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BARREL LIFT MECHANISM

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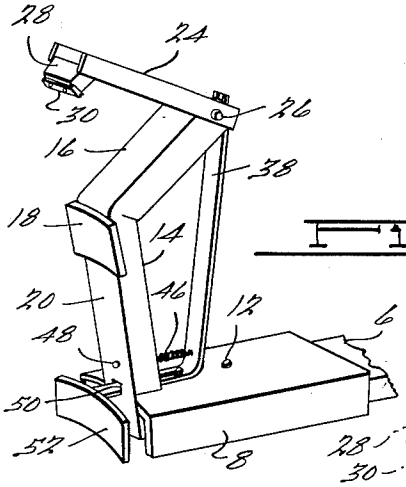


FIG. 1.

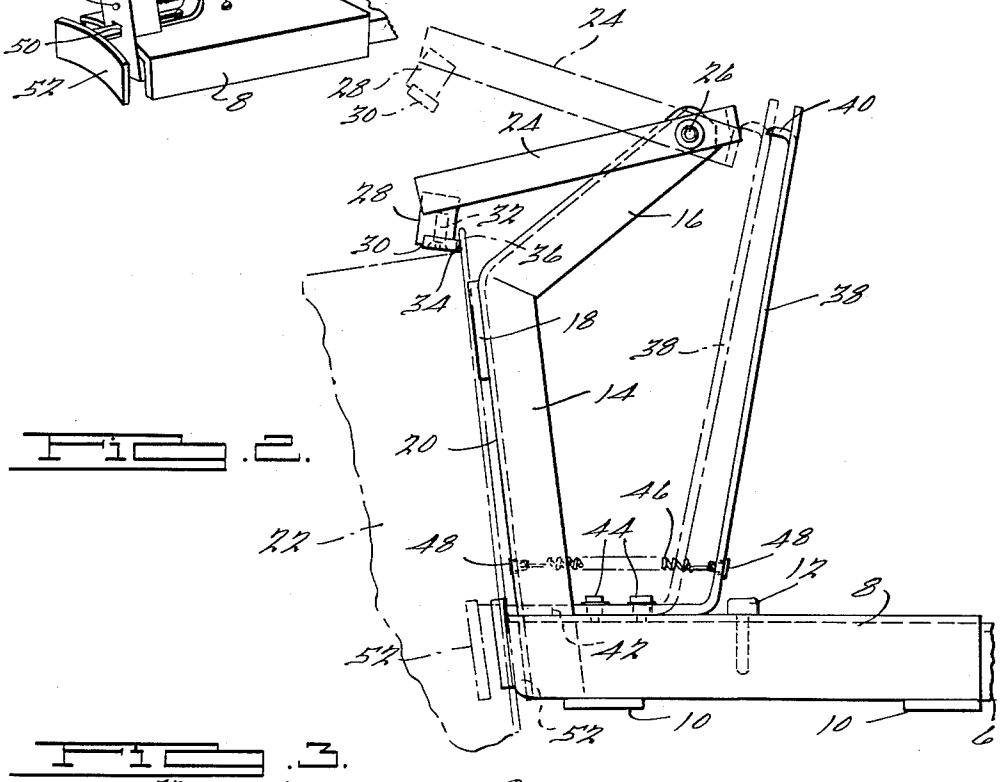


FIG. 2.

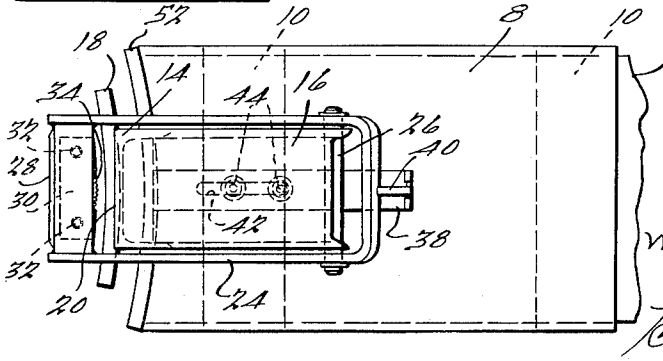


FIG. 3.

