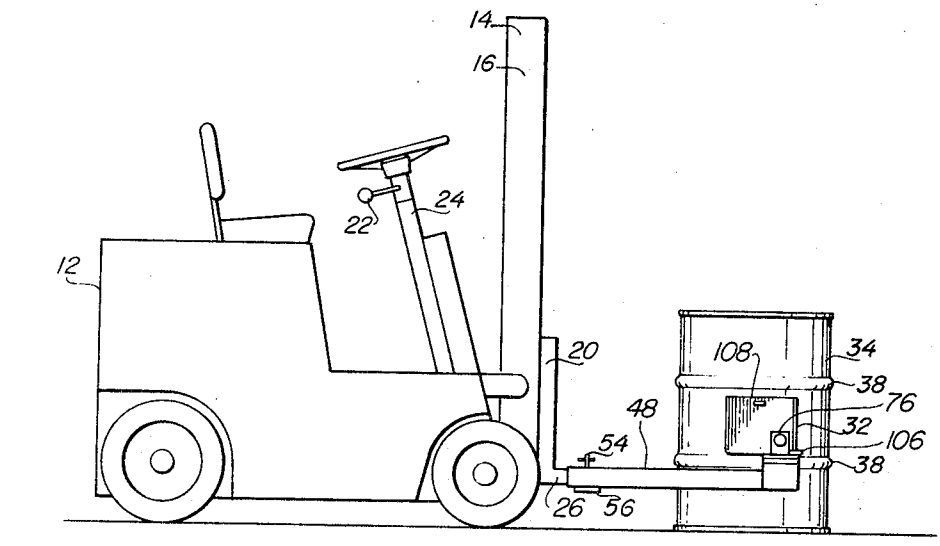

Fig. 1

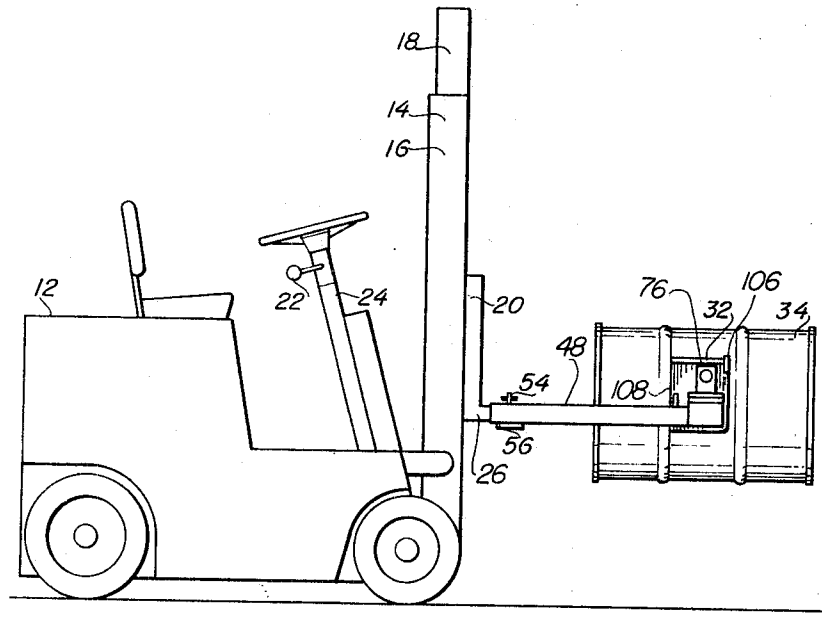

Fig. 2

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NINETY DEGREE TURNING ATTACHMENT FOR FORKLIFT TRUCK

