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[54] **LOADING AND UNLOADING CONVEYOR**

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Related U.S. Application Data

[62] Division of Ser. No. 20,711, March 18, 1970, Pat. No. 3,613,910.

[52] **U.S. Cl.**.....**214/38 B,** 198/106, 198/219, 214/91

[51] **Int. Cl.**.....**B65g 67/02**

[58] **Field of Search**...214/38 R, 38 B, 38 BA, 38 BB, 214/38 C, 38 D; 198/106, 219

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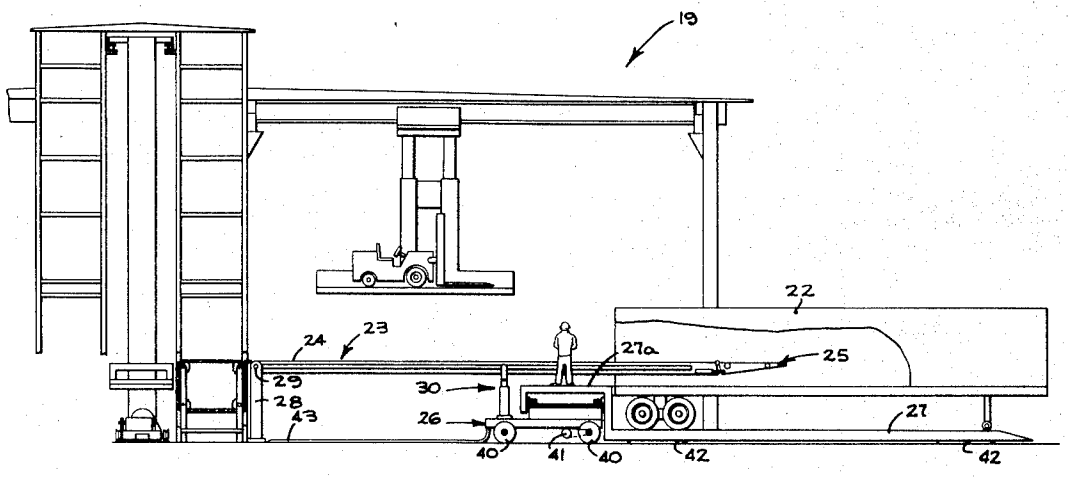
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[57] **ABSTRACT**

A loading-unloading conveyor boom is vertically adjustable with a ramp pivotally attached at one end that can be independently tilted up or down. The ramp has a set of movable wedge-shaped finger members for moving freight from its wedge-shaped finger tips to the conveyor boom or vice-versa. All motions of the loading-unloading conveyor boom are controlled by an operator working in the vicinity of the ramp. The loading-unloading boom is of fixed length, and is pivoted by a motorized cart that also moves an air-bearing supported platform on which a freight carrier or container rests, backward or forward and sideways left or right.