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BARREL LIFT MECHANISM

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The present invention broadly pertains to a mechanism for lifting objects such as casks, boxes, drums, barrels, containers and the like which have an upstanding wall or flange at their upper end portions. A preferred embodiment of this invention as herein illustrated and described is particularly adapted for lifting cylindrical objects such as barrels or drums having a chime or rim around the upper end thereof.

One object of the present invention is to provide an improved lift mechanism for lifting objects that automatically engages an object in response to contact of the mechanism therewith and thereafter automatically releases the object when it is set down.

Another object of this invention is to provide an improved lift mechanism that enables the lifting of objects such as boxes, barrels, drums and the like in an upright position facilitating handling thereof and stacking the objects in compact relationship.

Still another object of this invention is to provide an improved mechanism which readily accommodates objects of varying size and configuration.

A further object of this invention is to provide an improved lift mechanism that is simply mountable and demountable on materials handling equipment having a suitable mobile supporting member such as a boom on a crane, a prong member of a fork on a pallet-type lift truck, etc., enhancing the flexibility of such equipment and facilitating the handling of materials therewith.

A still further object of this invention is to provide a lift mechanism which is of simple design, of durable construction and operation, and of economical manufacture.

The foregoing and other objects of this invention are achieved by a lift mechanism having a structure characterized by a framework including provisions thereon for mounting the mechanism on a suitable mobile supporting member and having an upstanding bearing surface for contacting the side of an object to be lifted and a movable lever member movably mounted thereon for engaging and clamping the upper edge portion of the object against the bearing surface. The lift mechanism is further provided with contact means on the bearing surface operative when contacting the side of an object to actuate latching means releasing the lever member and enabling the movement thereof from an inoperative position to an engaging position. Upon release of the object the latching means are adapted to latch the lever member in the inoperative position, preparatory to engaging the next object to be lifted.

Other objects and advantages of this invention will become apparent from the following description taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a perspective view of a lift mechanism constructed in accordance with a preferred embodiment of this invention, and adapted for mounting at the forward end portion of a fork on a pallet-type lift truck;

FIG. 2 is a side elevation view of the lift mechanism shown in FIG. 1, illustrating in solid lines the lever arm in an engaged position against the chime of a cylindrical object shown fragmentarily in phantom; and

FIG. 3 is a plan view of the lift mechanism shown in FIG. 2.

Referring now in detail to the drawings, a lift mechanism is shown constructed in accordance with a preferred embodiment of this invention which is particularly

adapted to engage and lift objects of a cylindrical configuration. The lift mechanism is illustrated in the drawings in a removably mounted position on the forward end portion of a prong member 6 of a fork or pallet-type lift truck. The lift mechanism comprises a channel base member 8 of an inverted U-shaped cross-section having a pair of spaced transverse braces 10 rigidly affixed to and extending between the edges of the depending flanges of the base member 8. The bight portion of the base member 8 is provided with a suitable aperture adapted to slidably receive a securing pin 12 having a shank portion that extends through the base member 8 and engages a suitable aperture in the prong member 6 for detachably securing the lift mechanism to the mobile supporting member. A substantially upright support member 14 is rigidly affixed at the lower portion thereof to the forward end of the base member 8 and includes an angularly extending leg portion 16 integrally affixed to and extending rearwardly from the upper end portion of the support member 14. A fixed pressure pad 18 of an arcuate configuration is rigidly secured to a forward or bearing surface 20 of the support member 14 at the upper portion, thereof, and is adapted to contact the peripheral side surface of a cylindrical object such as a steel barrel or drum 22 as shown in phantom in FIG. 2.