Filed Dec. 27, 1968 3 Sheets-Sheet 2

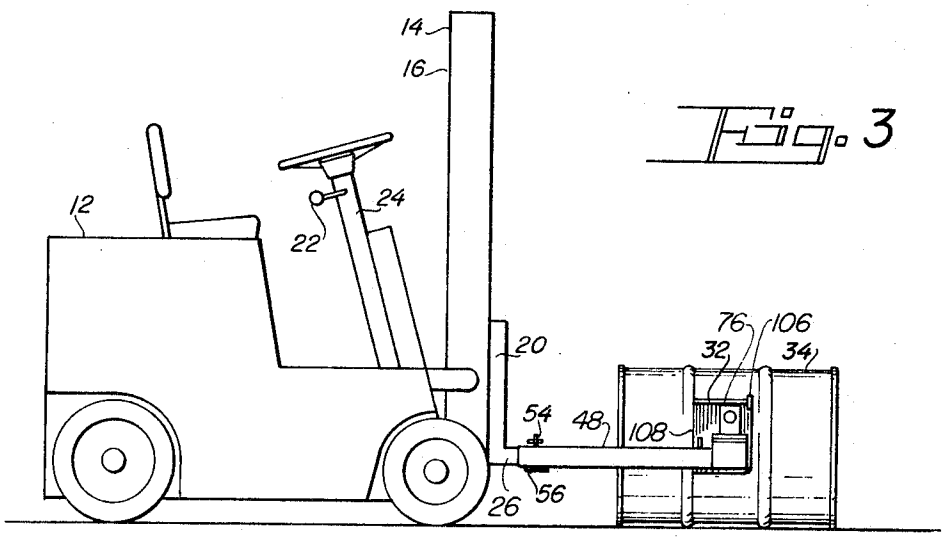

Fig. 3

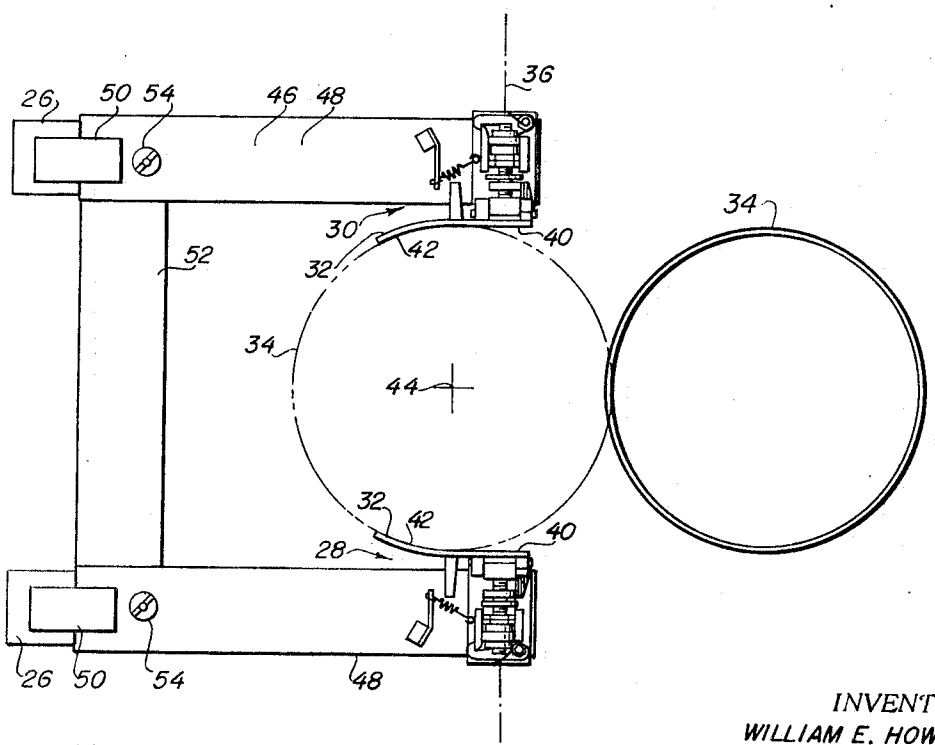

Fig. 4

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Filed Dec. 27, 1968 3 Sheets-Sheet 3