9 Claims, 10 Drawing Figures



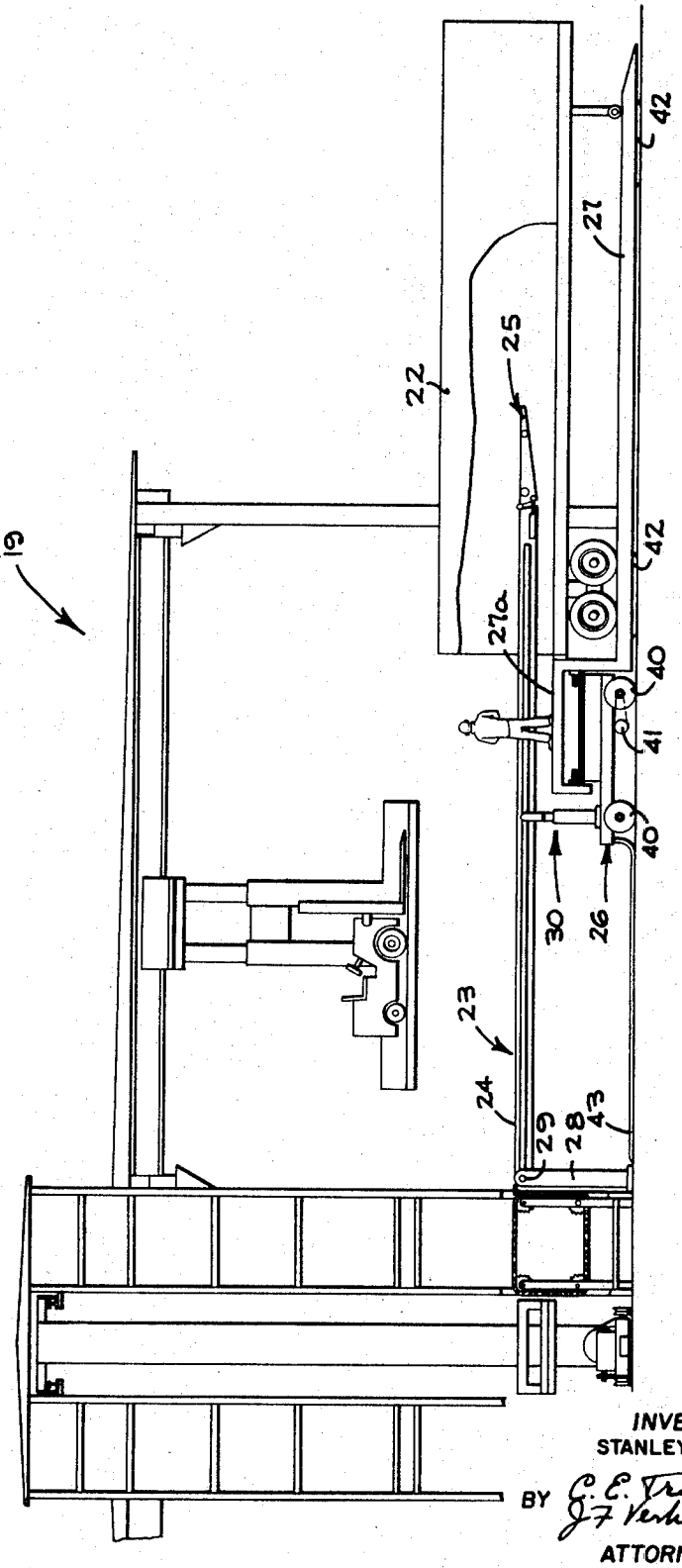