A lever arm 24 of a U-shaped configuration is pivotally mounted on a pivot pin 26 affixed to and extending between the depending flanges of the leg portion 16. The lever arm 24 is provided with a jaw holder 28 rigidly affixed between the forward projecting portions thereof to which an engaging jaw 30 is detachably secured by means of suitable screw-type fasteners 32. The engaging jaw 30 is provided with an arcuate engaging surface having a contour corresponding substantially to the arcuate contour of the fixed pressure pad 18 and is provided with a plurality of serrations or teeth 34 for frictionally engaging and gripping the inner surface of a chime 36, for example, of the barrel 22 as shown in FIG. 2.

The lever arm 24 is pivotable about the pivot pin 26 to and from an inoperative position as shown in phantom in FIG. 2 to an operative or engaging position as shown in solid lines. The lever arm 24 is disengageably held in the inoperative position by a suitable latching mechanism comprising an L-shaped slide member 38 having an engaging tang 40 projecting forwardly from the upper end portion thereof and adapted to overlie the upper edge of the rearward projecting portion of the lever arm 24 when in the inoperative position. The base portion of the slide member 38 is provided with a longitudinal slot 42 through which the shank portions of a pair of screws 44 extend and are threadably engaged in the bight portion of the base member 8 enabling restricted longitudinal sliding movement of the slide member 38 relative to the support member 14 and base member 8. The slide member 38 is biased toward the forward position by means of a helical coil spring 46 having the ends thereof connected to apertures in clevis pins 48 disposed in longitudinal alignment and affixed to the support member 14 and slide member 38. The base portion of the slide member 38 extends through a rectangular aperture 50 in the bight portion of the support member 14 and projects beyond the forward or bearing surface 20 thereof. A movable pressure pad 52 of an arcuate configuration is rigidly affixed to the forward projecting end of the base portion of the slide member 38 and is adapted to contact the peripheral side surface of a barrel or drum 22 as shown in FIG. 2, and is movable thereby from a projected position as shown in phantom to a retracted position adjacent to and in bearing contact with the forward or bearing surface 20. The front end portion of the base member 8 is provided with an arcuate contour corresponding to the contour of the movable

pressure pad 52 providing a seating surface for supporting the movable pressure pad when in the fully retracted position.

In operation, the lift mechanism is installed on a suitable mobile supporting member such as, for example, the prong member 6 of a pallet-type lift truck by sliding the base member 8 over the front end portion of the prong member 6 of the fork and securing the mechanism thereon by the securing pin 12. With the lever arm 24 of the lift mechanism in the inoperative position and the movable pressure pad 52 in the fully projected position as shown in FIG. 1, the lift mechanism is transported by the mobile supporting member such as the prong member 6 to a position adjacent to a cylindrical object to be lifted. The lift mechanism is positioned by the mobile supporting member so that the fixed pressure pad 18 is disposed at an elevation slightly below the upper edge of the upright barrel shown in FIG. 2. The lift mechanism is advanced against the peripheral side surface of the drum 22 whereby the movable pressure pad 52 is moved from the projected position toward the retracted position in opposition to the biasing force of the coil spring 46. Movement of the movable pressure pad 52 toward the retracted position causes the slide member 38 to move rearwardly to a release point whereby the engaging tang 40 at the upper end thereof disengages the lever arm 24 which through the action of gravity pivots downwardly about the pivot pin 26 to the engaging position wherein the serrations 34 on the engaging jaw 30 are disposed adjacent to the inner surface of the chime 36 at the upper edge of the barrel 22 as shown in FIG. 2. Release of the lever arm is arranged to occur at substantially the time the fixed pressure pad contacts the side surface of the barrel.