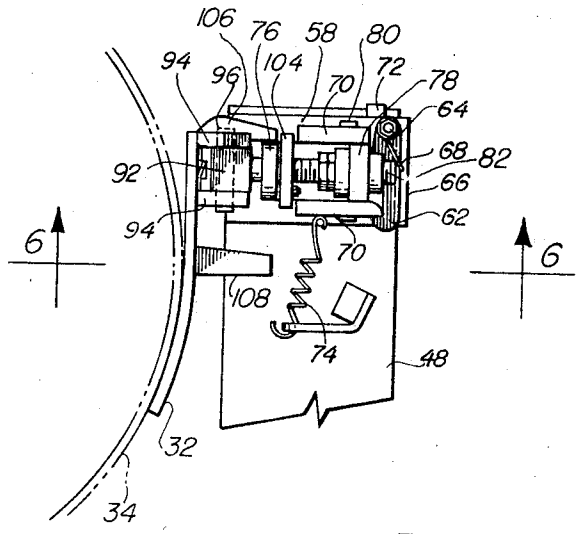

Fig. 5

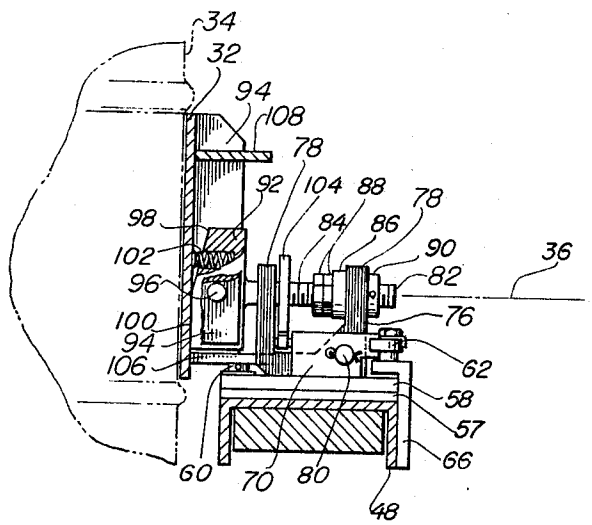

Fig. 6

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3,512,670

NINETY DEGREE TURNING ATTACHMENT FOR FORKLIFT TRUCK

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Int. Cl. B65g 7/00
U.S. Cl. 214—620 7 Claims

ABSTRACT OF THE DISCLOSURE

An attachment for a forklift truck is disclosed for turning drums ninety degrees from an on-end to an on-side condition and vice versa. The attachment is purely mechanical in nature and utilizes the weight of the drum and the normal lifting movement of the fork to obtain the turning movement, no hydraulic cylinder or other power actuators being required.

BACKGROUND OF THE INVENTION

This invention relates to attachments for forklift trucks, and deals more particularly with such an attachment particularly adapted for turning drums ninety degrees to change them from an on-end to an on-side condition or vice versa and additionally useful for carrying drums from one location to another.

In the handling of large steel drums of the type conventionally used for storing many different types of materials it is often necessary not only to transport the drums from place to place but also to turn them ninety degrees to change their positions from an on-end condition with their longitudinal axes vertical to an on-side condition with their longitudinal axes horizontal. For example, such drums are often stored or shipped in the more stable on-end condition but in use are changed to the on-side condition to permit the drainage of liquid materials from the drums or to permit the drums to be rolled on their rolling rings to different locations. Also, it is often times necessary, when using such drums to store various materials for a long time, to periodically change the positions of the drums in order to prevent undue settling of the stored materials. These drums when completely filled are usally very heavy and normally require as many as two to three men to safely manually turn them from an on-end to an on-side condition or vice versa. This turning operation therefore not only requires a great deal of labor but is hazardous and has resulted in many accidents.

The object of this invention is therefore to provide a simple drum handling mechanism which may be attached to a forklift truck and used for handling drums particularly in the operation of turning them ninety degrees from an on-end to an on-side condition or vice versa. A further object is to provide such an attachment whereby the operation may be controlled entirely by the operator of the forklift truck without any assistance and wherein the attachment is relatively simple, unpowered and one which may be quickly added to and removed from the forklift truck to allow the truck to be used for other purposes when the drum handling operation is completed.