FIG. 1

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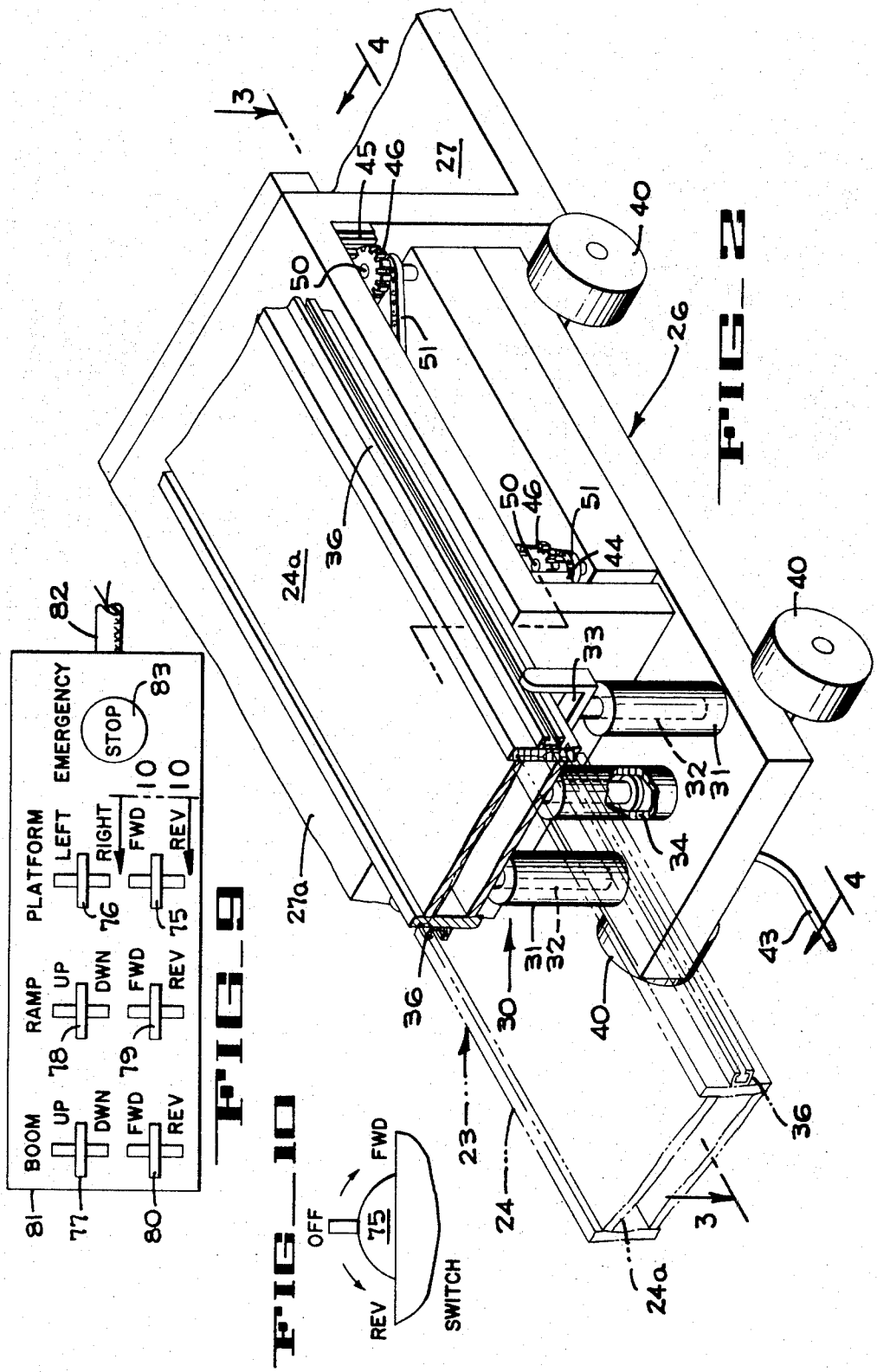
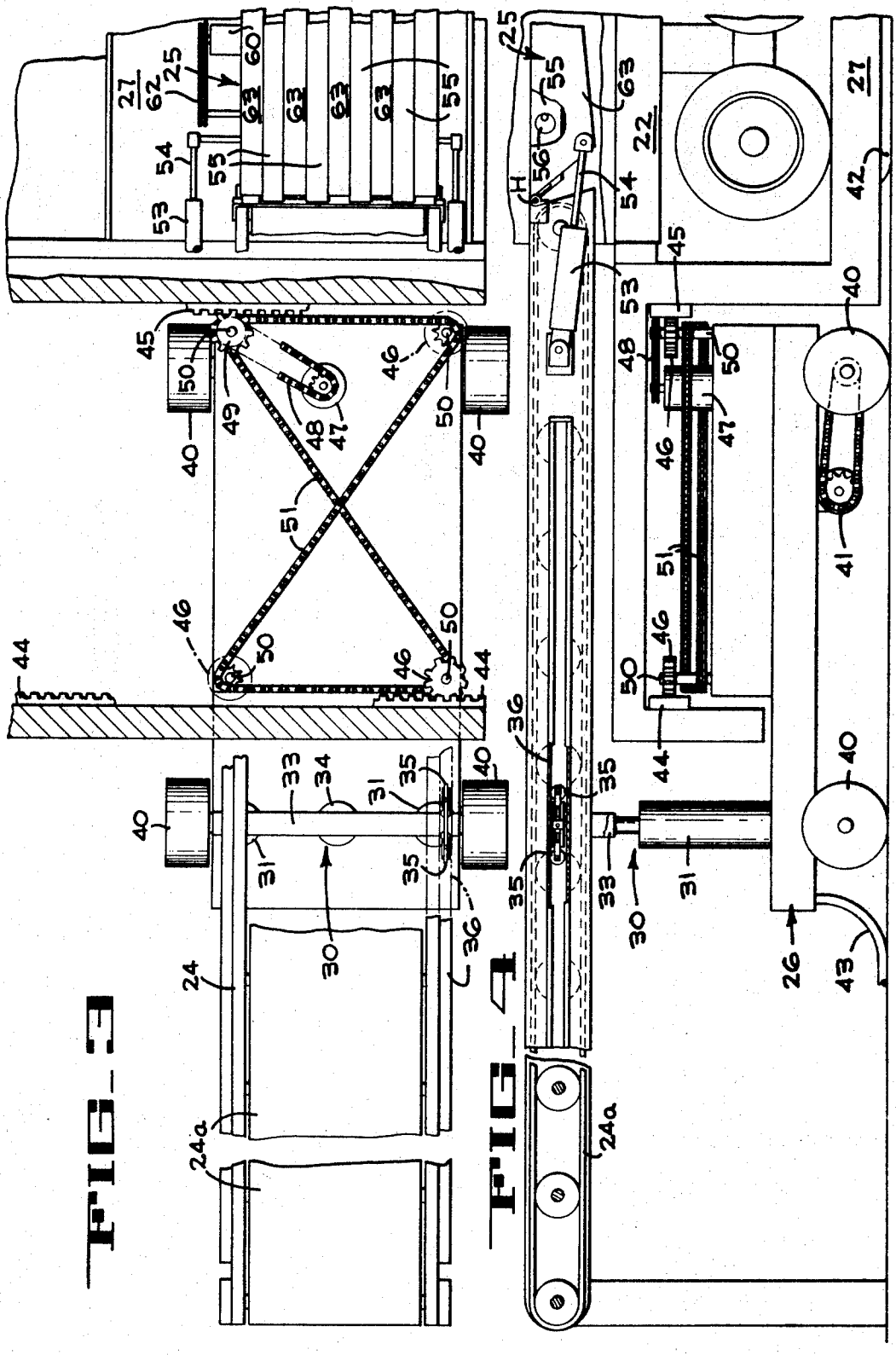


