Jan. 25, 1966 K. W. TANTLINGER 3,231,103

CONTAINER STACKING SYSTEM

Filed Sept. 10, 1962 4 Sheets-Sheet 1

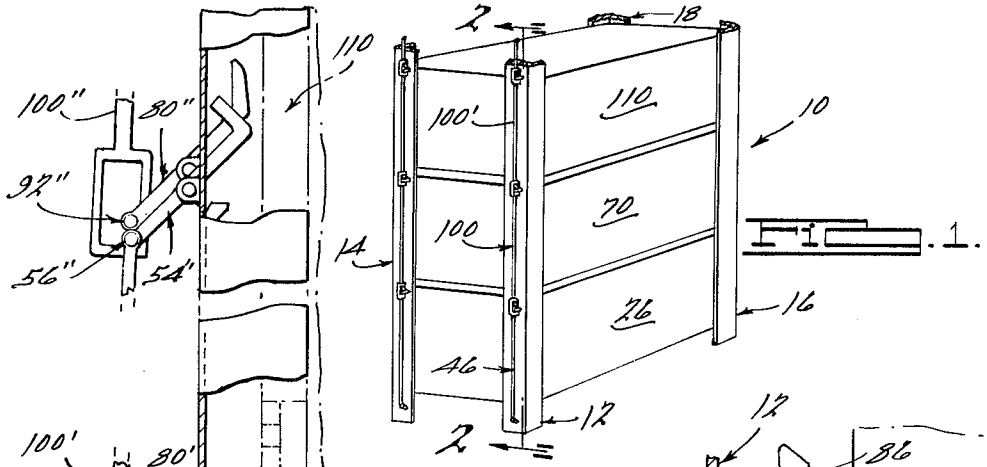

Fig. 1.

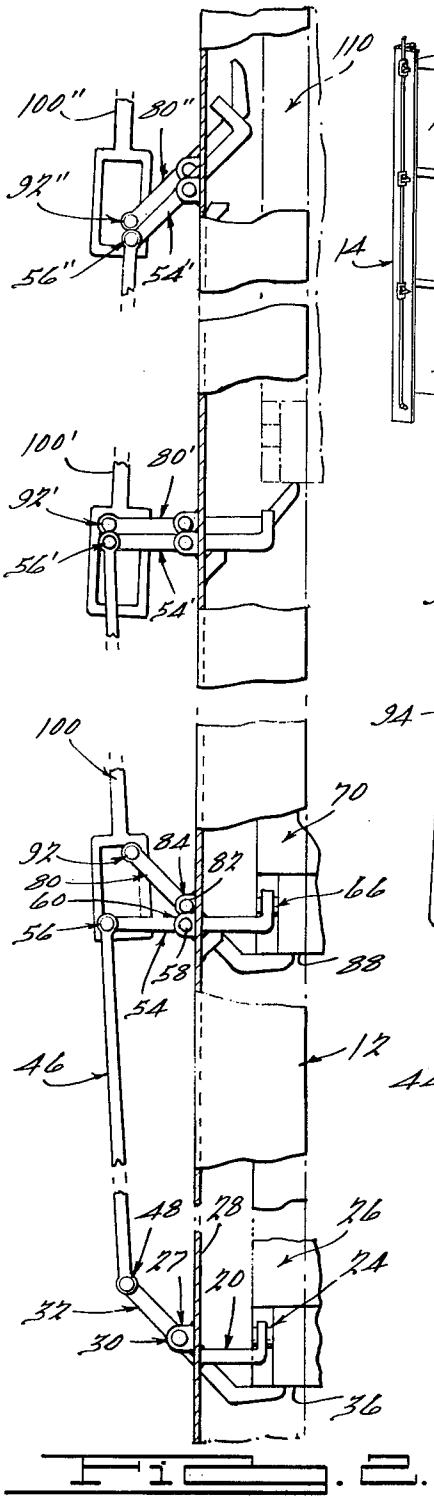

Fig. 2.