SUMMARY OF THE INVENTION

An attachment for a forklift truck includes a frame adapted to be removably secured to the forks of the truck and including two laterally spaced oppositely facing curved pads adapted to engage opposite sides of a drum received therebetween. The pads are rotatable about a common transverse axis and are biased about such axis to positions conditioning them for engagement with a drum placed

on end with its longitudinal axis oriented vertically. The centers of curvature of the two pads is spaced rearwardly from the transverse axis of rotation so that when the pads are lifted by raising the fork the weight of the drum exerts a moment on the pads automatically rotating them and the drum about the transverse axis and a stop means limits this movement to approximately ninety degrees. After this ninety degree turning has taken place the fork may be lowered to lower the drum onto the ground and to disengage it from the pads.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a forklift truck equipped with a drum handling attachment embodying this invention.

FIG. 2 is similar to FIG. 1 but shows the forklift truck with its fork raised from the position of FIG. 1 and the drum turned ninety degrees from its FIG. 1 position.

FIG. 3 is another view similar to FIG. 1 but shows the fork of the forklift truck returned to a lowered position to place the drum on the ground.

FIG. 4 is an enlarged plan view of the drum handling attachment of FIG. 1.

FIG. 5 is a fragmentary still further enlarged plan view showing one of the drum engaging pads and its supporting mechanism of the drum handling attachment of FIG. 1.

FIG. 6 is a vertical sectional view taken on the line 6—6 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to the drawings and first considering FIGS. 1, 2, and 3, a device embodying this invention is there shown attached to a conventional forklift truck **12** having a vertical mast **14** at its forward end. The mast **14** includes a stationary part or column **16** and a vertically movable part or column **18** having a fork **20** fixed thereto. The portion of the movable part to which the lifting work is attached being often referred to as a lifting carriage. Raising and lowering movement of the column **18** relativetive to the column **16**, to raise and lower the fork **20**, is effected by one or more hydraulic actuators or other conventional motors controlled by the operator f the truck by means of a control lever **22** mounted on the steering column **24**, or elsewhere near the steering column, so as to be easily manipulated by the operator while he remains in a driving position on the truck. The fork **20** is of conventional construction, and as best shown in FIG. 4, includes two horizontal and transversely spaced prongs **26**, **26** which extend forwardly from the mast **14**.

The drum handling device of this invention is carried by the prongs **26**, **26** of the fork **20** and includes two pad assemblies, indicated generally at **28** and **30** in FIG. 4. The pad assemblies **28** and **30** are substantially identical to one another, are associated respectively with the two fork prongs **26**, **26** and are arranged directly opposite to one another near the forward ends of the prongs. Each pad assembly includes a drum engageable pad **32**, and the two pads **32**, **32** face one another and are adapted to receive therebetween a standard drum **34**, as shown in FIGS. 1, 2, and 4, having a pair of axially spaced rolling rings **38**, **38** which are located on opposite sides of the center of the drum and project laterally outwardly from the remainder of the side surface of the drum. The two pads **32**, **32** are supported for movement about a common axis, indicated at **36** in FIG. 4 and extending transversely of the prongs, and are each biased about such axis to a normal position shown in FIGS. 1 and 4. In this normal position the pads are arranged to engage, as shown in FIGS. 1 and 4 a drum **34** orientated in an upright or on-end condition. With reference to FIG. 1, the vertical