After the lever arm has attained the engaging position, the lift mechanism is raised by the mobile supporting member during which movement the serrations or teeth 34 on the engaging jaw 30 coact with and become firmly engaged to the inner side wall of the chime 36 of the steel barrel 22. The lifting force applied to the chime 36 of the barrel 22 by the engaging jaw 30 causes the barrel to tend to tip so as to orient its center of gravity in vertical alignment with the engaged portion of the chime. The tilting tendency of the barrel creates a torque moment or couple acting about the fixed pressure pad 18 and the engaging jaw 30 whereby the side wall of the barrel is firmly pressed against the fixed pressure pad and the upper end portion of the barrel pivots toward the engaging jaw 30 which is restrained from movement by the lever arm 24 and causes the teeth 34 to become more firmly engaged in the inner surface of the chime 36. The torque moment or couple which holds the barrel is achieved by the relationship of the engaging jaw 34 with respect to the upper contact surface or fixed pressure pad 18 wherein the engaging teeth 36 on the engaging jaw 34 are disposed in a position vertically spaced above the center of contact of the fixed pressure pad and in opposing spaced relationship thereto and directed substantially perpendicular to a plane therebetween as shown in FIG. 2. The tilting movement of the barrel 22 is restrained by the rigidity of the chime 36 in contact with the engaging jaw 30 and the side wall of the barrel in contact with the fixed pressure pad 18. To prevent excessive twisting forces from being applied to the chime and to the side surface of the barrel which may result in permanent deformation or distortion of the barrel at the points of contact, particularly when lifting barrels containing relatively heavy material, the tilting movement of the barrel is positively restrained by the lower contact surface or movable pressure pad 52 when it attains the fully retracted position in which it is firmly seated against the front end portion of the base member 8. Accordingly the maximum tilting movement of the barrel relative to the support member 14 is established by the rearward offset of the movable pressure pad 52 when in the retracted position relative to the plane of the fixed pressure pad 18. The limiting relationship between the fixed and movable pressure pads is represented by the condition wherein the movable pressure pad 52 when in the fully retracted position is disposed relative to the side of the object the same distance as the fixed pressure pad 18 whereby no tilting movement is obtained. In the specific lift mechanism shown in the drawing, the vertical plane through the forwardmost point of contact of the fixed pressure pad 18 is disposed slightly forwardly of the movable pressure pad 52 when in the fully retracted position enabling slight tilting movement which results in only slight elastic deformation of the barrel during the lifting movement. As will also be noted in FIG. 2, the substantially upright member 14 is disposed in a slightly forwardly tilted position which constitutes a preferred form of this invention and facilitates engagement of the chime 36 particularly in situations wherein the chime has been distorted or otherwise damaged through long usage.

Accordingly, the barrel engaged as hereinabove described can be transported by the mobile supporting member in an elevated position to the desired location. Any slight tilt of the barrel when in the fully engaged position as a result of the tilt of the upright member 14 can be compensated for by tilting the prong member 6 upwardly whereby the barrel is oriented in a substantially upright position during its transportation while in a raised position.

The lift mechanism automatically disengages the barrel as the mobile supporting member is lowered during which movement the bottom of the barrel contacts the floor or other suitable supporting base relieving the lift mechanism of the lifting forces thereon. When the bottom of the upright barrel has attained the fully lowered position the mobile supporting member is further lowered and backed slightly away from or tilted downwardly away from the peripheral side surface of the barrel whereby the movable pressure pad 52 is released and is moved to the projected position as shown in phantom in FIG. 2 by the resilient biasing force of the coil spring 46. During the movement of the movable pressure pad from the retracted to the projected position, the L-shaped slide member 38 moves from the position shown in solid lines to the position shown in phantom in FIG. 2 wherein the forward tip of the engaging tang 40 at the upper end portion thereof slidably contacts the rearward surface of the lever arm 24. The continued downward movement of the lift mechanism relative to the barrel 22 causes the lever arm 24 to be pivoted upwardly by the coaction of the upper end of the barrel 22 until it attains the inoperative position and at which time the engaging tang 40 springs into overlying engagement on the rearward edge surface of the lever arm 24 preventing its downward movement beyond the inoperative position shown in phantom in FIG. 2. The lift mechanism is thereafter slightly raised by the mobile supporting member to enable the engaging jaw 30 to clear the upper edge of the barrel 22 and in which position the lift mechanism is in position to engage the next barrel to be lifted.

