June 15, 1971 J. A. MERRICK 3,584,324

DOCKBOARD

Filed Dec. 16, 1968 2 Sheets-Sheet 1

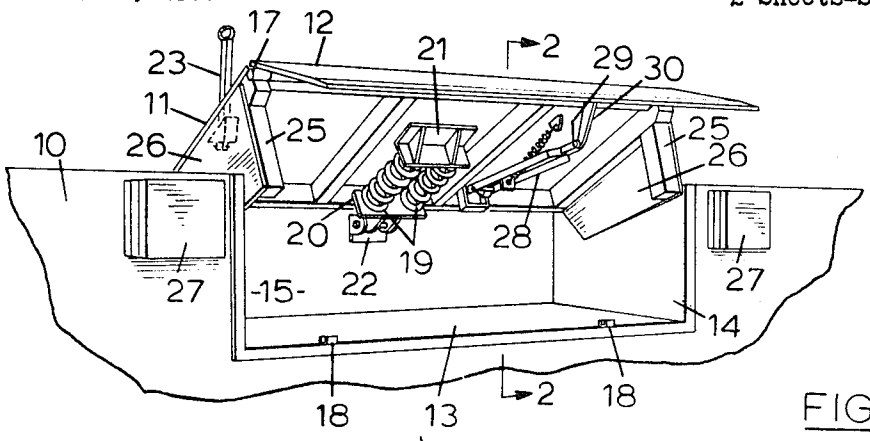


FIG. 1

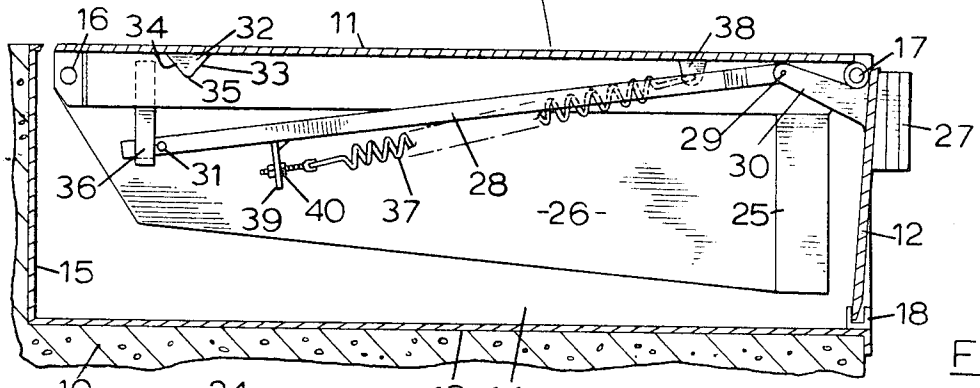


FIG. 3

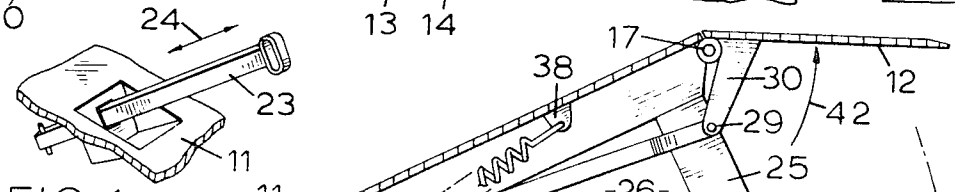


FIG. 4

FIG. 2

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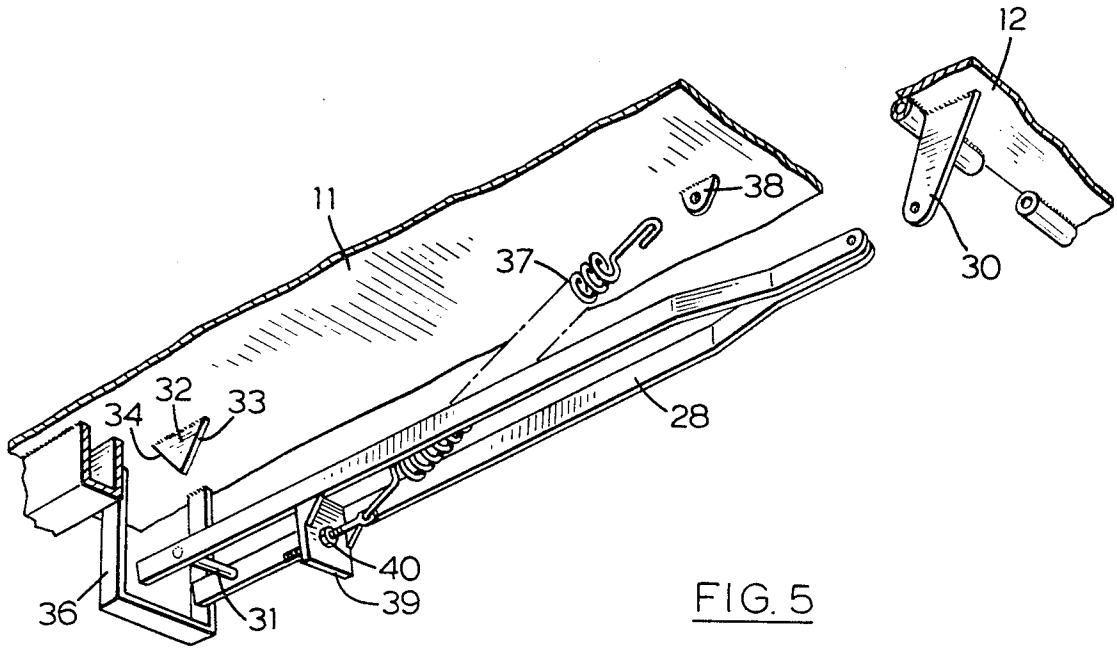


FIG. 5

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DOCKBOARD

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ABSTRACT OF THE DISCLOSURE

In a dockboard comprising a main plate with a lip plate pivotally mounted on its front edge combined lip elevating means and latching means to hold the lip plate in its extended position comprise an arm on the lip plate and a latch arm connected thereto in toggle configuration with spring means urging the linkage away from its neutral position; the co-operating latch members are on the main plate and the latch arm so that the lip elevating spring also ensures engagement and disengagement of the latch; the rear end of the latch arm moves freely vertically, the spring being connected to give an accelerated snap action through the toggle neutral position; one of the latch members is a cam and permits the latch to release if an excessive force is applied to the lip, for example by a transport backing into the lip or the dockboard moving downwards with an excessive force.

FIELD OF THE INVENTION

This invention is concerned with improvements in or relating to dockboards, and especially to dockboards of the type comprising a main plate having a lip plate pivotally connected to its front edge for movement between stored and operative extended positions.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a dockboard of the type specified having a new latching means for latching the lip plate in the said extended operative position.

It is a specific object to provide such a dockboard wherein the latching means is also effective to assist an operator in moving the lip plate by hand to the said operative position.

It is a more specific object to provide such a dockboard wherein the latching means is also effective when the lip plate is in the said stored position to constrain the plate in that position.