dimension of each pad **32** is such so that the pads fit loosely in the space between the two rolling rings **38, 38** of the drum **34**. Further, the pads are so shaped that they may be moved into engagement with the on-end drum **34** by merely moving the forklife truck **12** forwardly toward the drum, without any movement of the pads and when properly engaged with a drum the upper edge of each pad is engageable with the upper rolling ring **38** to exert a lifting force on the drum as the pads are raised. The shape of the pads are further such that when they are properly engaged with an on-end drum the center of gravity of the drum is offset rearwardly from the transverse pivot axis **36** so that as the pads are raised the weight of the drum bearing thereon produces a moment about the axis **36** causing the pads and drum to rotate. Still further the arrangemen and support for the pads is such that when they are in lifting engagement with an on-end drum—that is with their upper edges engaging the upper rolling ring—the axis **36** of rotation of the pads is located below the center of the drum so that if the drum is filled or substantially filled its center of gravity is located above the axis **36** of rotation thereby creating an unstable moment about the axis **36** as the drum is lifted causing it to rotate the full desired ninety degrees and to remain in the turned condition while lifted.

The desired shape of the pads **32, 32** is best shown in FIGS. 4, 5 and 6 wherein it will be noted that each pad includes a substantially straight or flat forward section **40** located in a vertical plane generally parallel to the associated fork **26** and a curved rear section **42**. The two straight sections **40, 40** of the two pads are spaced apart from one another by a distance substantially equal to the diameter of the drum **34** in the area between the rolling rings **38, 38** and the curved sections **42, 42** are each curved about an axis of revolution with their radii of curvature being substantially equal to one another and to the radius of the drum. Therefore when the two pads are both in their normal positions as shown in FIG. 4 their axes of revolution are located along a common vertical line indicated at **44** located behind the transverse axis **36**. When the drum **34** is engaged with the pads **32, 32** as shown in FIG. 4 the center axis of the drum will accordingly be located approximately on the axis of revolution **44** of the curved pad sections **42, 42** so that the center of gravity of the drum is located behind the axis **36** as desired.

Various different means may be used for supporting the pads **32, 32** relative to the prongs **26, 26** for rotation about the transverse axis **36**. However, it is convenient to use at the pad supporting means part of the same structure used in the fork lift attachment disclosed in my co-pending patent application Ser. No. 529,456, filed Feb. 23, 1966 entitled Article Grasping Device for Forklift Trucks, as this allows the basic attachment to be changed from the construction of said co-pending application to the construction of this application, or vice versa, by merely substituting a few parts. Accordingly, the drawings in this application do show a pad supporting structure utilizing many parts common to the attachment of my co-pending application, however, it should be understood that some of the illustrated parts are not necessary to the proper functioning of the device of this application and have utility only when used as part of the attachment of the co-pending application.

Referring to FIGS. 4, 5, and 6, the pad supporting means includes a separate frame **46** which fits over the prongs **26, 26** to allow the truck **12** to be quickly converted from normal use to use with the attachment, and vice versa. The frame **46** comprises two channel members **48, 48** each of which in use overlies and receives a respective one of the prongs **26, 26**. Each channel member **48** is slightly shorter than the associated prong and extends from the forward end of the prong to a point spaced slightly from the vertical rear portion of the prong. To the top surface of each channel member is welded a spacer plate **50** which extends beyond the channel member and is engageable with the vertical rear portion of the prong to properly locate the channel member on the prong. The two channel members **48, 48** are connected to one another by a third channel member **52** extending transversely therebetween and welded at each end to the adjacent member **48**. A retaining screw **54** threaded into each channel member **48** and engageable with the associated prong **26** releasably holds the frame to the prongs. Directly beneath each retaining screw, as shown in FIGS. 1, 2, and 3, the associated channel member **48** includes a plate **56** extending transversely across the bottom of the prong and welded to the side flanges of the channel member. Therefore, by tightening the screw **54** the associated prong is tightly clamped between it and the associated plate **56** to firmly retain the frame on the prong.