FIG. 2

FIG. 9

FIG. 10


FIG. 3
FIG. 4

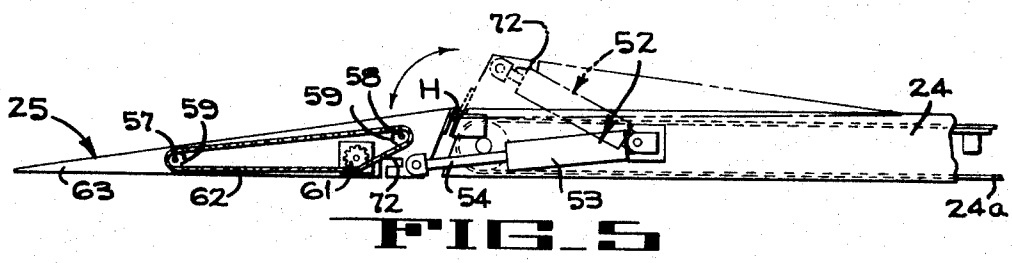


FIG_5

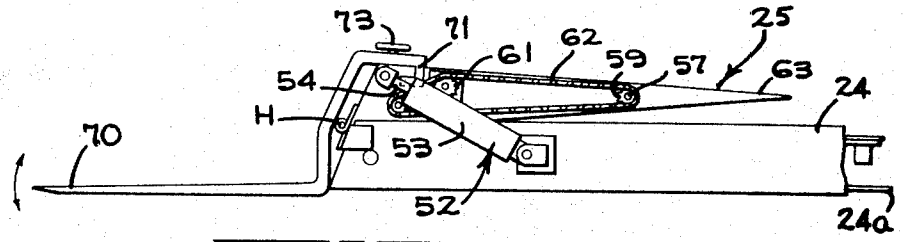


FIG_6

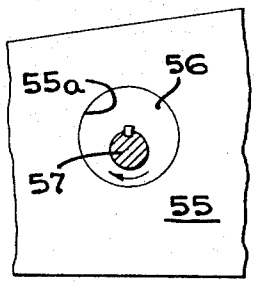


FIG_8

FIG_7

LOADING AND UNLOADING CONVEYOR

This application is a division of application Ser. No. 20,711 filed Mar. 18, 1970, now U.S. Pat. No. 3,613,910.

BACKGROUND OF THE INVENTION

The present invention relates to an automatic terminal for loading, unloading and moving shipments from one freight container to another.

In a typical conventional terminal, such as a truck terminal, articles are manually unloaded from inbound trucks onto pushcarts. If an article is too heavy to manually lift, fork-trucks are used. Loaded carts are manually pushed to the appropriate terminal door for load-out or, where towlines are installed for transporting carts, carts are manually hooked onto and removed from the towline.

Some problems associated with unloading and loading trucks using carts are:

1. Carts sometimes cannot be positioned near article pick-up and put-down points because large, long and/or heavy articles are on the floor. Dockmen must therefore carry articles across large heavy pieces to and from push-carts to clear out top-off freight before a fork-truck can get in and move big articles out of the way;
2. A fork-truck is not always handy when needed to move a large or heavy piece and a dockman may need to wait until one arrives before resuming load or unload operation.

SUMMARY OF THE INVENTION

To reduce cost and speed up handling of freight, the present invention provides loading-unloading conveyor booms. Each boom has an endless belt to carry articles in one direction or the other thereon. The booms are pivotally mounted at one end so they may be tilted about a pivot axis. A short-wedge shaped ramp is connected on a pivot axis to the outer end of each boom. The ramp has mobile fingers which are interspersed with stationary fingers so that as the mobile fingers orbit, the mobile fingers rise above, and sink below, the top of the stationary fingers. The mobile fingers move the cargo in incremental steps in either direction. When an inbound truck arrives, an operator controls the conveyor and ramp to scoop articles onto the ramp.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a view in elevation of the conveyor and ramp of the present invention;

FIG. **2** is a view in perspective of a platform cart to support a conveyor;

FIG. **3** is a view taken on the lines **3—3** of FIG. **2**;

FIG. **4** is a view taken on the lines **4—4** of FIG. **2**;

FIG. **5** is a side view of the boom conveyor ramp, showing the ramp extended for operation in solid lines and showing the ramp folded back in dotted lines;

FIG. **6** is a view taken as the view of FIG. **5**, showing the use of removable tines in place of the ramp;

FIG. **7** is a view in perspective of the ramp;

FIG. **8** is a view taken on the lines **8—8** of FIG. **7**;

FIG. **9** is a top view of the operator's control box;

FIG. **10** is a view taken on the line **10—10** of FIG. **9**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Leading to each loading-unloading station of a truck terminal **19** is a loading/unloading arm, as shown best in FIG. **1**. In the preferred form of the invention, the loading-unloading arm **23** consists of four major parts: a fixed length conveyor boom **24**, a ramp **25**, a motorized cart **26**, and a platform **27**. The fixed length conveyor boom **24**, which has an endless belt **24***a* (FIG. **7**) to carry articles in one direction or the other thereon, is pivotally mounted at one end to a standard **28** so that it may be tilted up or down about pivot axis **29**. The conveyor boom **24** is slidably attached to supporting structure **30** (see FIGS. **4**, **5** and **6**) which is mounted on carriage **26**. The supporting structure **30** has two guide cylinders **31** into each of which a guide plunger **32** is slidably received. The guide plungers **32** are connected by a cross bar **33** which is raised and lowered by a pneumatic ram **34**. The guide plungers **32** have rollers **35** connected thereto which are received in the track **36** of the conveyor boom. Actuation of the ram in one direction will raise the outer end of the arm **23** and actuation of the ram in the opposite direction will lower the outer end of the arm.