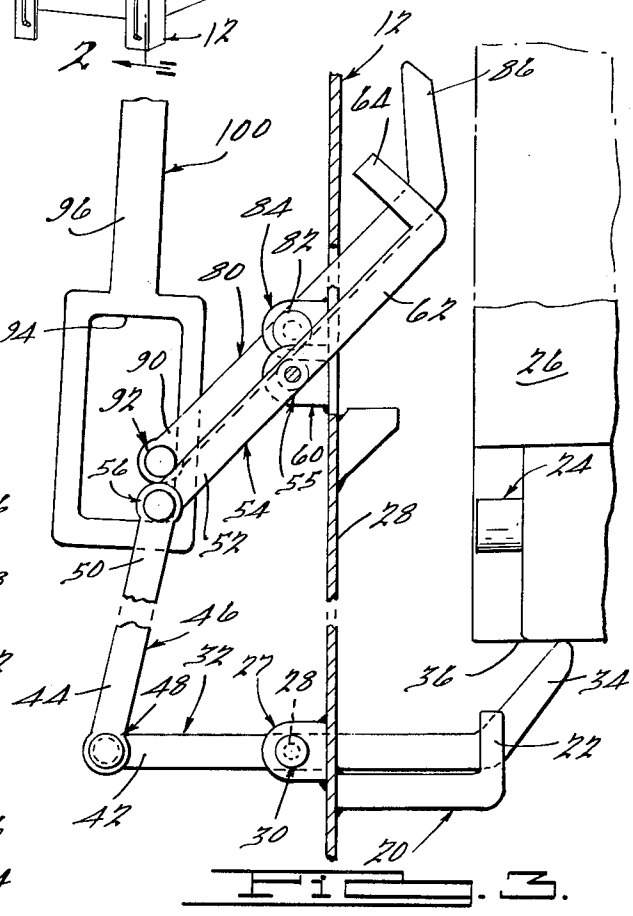

Fig. 3.

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CONTAINER STACKING SYSTEM

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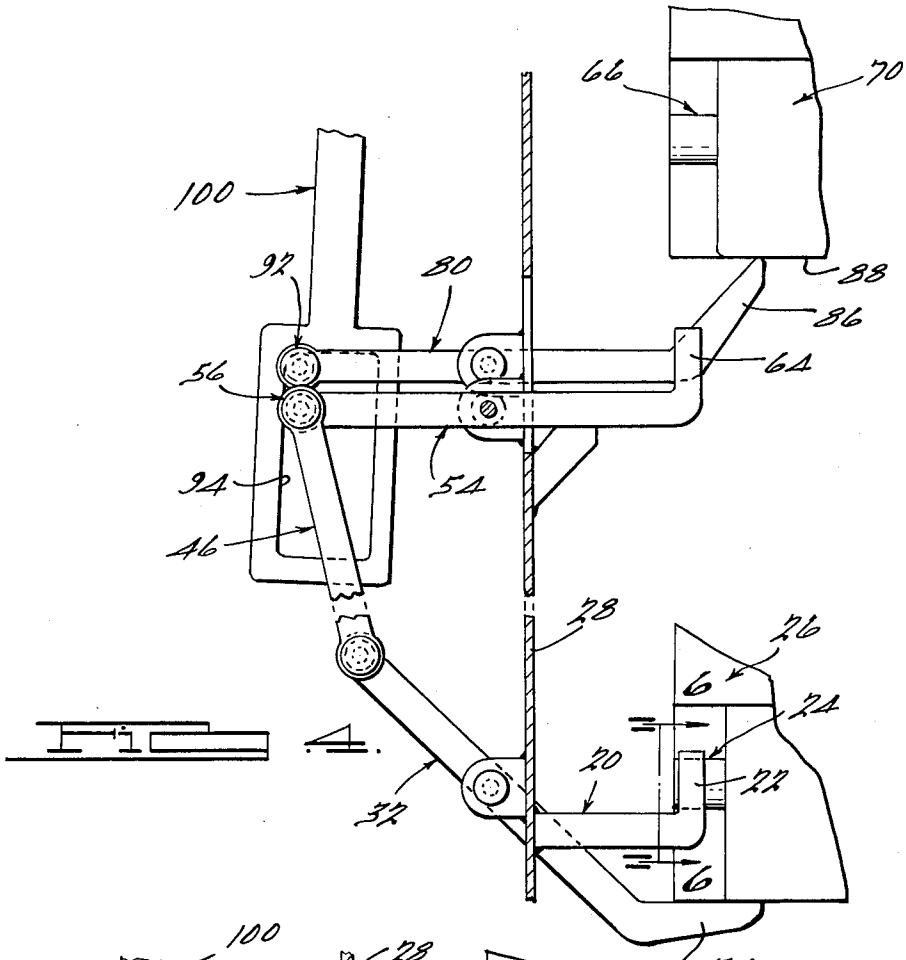