It is a further specific object to provide such a dockboard wherein the latching means is released upon an excessive impact with the lip plate while it is in the extended position, and wherein the latching means is also operative to prevent undesired oscillations of the lip plate upon such unlatching.

In accordance with the present invention there is provided a dockboard comprising frame means, a main plate having a front edge, means pivotally connecting the main plate with said frame means for pivoting movement about a respective first pivot axis, a lip plate, means pivotally connecting the lip plate with the main plate front edge for pivoting movement relative to the main plate about a respective second pivot axis between a stored position and an operative extended position, characterised by lip latching means for latching the said lip in the said extended position comprising an extension arm movable with the lip plate, a latch arm pivotally connected to the extension arm to constitute therewith a toggle linkage which is movable through a neutral position alternatively toward a lip plate restraining position corresponding to said lip plate extended position or towards a lip plate assisting position corresponding to said lip plate extended position, spring means connected between the said latch arm and the main plate and urging the said toggle linkage away from the said neutral position toward the said two alternative positions, and latch members provided respectively by the base plate and the latch arm and engageable with one another to latch the lip plate in the said extended position.

DESCRIPTION OF THE DRAWINGS

A dockboard which is a particular preferred embodiment of the invention will now be described, by way of example, with reference to the accompanying drawing, wherein:

FIG. 1 is a perspective view from the front and to one side showing the dockboard mounted in a loading dock, the dockboard being in an elevated operative position and the lip plate being latched in that position.

FIG. 2 is a plane section taken on the line **2—2** of FIG. 1 to show the latching mechanism in greater detail.

FIG. 3 is a section similar to that of FIG. 2, but showing the dockboard and the latching mechanism in its stored position.