FIGS. 5 and 6 show the structure for supporting the right hand pad **42** on its associated frame member **48**, the structure for supporting the associated left hand pad on its frame member being an identical mirror image of the same and therefore not illustrated. Referring to these figures for an understanding of the structure shown therein, fixed to the forward end of the illustrated frame member **48**, as by welding, is a bearing plate **57** on top of which rests a base plate **58**. For use in the operation of the attachment of the aforesaid co-pending application, the base plate **58** is pivotally movable relative to the bearing plate **57** about a vertical axis defined by a pivot pin **60**. In the use of the illustrated attachment, however, the base plate **58** remains stationary relative to the bearing plate **57** and is at all times held in its illustrated position by a latch member **62**. The latch member **62** is pivotally supported by a stud **64** fixed to an L-shaped retaining member **66** welded to the outside flange of the channel member **48**. The latch member **62** is biased about the axis of the stud **64** by a spring **68** which urges the latch member toward and holds it in latching relationship with the rear one of two spaced upright ears **70, 70** welded to the base plate **58**. The outside or right hand portion of the base plate **58**, as shown in FIG. 6, is located beneath the upper arm of the L-shaped retaining member **66** and by this arm and the pivot pin **60** is retained against upward movement relative to the bearing plate **57**. Likewise, the latch **62** which is engageable with the rear ear **70** and an upright stop **72** welded to the channel member **48** and engageable with the forward edge of the base plate retain the base plate against movement in either direction about the pivot pin **60**. Therefore the base plate is maintained in a stationary condition and in effect constitutes a fixed part of the channel member **48**. A spring **74** connected between the channel member **48** and the base plate **58** so as to bias the base plate about the axis of the pivot pin **60** is used only in the attachment of the co-pending application and serves no useful purpose in the operation of the illustrated device.

Between the ears **70, 70** of the base plate **58** is a U-shaped carrier **76** having two upright laterally spaced legs **78, 78**. The carrier **76** is substantially immovably fixed to the base plate **58** by a pin **80** extending through the ears **70, 70** and the member **76**. The U-shaped member **76** is slightly different from the corresponding part of the attachment of my aforesaid copending application in that in the aforesaid application such member is provided with a relieved lower right hand corner to permit it to rotate about the axis of the pin **80**. In the present case, however, the member **76** is provided with a squared lower right hand corner so that such corner engages the base plate and prevents the member from rotating about the axis of the pin **80**. Therefore, the member **76** is fixed to the base plate and like the base plate is essentially the equivalent of a part fixed directly to the channel member **48** of the frame.

The carrier **76** rotatably supports an intermediate part **82** for rotation about the transverse axis **36**. The part **82** includes a generally cylindrical shank portion **84** which

passes loosely through conforming openings in the two arms **78, 78** of the carrier so as to be rotatable relative thereto. The shank portion **84** is externally threaded along a part thereof and axially fixed relative to the carrier by a thrust bearing **86**, two locking nuts **88, 88** and a collar **90**, the collar **90** being releasably fixed to the outer portion of the shank by a set screw or similar means. This arrangement allows the intermediate part **82** to be moved to various different positions of axial adjustment relative to the carrier **76** by shifting the locking nuts **88, 88** and the collar **90**, to vary the spacing between the two pads **32, 32** to adjust for the diameter of the drums being handled.

At its inboard end of the intermediate part **82**, FIGS. 5 and 6, includes a head **92** having two flat parallel side surfaces engaged respectively by two parallel spaced ears **94, 94** welded to the pad and projecting laterally outwardly therefrom. The pad **32** is pivotally connected to the head **82** by a pivot pin **96** passing through the ears **94, 94** and through the head **82**. When the pad **32** is in its normal position as shown in FIGS. 1, 4, 5 and 6, the pivot pin **86** is positioned with its axis horizontal and parallel to the axis of the associated prong **26**. Also, as best seen in FIG. 6 the pin **86** is spaced from the upper edge of the pad by a distance substantially greater than half the space between the two rolling rings **38, 38** so that when the upper edge engages the upper rolling ring the axis **36** of rotation is located below the center of the drum. Facing the pad **32** the head **92** has two surfaces **98** and **100**. The lower surface **100** is arranged in a vertical plane and the upper surface **98** is inclined slightly away from the vertical plane. These two surfaces are engageable with the pad **32** to limit its movement about the axis of the pin **96**, and a spring **102** is received in a cavity in the upper portion of the head **92** and works between such head and the pad to normally bias the pad into engagement with the surface **100** to maintain the pad in a normal upright condition as illustrated in FIG. 6. It should be noted that the intermediate part **82** is or may be exactly identical with the corresponding part of the attachment shown in my aforesaid co-pending application except that it is connected with the carrier **76** and pad **32** so that its inclined surface **98** is located above rather than below its central axis. Also, it should be noted that the pivotal connection betwen the head **92** and the pad **32** is not essential and if desired the pad could be welded or otherwise fixed to the head in the position shown in FIG. 6. The pivotal mounting does, however, have some advantage in allowing the pads to move more smoothly as they pass over the rolling ring of the drum when disengaging them from a drum after the drum has been turned to the on-side condition shown in FIG. 3.