FIG. 4

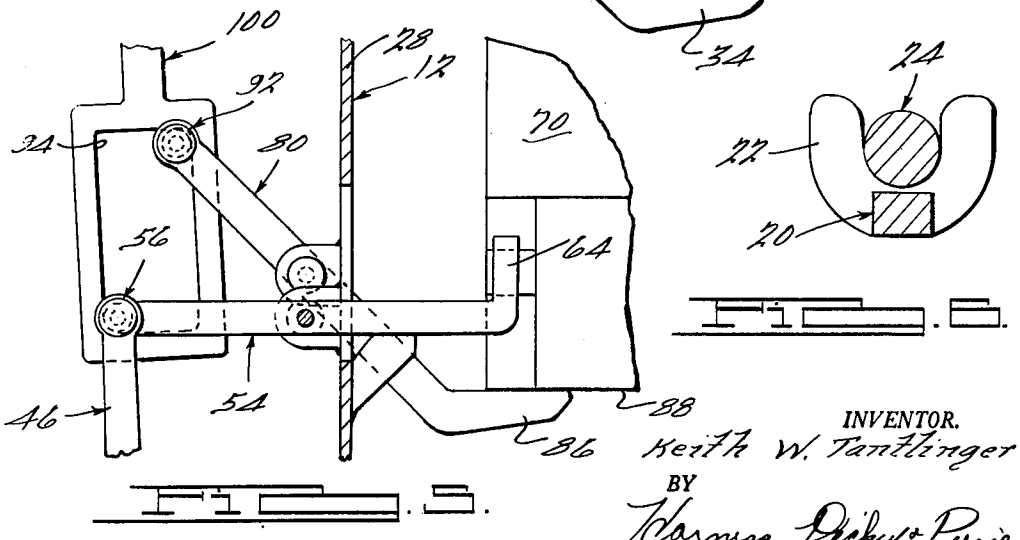

FIG. 5

FIG. 6

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CONTAINER STACKING SYSTEM

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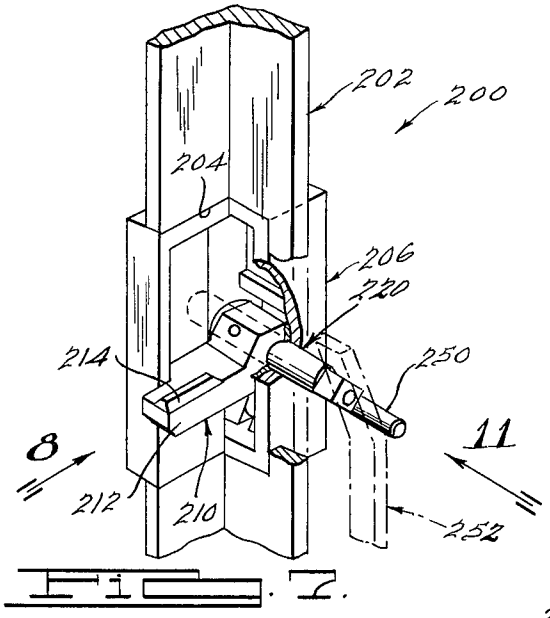

FIG. 7.