FIG. 4 is a perspective view of a detail of a handling lever for the board, and

FIG. 5 is a perspective view to an enlarged scale to show the dockboard latching mechanism in more specific detail.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The particular form of dockboard shown herein is adapted to be mounted as an integral unit into a prepared recess in a loading dock or platform **10**, so that with the dockboard in the position shown in FIG. 3 (called herein its stored position), the main plate **11** thereof is approximately horizontal and level with the top surface of the dock, while its lip plate **12** is folded down to a dependent stored position, in which it is approximately flush with the front face of the dock. It will be understood that the term "stored position" is used for convenience in terminology, and under some conditions the board will be used for loading and unloading while in the so-called stored position.

This particular dockboard has a box-like frame means comprising a bottom **13**, side walls **14** and a rear wall **15**, formed of welded sheet metal and made sufficiently rigid for transport, installation and subsequent use. When installed this particular frame means is supported by the surrounding concrete of the dock and a minimum of additional strengthening means, such as cross braces and specially thickened edges, is required. The invention is however also applicable to other forms of dockboard, such as a free-standing unit without a surrounding dock, which will require such additional strengthening means and a unit of the type especially adapted for use with a "step-down" dock.

The term "frame means" is used herein for convenience in terminology, and in the embodiment illustrated comprise the said box-like frame assembly; in other embodiments the frame means may instead comprise, for example, only the fastening means by which the main plate and its associated latching mechanism are fastened to a suitable supporting structure, which may be the dock.

The main plate **11** has its rear edge pivotally connected to the frame assembly about a first pivot **16**, the axis of the pivot being shown as horizontal. The pivot means normally are arranged to permit side to side tilting of the main plate, but such arrangements are well known in the art and are not illustrated since they form no part of this invention. The lip plate **12** is pivotally connected to the front edge of the main plate about a second pivot **17** having its axis parallel to the first axis. Referring especially to FIG. 3, when in the stored position illustrated,

with the lip plate in what is called herein its dependent position, the lip plate front edge is engaged inside stop means comprising a pair of spaced stops **18**.

Counterbalance spring means for the board comprises one or more heavy helical compression springs **19**, which are mounted between a member **20** and a bracket **21** fixed to the underside of the main plate, the member **20** being pivotally connected to another member **22** fixed to the frame means rear wall **15**. The springs **19** are so mounted that as they shorten and provide more spring force their upwardly-acting component is reduced; so that in all positions of the ramp assembly, whether the lip plate is in the said extended or in the said dependent position, the effective weight of the assembly just overcomes the upward bias of the spring means. With the lip plate in extended position, as shown in FIGS. 1 and 2, the effective weight of the dockboard acting against the spring means is increased, whereupon the board moves more positively downward.

The dockboard of this embodiment is moved by hand, and to facilitate such handling a permanently-mounted lever handle **23** is provided, the handle being movable longitudinally through a slot in the main plate, as indicated by the arrow **24** in FIG. 4, between stored and operative positions. In the stored position the lever handle is received in a well in the main plate so that it does not obstruct the passage of traffic. Safety limit means comprising a pair of spaced pedestals **25** are mounted on the underside of the main plate and positively engage the bottom **13** when the dockboard reaches a lowermost position, so that it cannot descend below that position. The usual protective side plates **26** are provided to ensure that an operator cannot be trapped between the dock and the board while the latter is in its normal uppermost position. The front of the dock is provided in conventional manner on both sides of the board with protective bumpers **27**.

Our novel latching means for the lip plate are constituted by a bifurcated generally Y-shaped latch arm **28**, which has its foot extending forward and pivoted at **29** to an extension arm **30**. The extension arm is fastened to the lip plate adjacent the pivot **17** and projects very approximately at right angles to the plane of the lip plate. The bifurcated other end of the latch arm carries a latch member pin **31** extending between the two arm members thereof. The latch pin **31** is engageable, in a manner to be described in detail below, with a latch member cam **32** fastened rigidly to the underside of the main plate **11** adjacent the pivot **16**. The cam **32** has a front downwardly and rearwardly sloping face **33**, and a rear downwardly and forwardly sloping face **34**, the two faces meeting at an apex **35**. A U-shaped bracket **36** fastened to the underside of the main plate loosely embraces the rear end of the arm **28** and limits the extent of the downward movement thereof. A tension spring **37** has one end attached to a bracket **38** on the underside of the main plate adjacent the pivot **17**, while the other end is attached to a downwardly-extending bracket **39** on the arm **28** adjacent the latch pin **31**. The bracket **39** is mounted between the two arm members and the spring extends between these two arms to ensure a balanced assembly.