Rotation of the pad **32** of FIGS. 5 and 6 is accommodated by rotation of the attached intermediate part **82** about the axis **36** relative to the carrier **76**. The pad **32** is, however, biased to the illustrated normal position of FIGS. 1, 4, 5 and 6 by a spiral spring **104** having one end fiixed to the carrier **76** and its other end fixed to the shaft portion **84** of the part **82**. Rotation of the pad and intermediate part **82** about the axis **36** in the direction in which they are urged by the spring **104** is limited by a first laterally outwardly extending arm **106** welded to the lower end of the pad **32**, as shown best in FIG. 6, and engageable with the inner leg **78** of the U-shaped carrier **76**. Rotation of the pad **32** and intermediate member **82** in the opposite direction is limited by a second laterally outwardly extending arm **108** welded to the upper portion of the pad **32** and engageable with the upper surface of the associated channel member **48**, as shown best in FIG. 3. Therefore, the two stop arms **106** and **108** of each pad limit its rotation about the axis **36** to a total travel of approximately ninety degrees from the normal position of FIG. 1 to the position of FIGS. 2 and 3.

Referring to FIGS. 1, 2 and 3, the operation of the device in turning a drum from an on-end to an on-side condition may be understood by considering these figures in sequence. When the drum **34** is in an on-end condition, as shown in FIG. 1, the attachment is engaged with the drum by positioning the fork **20** of the forklift truck to the level at which the two pads **32, 32** are at the same level as the intermediate portion of the drum located between the two rolling rings **38, 38**. The truck is then moved forwardly toward the drum until the pads are brought to the position of FIG. 1 at which they receive the drum therebetween and engage opposite sides thereof. The fork **20** is then raised from the FIG. 1 position and as it is raised the upper edges of the two pads **32, 32** bear against the upper rolling ring **38** and start to lift the drum.

As the drum is raised the weight thereof bearing against the upper edges of the pads **32, 32** creates a moment about the transverse axis of rotation of the pads and causes the pads and the drum to rotate about such axis with the upper end of the drum moving rearwardly toward the truck **12**, so that after the fork is raised a sufficient distance to permit the lower edge of the drum to swing past the level of the floor or ground the drum and pads rotate a full ninety degrees to the position illustrated in FIG. 2, at which position the rotation is stopped by the two stops **108, 108** on the two pads **32, 32** engaging the two channel members **48, 48**. With the drum in the position illustrated in FIG. 2, the drum may be transported to any desired new location by the truck **12**, if desired, and then the drum may be returned to the floor or ground by lowering the fork **20** to the position shown in FIG. 3, the drum in this case now being located on the floor or ground in an on-side condition. After the fork is lowered to the position shown in FIG. 3, with the drum resting on the floor or ground, the fork may be lowered still further to release the pads from the drum and the pads may then be fully disengaged from the drum by backing the truck **12** away from the drum or toward the left in FIG. 3. As the pads are lowered from the FIG. 3 position, the springs **104, 104** will tend to rotate the pads about the transverse axis **36** toward their normal positions and as the forklift truck is backed away from the drum the pads will usually rotate slightly about the axes of the pivot pins **96, 96** to allow them to pass more smoothly over the left-hand rolling ring **38** in FIG. 3.