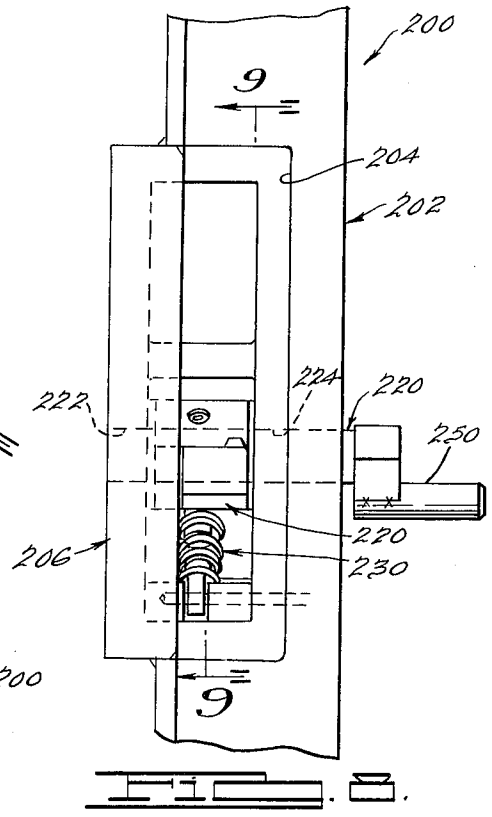

FIG. 6.

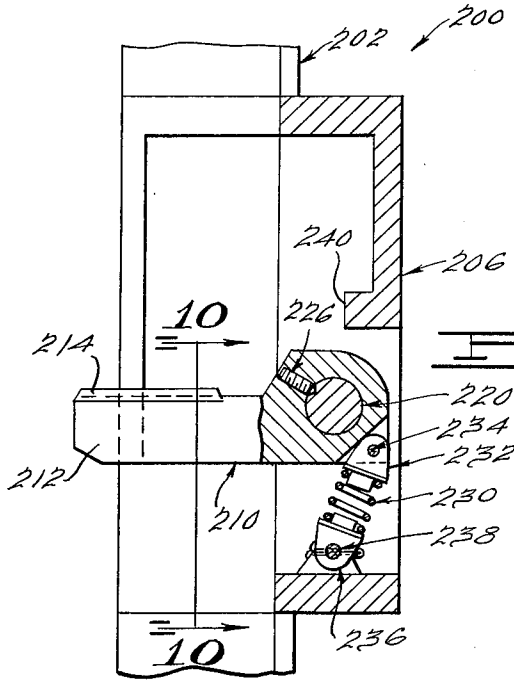

FIG. 8.

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CONTAINER STACKING SYSTEM

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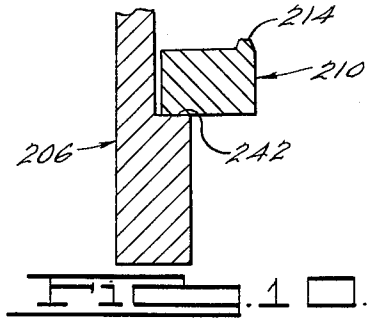

FIG. 10.