As heretofore mentioned, the specific lift mechanism herein shown and described is particularly adapted for lifting cylindrical objects such as barrels or drums and incorporates a fixed and movable pressure pad and an engaging jaw which are of an arcuate configuration. It will be understood that the fixed and movable pressure pads and the engaging jaw can be modified in configuration to best adapt the lift mechanism to the particular shape of the object to be lifted therewith. Nor is the mechanism limited to objects which have a substantially vertical side wall such as the steel barrel shown in the drawing. Objects having irregularly shaped or inclined side walls can also be readily handled by the lift mechanism using the engaging relationship between the upper contact surface or fixed pressure pad 18 and the engaging jaw 30 on the lever arm 24. Regardless of the shape of the object, the lower contact surface or the fully retract-

ed position of the movable pressure pad is disposed in spaced relationship from the side of an object to be lifted a distance greater than the spaced relationship of the fixed pressure pad from the side of the object to enable the tilting tendency of the object toward the lift mechanism to create the engaging couple during the elevating movement of the lift mechanism.

While it will be apparent that the specific lift mechanism shown in the drawings incorporates the preferred embodiments of this invention and is calculated to fulfill the objects above stated, it will be appreciated by those skilled in the art that the lift mechanism is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims. Modifications which are encompassed within the scope of the present invention include a variation of the base member **8** to best adapt the mechanism for mounting on a specific type of mobile supporting member or lifting means. Moreover the base member **8** or other mounting means on the lift mechanism need not be situated at the base of the upright member **14** as shown in the drawings but alternatively, can be positioned at any point therealong so as to provide a partly or fully underslung lifting mechanism. It is also contemplated that the lifting arm **24** can be pivotally supported on the frame from a support member other than the rearwardly extending leg portion **16** affixed to the upright member **14** as shown in the drawings. Additionally, the specific type and location of the contact means can be varied to best adapt the lift mechanism to the specific configuration of an object to be lifted and to the particular mobile supporting member on which the lift mechanism is mounted. For example, an alternate satisfactory latching mechanism in lieu of the mechanical mechanism herein shown and described can comprise a pressure-sensitive switch mounted on the frame of the lift mechanism and adapted to be actuated by the side surface of the object and effective to control a suitable solenoid actuated latching member for releasing and engaging the lever arm **24**.

What is claimed is:

1. In a mechanism for lifting objects having an upstanding flange at the upper end thereof and adapted for mounting on a mobile supporting member, the combination comprising a frame including an upstanding member having a forwardly directed contact surface thereon adapted to contact the side of the object to be lifted, lever means pivotally mounted on said frame and movable to and from an inoperative position and an engaging position, engaging means on said lever means for gripping the inner surface of the upstanding flange on the object, said lever means when in said engaging position disposed with said engaging means thereon in vertical spaced relation above and forwardly of the center of contact of said contact surface and in opposing spaced relationship thereto and directed substantially perpendicular toward a plane therebetween, said lever means when in said inoperative position disposed with said engaging means thereon arcuately spaced upwardly from said engaging position, contact means on said frame for contacting the side of an object to be lifted and actuable thereby, and latching means for holding said lever means in said inoperative position and for releasing said lever means enabling gravitational movement thereof to said engaging position in response to actuation of said contact means by an object to be lifted.