In addition to being used for turning a drum from an on-end to an on-side condition and/or for transporting a drum from one location to another as described above, the illustrated device may also be used for returning a drum from an on-side condition to an on-end condition. In performing this operation, the fork is lowered below the position shown in FIG. 3 to a point at which the pads **32, 32** will pass beneath the on-side drum. The forklift truck is then moved forwardly toward the drum to a point at which the pads are located between the closest or rear end flange of the drum and the adjacent rolling ring. The fork is then raised, which brings the pads into engagement with the side of the drum between the end flange and the rolling ring, thereby exerting a lifting force on that end of the drum. As the fork is raised further to raise the rear end of the drum, it is also moved forwardly so as to tip the drum toward an upright position by pivoting it on its opposite or forward end flange. That is, assuming that the drum illustrated in FIG. 3 is the one to be turned from its illustrated on-side position to an upright or on-end position and that the pads are brought into engagement with the area between its left-hand end flange and its left-hand rolling ring, as it is turned to its upright position, it pivots on its right-hand end flange which bears against the floor or ground, and, of course, in the process of this turning movement the pads **32, 32** rotate about their common transverse axis **36**, relative to the fork prongs **26, 26**.

I claim:

1. A drum handling device for attachment to a forklift truck having a vertically movable fork with two generally horizontal transversely spaced prongs and for use with drums of the type having a generally cylindrical side sur-

face with it least one laterally outwardly projecting ring axially spaced from the center thereof, said device comprising two drum engageable pads, means supporting each of said pads adjacent a respective one of said two prongs directly opposite from the other of said pads and for rotation about a common axis extending transversely of said prongs, means for biasing each of said pads about said common axis toward a normal position, stop means for limiting each of said pads to said normal position and to a second position located approximately ninety degrees about said common axis from said normal position, each of said pads having a curved section conforming to the curvature of the side surface of a drum to be handled and which in the normal position of the pad is substantially arcuate about a vertical axis of revolution spaced rearwardly of said common transverse axis so that when said pads are brought into point engagement with a drum oriented on-end with its central axis substantially vertical, the center of gravity of said drum is located rearwardly of said common axis, each of said pads further having an upper edge which is engageable with said rnig as said pads are raised to exert a lifting force on said drum and which upper edge is spaced from said common transverse axis by a distance substantially greater than the spacing between said ring and the center of said drum so that as said pads are raised to lift said drum the weight of said drum exerts an unstable turning moment on said pads automatically turning said pads and said drum about said common axis from said normal position to said second position whereat said drum is oriented with its central axis substantially horizontal.

2. A drum handling device as defined in claim 1 for use with drums of the type wherein said one ring is one of two rolling rings axially spaced from one another and located on opposite sides of the center of the drum, further characterized by said pads each when it its normal position having a vertical dimension slightly less than the spacing between said two rolling rings of said drums.

3. A drum handling device as defined in claim 1 further characterized by each of said pads including a straight

forward section projecting forwardly from said curved section when said pad is in its normal position is located in a vertical plane substantially parallel to the associated prong, said two straight sections of said two pads being laterally spaced from one another by a distance substantially equal to the diameter of a drum to be handled.

4. A drum handling device as defined in claim 1 further characterized by means supporting each of said pads for movement relative to its associated prong about a second axis fixed relative to the pad and arranged so as to be perpendicular to said common axis and horizontal when said pad is in its normal position.

5. An article grasping device as defined in claim 4 further characterized by means for limiting each of said pads to an upright position in its movement in one direction about its second axis, and means for biasing each of said pads in said one direction toward said upright position about said second axis.

6. A drum handling device as defined in calim 1 further characterized by means for adjustably shifting the lateral position of at least one of said pads toward or away from the other of said pads to vary the spacing between said pads.

7. A drum handling device as defined in claim 1 further characterized by said means for supporting said pads including a frame adapted to fit over said prongs, and means for releasably holding asid frame to said prongs.

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U.S. Cl. X.R.

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