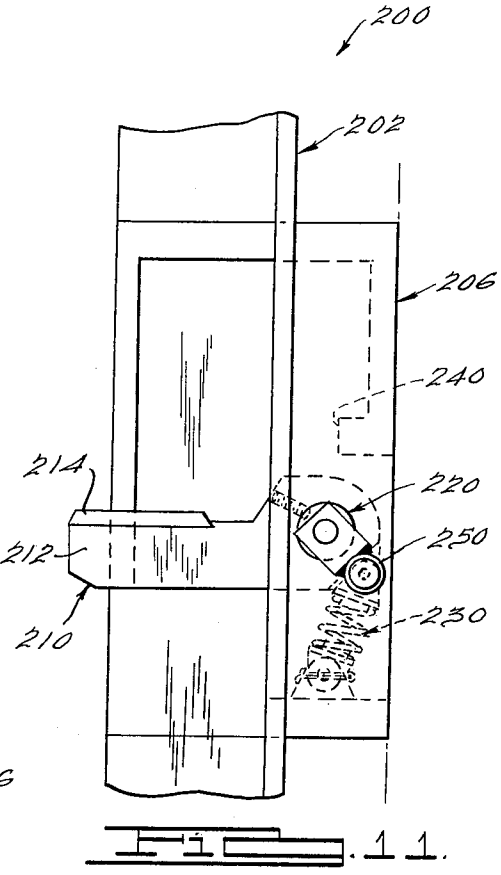

FIG. 11.

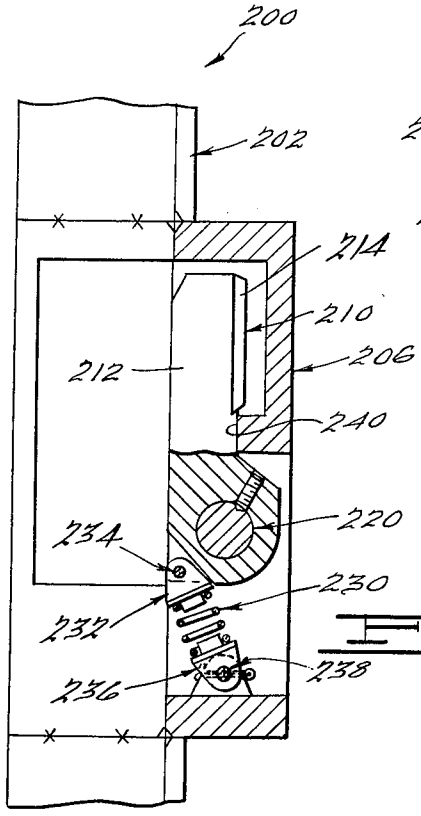

FIG. 12.

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3,231,103

CONTAINER STACKING SYSTEM

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Filed Sept. 10, 1962, Ser. No. 222,368
3 Claims. (Cl. 214—10.5)

This application relates generally to shipping apparatus and more particularly to a novel container stacking system.

The advent of the multipurpose shipping container has simplified the shipment of goods to the point where known materials handling systems are, at best, inefficient and, in many cases, totally inadequate. For example, use of the modular shipping containers has created the need for a stacking system that efficiently utilizes the space within, for example, the hold of a ship, or on a loading dock, without requiring that the containers be strong enough to support other loaded containers in vertically stacked relationship.

The container stacking system of the present invention solves this problem in such a manner that the containers need be designed to support only a pay load plus a given safety factor. The need for designing into the container sufficient strength to support a number of stacked containers is obviated.

In accordance with the present invention, a stacking system comprises a plurality of vertically extending members or guides made from, for example, L-beams. Each of the vertical guides has a plurality of container support stations. The weight of each container is transferred directly to the vertically extending guides so that each container is supported independently of the other vertically aligned containers.

Accordingly, one object of the present invention is an improved stacking system for shipping containers and the like.

Another object is a stacking system for shipping containers wherein the containers are individually supported.

Another object is a container stacking system wherein the containers are individually supported and movable vertically into and from the stacked condition.

Another object is a container stacking system wherein a supporting means for a subsequently stacked container is automatically positioned upon movement of a prior container into the supported condition.

Another object is a stacking system that is conditioned for the acceptance of a container by the container handling equipment.

Another object is a stacking system wherein the supporting means for a previously removed container is automatically retracted upon removal of a subsequent container.