In the usual operation of the dockboard a transport (indicated in FIG. 2 in broken lines and given reference **41**) backs up to the dock while the dockboard is in the stored position of FIG. 3. The operator pulls the handle **23** upward to its fullest extent, and employing the mechanical advantage of the lever, together with the assistance of the counterbalance springs **19**, is able to lift the dockboard easily until the main plate is inclined at an angle of about 30° to the horizontal. From FIG. 3 it will be seen that the arms **28** and **30** constitute a toggle linkage and, with the latch linkage in the so-called stored position illustrated, the pivot **29** of the toggle linkage is just above the neutral position in which the pivots **17** and **29** and the connection point **40** are colinear, so that the tension force of the spring **37** is operative to pull the rear

end of the latch arm downward into engagement with the bracket **36** and to push the pivot **29** upward to the maximum possible extent, with the result that the lip plate is positively held in the stored position and is constrained against annoying and unsettling oscillations about the pivot **17** as the dockboard is lifted.

The operator now grasps the lip plate and rotates it upward by hand; the initial part of such hand movement is in opposition to the force provided by the spring **37**, but at this point the moment required to rotate the lip plate is still small, since it is hanging downward at a relatively small angle to the vertical, and the force that must be exerted is well within the capability of the operator. As the lip is rotated the latch linkage quickly reaches the above-described neutral position, whereupon the action of the spring changes to move the linkage toward its so-called operative position, in which the spring quickly lifts the rear end of the latch arm toward the underside of the main plate and also urges the linkage to rotate the lip plate upward as indicated by the arrow **42**. The quick upward movement of the latch arm rear end moves the connection **40** upward, with the result that the linkage moves with a fast snap action away from the neutral position. The same snap action is obtained when the latching means moves from the operative position to the stored position. The operator now continues the upward rotation of the lip plate, with the assistance of the spring **37** to offset the increasing movement of the lip as it moves to a more horizontal position.

The free end of the latch arm now presses against the underside of the main plate and the latch pin **31** is thereby positioned for engagement with the latch cam **32**. As the rotation of the lip is continued the pin rides over the apex **35** and engages the cam face **33** as the lip reaches its fully extended position. Since the weight of the lip plate is not fully counterbalanced by the spring **37**, the residual weight pushes the pin **31** rearwardly and upwardly against the face **33**, to maintain the latch engaged. The dockboard is now lowered until the lip plate rests on the transport, and thereafter will "float" up and down as the transport is loaded and unloaded, under the effect of its uncounterbalanced weight. Even though in operation the latch pin may move out of engagement with the cam **32**, the action of the spring **37** in urging the latch arm rear end upwards always ensures that the latch members will remain positioned for operative engagement.

If at any time the dockboard is to be returned to the stored position the operator lifts the board by the lever **23** and then pushes sharply downward on the front edge of the lip plate. The force provided by the spring **37** is at a minimum, while the lip plate is exerting its maximum downward movement, and a sharp moderate push is sufficient to force the pin down the cam face **33** and over the apex **35**, whereupon the lip plate pivots downward under its own weight, the latch linkage moving to the neutral position and immediately thereafter snapping into the said stored position.

It sometimes can happen that a transport moves backwards against the front edge of the lip plate while the latch is engaged, but any large or heavy movement of this kind merely moves the latch pin **31** downwards on the cam face **33** to release the latch, before the lip and main plates and their respective pivots can suffer any damage. Another undesirable action is for the transport to move away from under the extended dockboard with no attempt made to return it to the stored position; in that case the dockboard will fall downwards until the safety pedestals **25** hit the bottom **13**; the lip plate will try to continue downwards because of its momentum and this momentum is arranged to be sufficient to drive the latch arm backwards and unlatch the latch. The spring **37** will continue to urge the latch pin **31** upwards so that it engages the rear cam face **34** to prevent excessive rebound of the lip plate.

It will be understood by those skilled in the art that a particular preferred embodiment only has been de-

scribed, and that different mechanically equivalent modifications and arrangements may be provided within the scope of the appended claims.