2. In a mechanism for lifting objects having an upstanding flange at the upper end thereof and adapted for mounting on a mobile supporting member, the combination comprising a frame including an upstanding member having a forwardly directed fixed pad thereon adapted to contact the side of the object to be lifted, lever means pivotally mounted on said frame and movable to and from an inoperative position and an engaging position, engaging means on said lever means for gripping the inner surface of the upstanding flange on the object, said lever means when in said engaging position disposed with said engaging means thereon in vertical spaced relation above and forwardly of the center of contact of said fixed pad and in opposing spaced relationship thereto and directed substantially perpendicular toward a plane therebetween, said lever means when in said inoperative position disposed with said engaging means thereon arcuately spaced upwardly from said engaging position, a movable forwardly directed pad on said frame disposed below said fixed pad for contacting the side of an object to be lifted and movable thereby to and from a projected position disposed forwardly of the plane of contact of said fixed pad and a retracted position disposed rearwardly of the plane of contact of said fixed pad, means for urging said movable pad toward said projected position, and latching means for holding said lever means in said inoperative position and for releasing said lever means enabling gravitational movement thereof to said engaging position in response to movement of said movable pad from said projected position toward said retracted position by an object to be lifted.

3. In a mechanism for lifting barrels and the like and adapted for mounting on a mobile supporting member, the combination comprising a frame including an upstanding member having a fixed pad thereon adapted to contact the side of a barrel to be lifted, a lever pivotally mounted on said frame and having an end portion thereof projecting beyond the plane of said fixed pad, an engaging jaw on said end portion for gripping the inner surface of a chime on a barrel, said lever pivotable in a plane extending longitudinally through and substantially perpendicular to the plane of said fixed pad and movable to and from an engaging position and an inoperative position, said lever when in said engaging position disposed with said engaging jaw thereon in vertical spaced relation above the center of contact of said fixed pad and in opposing spaced relationship thereto and directed substantially perpendicular toward a plane therebetween, said lever when in said inoperative position angularly spaced from said engaging position, a slide member movably mounted on said frame including latching means for disengageably holding said lever in said inoperative position, said slide member including a forward portion projecting beyond the plane of contact of said fixed pad, a movable pad on said forward portion adapted to contact the side of a barrel and movable to and from a projected position to a retracted position disposed rearwardly of a vertical plane contacting the forwardmost portion of said fixed pad, urging means biasing said slide member and said movable pad thereon toward said projected position, said slide member operative to cause said latching means thereon to release said lever enabling gravitational movement thereof to said engaging position in response to movement of said movable pad from said projected position toward said retracted position, and means on said frame for mounting said mechanism on a mobile supporting member.

4. In a mobile mechanism for lifting objects having an upstanding flange at the upper end thereof, the combination comprising a mobile supporting member, a lift mechanism removably mounted on said mobile supporting member and movable thereon and directionally guided thereby, said lift mechanism comprising a frame including means thereon for removably mounting said frame on said mobile supporting member, said frame including an upstanding member having a forwardly directed contact surface thereon adapted to be positioned substantially parallel to the side of an object to be lifted by said movable supporting member, lever means on said frame arcuately movable to and from an inoperative position and an engaging position, engaging means on said lever means for gripping the inner surface of the upstanding flange on the object, said lever means when in

said engaging position disposed with said engaging means thereon in vertical spaced relation above and forwardly of the center of contact of said contact surface and in opposing spaced relationship thereto and directed substantially perpendicular toward a plane therebetween, said lever means when in said inoperative position disposed with said engaging means thereon arcuately spaced upwardly from said engaging position, contact means on said frame for contacting the side of the object to be lifted and actuable thereby, and latching means for holding said lever means in said inoperative position and for releasing the said lever means enabling movement thereof to said engaging position in response to actuation of said contact means by an object to be lifted.