Other objects and advantages of the instant invention will be apparent in the following specification, claims and drawings, wherein:

FIGURE 1 is a perspective view of a container stacking system in accordance with an exemplary embodiment of the present invention;

FIG. 2 is a cross sectional view taken substantially along the line 2—2 of FIGURE 1;

FIG. 3 is an enlarged fragmentary view of a portion of the stacking system of FIG. 2 showing the condition of a lower support arm and trip lever prior to movement of a lowermost container into engagement with the lower support arm;

FIG. 4 is a cross sectional view similar to FIG. 3 showing the lowermost container supported by the lower support arm and the lowermost trip lever rotated so as to condition the next overlying support arm and trip lever for engagement with the next shipping container;

FIG. 5 is a cross sectional view similar to FIG. 4 showing a second shipping container moved downwardly to the supported condition;

FIG. 6 is a cross sectional view taken substantially along the line 6—6 of FIG. 4;

FIG. 7 is a fragmentary perspective view of another embodiment of the instant invention;

FIG. 8 is a cross sectional view taken substantially in the direction of the arrow 8 of FIG. 7;

FIG. 9 is a cross sectional view taken substantially along the line 9—9 of FIG. 8;

FIG. 10 is a cross sectional view taken substantially along the line 10—10 of FIG. 9;

FIG. 11 is a view taken in the direction of the arrow 11 in FIG. 7; and

FIG. 12 is a view similar to FIG. 9, showing the container support arm in the retracted condition.

As best seen in FIGURE 1 of the drawings, a container stacking system 10 comprises a plurality of vertically extending L-beams 12, 14, 16, and 18, arranged in generally rectangular array, that transfer load of the vertically stacked shipping containers to, for example, the hull of a ship, etc.

A container support arm 20, FIGS. 2 and 3, having a generally U-shaped yoke portion 22 for the acceptance of a complementary pin 24 on the shipping container 26, is secured to the L-beam 12 as by welding. A bearing flange 27 having a laterally extending pin 30 extending therethrough is secured to a web portion 28 of the beam 12 as by welding. A trip lever 32 having an inner end portion 34 that is engageable with the bottom surface 36 of the lowermost shipping container 26 is pivotally supported on the pin 30 for rotation with respect to the vertical guide member 12. An outer end portion 42 of the trip lever 32 is pivotally connected to a lower end portion 44 of a lower operating rod 46, as by a pin 48.

Thus, as best seen by comparing FIGS. 3 and 4, downward movement of the container 26 effects rotation of the trip lever 32 which, in turn, effects vertical reciprocation of the operating rod 46.

An upper end portion 50 of the rod 46 is pivotally connected to an outer end portion 52 of a rotatable container support arm 54, as by a pin 56. The arm 54 is pivotally supported for rotation with respect to the guide member 12 as by a pin 58 that extends therethrough and through a suitable bracket 60 that is secured to the outer flange 28 of the guide member 12, as by welding. An inner end portion 62 of the arm 54 has an upwardly opening yoke portion 64, of generally U-shaped vertical cross section similar to the end portion 22 of the fixed arm 20 (FIG. 6), for the acceptance of the pin 66 (FIG. 4) on a second shipping container 70.

A trip lever 80 is pivotally supported for rotation with respect to the guide member 12 as by a pin 82 that extends through the trip lever 80 and through a complementary bracket 84 that is secured to the outer web portion 28 of the guide member 12, as by welding. An inner end portion 86 of the trip lever 80 is of a gooseneck configuration so as to be engageable with the bottom surface 88 of the second container 70.

An outer end portion 90 of the trip lever 80 has a laterally extending pin 92 therein that is engageable within a loop portion 94 on a lower end 96 of an upper operating arm 100.

It is to be noted that the elements comprising the container support arm 54, trip lever 80, operating arm 100 and associated components operatively related with the second container 70, are duplicated for each of the container support stations above the support station for the container 70. Accordingly, like elements in the upper support stations have been given prime and double prime numbers, it being understood that they are similar in con-

struction and function to the hereinbefore described elements of like number.

As best seen by comparing FIGS. 2, 3, 4 and 5, movement of the lowermost container 26 downwardly conditions the container stacking system 10 for the acceptance of the next subsequent container 70. As the bottom face 36 of the lowermost container 26 engages the gooseneck portion 34 of the lowermost trip lever 32 (FIG. 3), the trip lever 32 is biased clockwise about the pin 30 thereof to elevate the lower operating rod 46.