The cart **26** has wheels **40**, one of which is driven by reversible motor **41** in one direction or the other to move the platform **27** in or out, depending on the direction of drive of the motor. The platform **27** is supported by air bearings or cushions **42** (such as Cell No. S1–4266 manufactured by Airfloat of Decatur, Illinois). The air bearings or cushions **42** are supplied with air under pressure by air line **43**.

The truck trailer **22** is supported by the platform **27** which has an elevated end **27***a* for the operator to stand on during loading or unloading of the trailer. Connected to the platform under the elevated end **27***a* are two racks **44** and **45** which are engaged by pinions **46** mounted on cart **26**. The pinions **46** are driven by motor **47** which is connected by drive chain **48** to a drive pinion **49** on a shaft **50**. A second drive chain **51** connects all the pinions **46**, which are mounted on shafts **50** journaled at each corner of the cart. It will be noted that drive chain **51** is crossed so that two of the pinions **46** are driven clockwise and two driven counterclockwise. Thus, the pinions, two of which engage the rack on one side and two of which engage the rack on the opposite side, shift the platform laterally in one direction or the other when the motor **47** is driven in one direction or the other.

A short wedge-shaped ramp **25**, as shown best in FIGS. **5**, **6** and **7**, is connected on pivot axis H to the outer end of the conveyor boom **24**. A power ram **52** has a cylinder **53** pivotally connected at one end to conveyor **24**. The piston rod **54** of the ram is pivotally connected to ramp **25** below the pivot axis H thereof so that when the ram is extended the ramp is raised. As the ramp swings up and rod **54** crosses the pivot axis, ram **52** may be retracted to swing the ramp into a raised inoperable position, shown in dotted lines in FIG. **5**. The ramp **25** uses a "walking beam" principle for conveying objects on its upper surface. The "walking beam" principle used by the ramp calls for a set of mobile wedge-shaped fingers **55** which are raised and lowered by circular cams **56**. The cams **56** are eccentri-

cally secured on shafts **57** and **58** which are journaled in fixed fingers **63**. The cams **56** are rotatably received in circular holes **55a** in the mobile fingers **55**. As shown in FIG. **7**, shafts **57** and **58** receive sprockets **59** thereon. Reversible motor **60** has a drive sprocket **61** which is connected by chain **62** to sprockets **59** to rotate shafts **57**, **58**. The mobile fingers **55** are interspersed with the stationary fingers **63** so that as the mobile fingers orbit about shafts **57**, **58**, the mobile fingers rise above, and sink below, the top of the stationary fingers. When motor **60** is driven in one direction, the mobile fingers **55** move in one direction when above the stationary fingers to move the cargo in that direction. As the orbiting fingers change direction, they drop below the stationary fingers on which the cargo is deposited. As the orbiting fingers again rise above the stationary fingers, they again advance the cargo another incremental distance in the same direction. When the motor **60** is driven in the reverse direction, the mobile fingers **55** will move in the opposite direction when above the stationary fingers **56** to move the cargo in incremental steps in the opposite direction.

When the ramp **25** is folded back as shown in FIG. **6**, removable tines **70** may be mounted on the ramp. The hooked inner end **71** of the tines fits into a notch **72** in the ramp. A threaded clamp member **73** received in the tines screws down on the ramp to clamp the tines to the wedge.