5. In a mobile mechanism for lifting and transporting barrels and the like having a chime around the upper end thereof, the combination comprising a fork-lift truck including a prong member mounted thereon and movable thereby, a lift mechanism removably mounted on said prong member and directionally guided thereby, said lift mechanism comprising a frame including a base member for removably mounting said lift mechanism on said prong member, said frame including an upstanding member having a fixed pad on the upper portion thereof and adapted to be positioned substantially parallel to the side of a barrel to be lifted, a lever pivotally mounted on said frame and having an end portion thereof projecting beyond the plane of said fixed pad, an engaging jaw on said end portion of said lever for gripping the inner surface of a chime on a barrel, said lever pivotable in a plane extending longitudinally through and substantially perpendicular in the plane of said fixed pad and movable to and from an engaging position and an inoperative position, said lever when in said engaging position disposed with said engaging jaw thereon in vertical spaced relation above the center of contact of said fixed pad and in opposing spaced relationship thereto and directed substantially perpendicular toward a plane therebetween, said lever when in said inoperative position angularly spaced from said engaging position, a slide member movably mounted on said frame including latching means for disengageably holding said lever in said inoperative position, said slide member including a forward portion projecting beyond the plane of said fixed pad, a movable pad on said forward portion of said slide member adapted to contact the side of a barrel and movable to and from a projected position spaced forwardly of the plane of said fixed pad and a retracted position disposed rearwardly of the plane of said fixed pad, urging means biasing said slide member and said movable pad thereon toward said projected position, said slide member operative to cause said latching means thereon to release said lever enabling gravitational movement thereof to said engaging position in response to movement of said movable pad from said projected position toward said retracted position when said prong member on said fork-lift truck is advanced against the side of a barrel to be lifted.

6. A lifting mechanism comprising a frame including an upstanding member, lever means mounted on the upper portion of said upstanding member and engaging means on the outer end portion of said lever means for gripping the inner surface of the upstanding flange of an object to be lifted, latching means slidably mounted on said frame, said latching means terminating at its lower end in a contact member projecting forwardly of said frame and at its upper end in a latching member adapted to contact said lever means, said upstanding member having a contact surface thereon projecting forwardly therefrom and spaced upwardly from said frame and angularly disposed relative thereto for contacting and bearing against the side of an object to be lifted, said engaging means being vertically spaced from said contact surface and disposed in opposing relationship therewith, said contact member and latching means connected thereto slidably movable in a direction substantially normal to the plane of said contact surface between a forward position in which the said latching member on the said latching means engages said lever means and holds said lever means in an inoperative position, and a rearward position in which said latching member is disconnected from said lever means and said contact member is disposed rearwardly of a vertical plane contacting the forwardmost portion of said contact surface and lies in a plane substantially parallel with said contact surface.

7. In a mechanism for lifting objects such as barrels and the like having a peripheral flange thereon, the combination comprising a frame, said frame including an upstanding member having a pressure pad on its front surface and terminating at its upper end in an upwardly extending angularly disposed arm portion, lever means having one end thereof pivotally secured to said arm, engaging means on the opposite end of said lever means, said lever movable between an inoperative position and an operative position in which said engaging means is disposed in opposed clamping relationship to said pressure pad, a contact portion on said upstanding member disposed below said pressure pad and having its forward surface no farther forward than the plane of the forward surface of said pressure pad, latching means on said frame engageable with and disconnectible from said lever means and operative to latch said lever means in said inoperative position when said contact surface is free of contact with an object to be lifted and operative to cause said lever means to move to said operative position when said contact surface is in contact with an object to be lifted.

8. In a mechanism for lifting objects such as barrels and the like having a peripheral flange thereon, the combination comprising a frame, said frame including an upstanding member having a first pressure pad on its front surface and terminating at its upper end in an upwardly extending angularly disposed arm portion, lever means having one end thereof pivotally secured to said arm, engaging means on the opposite end of said lever means, said lever movable between an inoperative position and an operative position in which said engaging means is disposed in opposed clamping relationship to said first pressure pad, a second pressure pad mounted on said upstanding member below said first pressure pad and movable between a position forward of the plane of the forward surface of said first pressure pad to a position rearwardly of the plane of the forward surface of said first pressure pad, latching means attached to said second pressure pad operative to latch said lever means in said inoperative position when said second pressure pad is forward of the plane of the forward surface of said first pressure pad and operative to cause said lever means to move to said operative position when said second pressure pad is disposed rearwardly of the plane of the forward surface of said first pressure pad.

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