What I claim is:

1. A dockboard comprising frame means, a main plate having a front edge, means pivotally connecting the main plate with said frame means for pivoting movement about a respective first pivot axis, a lip plate, means pivotally connecting the lip plate with the main plate front edge for pivoting movement relative to the main plate about a respective second pivot axis between a stored depending position and an operative extended position, characterised by an extension arm connected to the lip plate and movable therewith, a latch arm pivotally connected at one end to the extension arm about a linkage pivot axis and extending beneath the main plate, latch members provided respectively by the main plate and the latch arm and operatively engageable with one another when the lip plate is in the extended position to latch the lip plate in that position, and spring means operatively connected at one end to the latch arm and at its other end to the main plate, the movement of the lip plate between said two positions producing corresponding movement of the linkage pivot axis over a path that passes though a neutral plane containing a line joining the said second pivot axis and the point of connection of the spring means with the latch arm, whereby the pivoted latch and extension arms constitute a toggle linkage, the spring means providing one force component urging the latch arm in the direction to move the linkage pivot axis out of the neutral plane, to thereby urge the lip plate alternatively toward its extended or dependent position, and simultaneously providing another force component transverse to said one force component urging the latch arm to dispose the latch members respectively for engagement with and disengagement from one another.

2. A dockboard as claimed in claim 1, wherein the pivot between the latch and extension arms permits movement of the other end of the latch arm toward and away from the main plate by rotation of the latch arm about the linkage pivot axis, the said other latch arm end being movable between an upper limit position closely adjacent the main plate and a lower limit position spaced from the main plate, wherein there are provided bracket means carried by the main plate and engaging the latch arm in its lower limit position to locate the last mentioned position, and wherein with the lip plate in the extended position the said other force component of the spring means urges the latch arm other end for rotation to the upper limit position and with the lip plate in the dependent position the said other force component urges the latch arm other end for rotation to the lower limit position to thereby provide rapid snap action movement of the latch arm through the neutral plane.

3. A dockboard as claimed in claim 2 wherein the latch arm latch member is mounted on the latch arm adjacent the said other end thereof, whereby with the latch arm in the said upper limit position the latch arm latch member is disposed for engagement with the main plate latch member, and with the latch arm in the said lower limit position the latch arm latch member is spaced from the said main plate latch member, to an extent preventing engagement of the latch members thereby providing corresponding rapid snap action movement of the latch members into and out of engagement with one another upon snap action movement of the latch arm.

4. A dockboard as claimed in claim 1, wherein said latch members comprise a cam member and a cooperating cam-engaging member whereby the application of a rotational force on the lip plate when latched in the extended position toward the stored position and greater than a predetermined magnitude moves the latch members relative to one another to release the latch means.

5. A dockboard as claimed in claim 1, wherein said latch members comprise a cam member having first and second cam faces and a co-operating cam-engaging member whereby the application of a rotational force on the lip plate latched in the extended position toward the stored position and greater than a predetermined magnitude will move the cam-engaging member over the first cam face to release the latch means, and engagement of the cam-engaging member with the second cam face latches the lip plate against return toward the said extended position.

6. A dockboard as claimed in claim 1, and comprising safety limit means mounted beneath the main plate and positively engaging the said frame means upon downward movement of the main plate to a predetermined lowermost level to prevent such further downward movement, wherein said dockboard moves downward under gravity in the absence of external means preventing such movement, wherein said latch members comprise a cam member and a co-operating cam-engaging member whereby the application of a rotational force on the lip plate latched in the extended position toward the stored position and greater than a predetermined magnitude will move the latch members relative to one another to release the latch means, and wherein the momentum of the downwardly moving latched lip plate upon engagement of said safety limit means with the frame means provides a downward rotational force sufficient to unlatch the latch means.

7. A dockboard as claimed in claim 1, wherein the said latch arm is of general Y-shape having the foot thereof pivotally connected to the extension arm about the said linkage pivot axis, wherein the latch arm latch member is mounted between the arms of the latch member at the other end thereof and adjacent to the said first pivot axis, and wherein the said spring means extends between the arms of the latch member.

8. A dockboard as claimed in claim 1, wherein the said spring means is a tension spring connected at its forward end to the main plate and connected at its rearward end to the latch arm, the spring means providing a horizontally-acting force component to urge the lip plate alternatively toward its extended or dependent position, and providing a vertically-acting force component to dispose the latch members respectively for engagement with and disengagement from one another.

9. A dockboard as claimed in claim 2, wherein said latch members comprise a cam member and a co-operating cam-engaging member whereby the application of a rotational force on the lip plate when latched in the extended position toward the stored position and greater than a predetermined magnitude moves the latch members relative to one another to release the latch means.

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