The controls for loading-unloading arms **23** consist of a set of six switches **75**, **76**, **77**, **78**, **79** and **80** held in a small housing **81** that is attached to the belt of the operator. An extendable cord **82** connects the control housing to the load unload arm. Each switch has three positions: the upright, or central, position (in which the switches are shown in FIG. **9**) where the switch is OFF, and the extreme position in either direction from the stop position where the switch activates the forward-reverse or up-down motions of the arm **23**, platform **27**, and/or ramp **25**. One switch **75** controls the stop, or forward or reverse, motions of the motor **41** that powers the motorized cart **26** to move the platforms in or out. A second switch **76** controls the motor **47** that powers the sideways motion of the platforms. When these switches are on, air is simultaneously supplied to the platform air bearings **42**. A third switch **77** controls the ram **34** that lifts or lowers the boom-conveyor. A fourth switch **78** controls the power ram **53** that tilts the ramp up or down. A fifth switch **79** controls the motor **60** which causes oscillation of the ramp conveying fingers **55**. The sixth switch **80** controls the motor (not shown) which drives the belt **24***a* on the boom-conveyor. For safety reasons, an emergency stop button **83** may also be incorporated in the control housing.

When an inbound trailer **22** or truck arrives and is parked on a platform **27**, an operator manipulates controls for the loading-unloading arms **23** to scoop articles onto the ramp **25** or position the ramp so that articles may be manually slid or placed on it. To pick up a specific article in the trailer, the platform **27** can be shifted laterally to align the article with the ramp **25**, and the boom **24** and ramp **25** can be vertically adjusted to position the ramp in front of the article and on the floor of the trailer. The platform **27** can then be advanced to bring the article to a position where the ramp fingers **55** will move the article up the ramp and onto the conveyor belt.

Although the best mode contemplated for carrying out the present invention has been herein shown and described, it will be apparent that modification and variation may be made without departing from what is regarded to be the subject matter of the invention.

What is claimed is:

1. A load-unload arm for loading and unloading a vehicle comprising a conveyor pivotal about one end, a ramp pivotally connected to the opposite end of the conveyor, said ramp being wedge-shaped and having mobile fingers to advance a load thereon, power means to effect lateral and longitudinal movement between the conveyor and the vehicle, power means to pivot the conveyor about said one end, power means to swing the ramp about said opposite end of the conveyor, and power means to move said ramp fingers.

2. The apparatus of claim **1** including mechanism to control the operation of at least some of said power means, said control mechanism remote from the units controlled.

3. The apparatus of claim **2** wherein said control mechanism is assembled on a single unit for simultaneous access by an operator.

4. The apparatus of claim **3** in which said single unit is portable by the operator.

5. Mechanism for loading and unloading a vehicle comprising an elongated conveyor, a ramp mounted on the end of said conveyor, said ramp being wedge-shaped and having mobile fingers to move a load thereon, power means to effect relative movement between the ramp end of the conveyor and the vehicle, and control mechanism to control the movement between the ramp end of the conveyor and the vehicle, said control mechanism remote from said power means for convenient access by an operator.

6. The mechanism of claim **5** in which said elongated conveyor is pivotal about one end.

7. The mechanism of claim **5** in which said ramp is pivotal about said one end of the conveyor.

8. Apparatus for loading and unloading a freight container comprising an elongated conveyor, means on said elongated conveyor to move articles thereon in one direction or the other, a wedge-shaped ramp conveyor pivotally connected at one end to one end of said elongated conveyor, said ramp conveyor terminating in a point at the opposite end, means on said wedge-shaped ramp conveyor for moving articles thereon in one direction or the other, means to pivot said ramp conveyor with respect to said elongated conveyor, and means to effect relative longitudinal movement between the pointed end of said wedge-shaped ramp conveyor and the freight container.

9. Apparatus for loading and unloading a freight container comprising an elongated conveyor, means on said elongated conveyor to move articles thereon in one direction or the other, a wedge-shaped ramp conveyor pivotally connected at one end to one end of said elongated conveyor, said ramp conveyor terminating in a point at the opposite end, means on said wedge-shaped ramp conveyor for moving articles thereon in one direction or the other, means to pivot said ramp conveyor with respect to said elongated conveyor, and means to effect relative lateral movement between the pointed end of said wedge-shaped ramp conveyor and the freight container.

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