It is to be noted at this point that the pin 36 on the upper end 50 of the operating rod 46 is of sufficient length to engage the outer end portion 90 of the trip lever 80 so that, upon vertically upward reciprocation of the rod 46, the trip lever 80, as well as the support arm 54, is moved clockwise to a condition generally normal to the flange 28 of the guide member 12 (FIG. 4) so as to be conditioned for the engagement of the bottom surface 88 and pin 66 on the second shipping container 70, respectively.

It is also to be noted that rotation of the arm 54 and trip lever 80 to the normal condition with respect to the flange 28, does not effect upward movement of the upper operating rod 100, since the loop portion 94 thereof is of such a configuration as to permit movement of the pins 56 and 92 on the support arm 54 and trip lever 80, respectively, without effecting movement of the rod 100.

As the next container 70 moves downwardly (FIG. 5), the bottom surface 88 thereof biases the trip lever 80 clockwise so that the laterally extending pin 92 on the outer end thereof engages the upper portion of the loop 94 in the operating rod 100 to bias the operating rod 100 upwardly to condition the next support arm 54' for acceptance of a complementary pin on a third shipping container 110. Similarly, the next higher trip lever 80' is rotated to a condition generally normal to the guide 12 so that an outer end portion thereof is engageable with the bottom surface of the next subsequent shipping container 110 as it moves downwardly into the supported condition in the support arm 54'. The aforementioned sequence of operation is repeated as each of the next higher containers moves downwardly into the supported condition.

In accordance with another embodiment of the present invention, the stacking system comprises a plurality of vertically extending members or guides made from, for example, L-beams, each of which guides has a plurality of container support stations. The weight of each container is transferred directly from a plurality of support arms to the vertically extending guides so that each container is supported independently of each other vertically aligned container, as in the embodiment heretofore described. However, the support arms are moved to the supporting or a retracted condition by a complementary member on a container hadling spreader bar.

Referring to FIGS. 7–12 of the drawings, a container stacking system 200, in accordance with the modified embodiment of the present invention, comprises a plurality of vertically extending support and guide members 202, one of which is shown, made from, for example, relatively heavy angle iron. The guide members 202 are similar in construction, except for the obvious left and right-hand relationship. Therefore, only the guide member 202 and components associated therewith will be described in detail for the purpose of clarity. It is to be understood that each of the guide members has like elements associated therewith so that a container is supported at each of the bottom four corners thereof. The guide members 202 are supported in vertically extending spaced and parallel relationship in a generally rectangular array within, for example, the hold of a ship, on a loading dock or in a warehouse, by any suitable means (not shown).

The vertical support or guide member 202 has a cutout 204 thereon for the acceptance of a support casting 206.

The casting 206 is secured within the cutout 204 as by welding. A support arm 210 is pivotally supported within and for rotation relative to the casting 206 by a pin 220 that is journaled in complementary aligned apertures 222 and 224 in the casting 206 (FIG. 8). The arm 210 is secured to the pin 220 as by a set screw 226. An outer end portion 212 of the arm 210 has an upstanding rib 214 thereon for engagement in a complementary seat on a container (not shown).

The arm 210 is biased between a container-supporting condition, as shown in FIG. 9, and a retracted condition, as shown in FIG. 12, by an over-center spring 230. The spring 230 extends between a complementary spring retainer 232 that is pivotally secured to the arm 210 as by a pin 234 and a similar spring retainer 236 which is pivotally secured to the casting 206 as by a pin 238.

The arm 210 is indexed to the retracted position shown in FIG. 12 by engagement with a complementary flange 240 on the casting 206 and to the container-supporting condition, as shown in FIG. 9, by engagement with a complementary shoulder 242 on the casting 206. The shoulder 242 also transfers the loads on the arm 210 to the casting 206 and member 202.

Rotation of the container-supporting arm 210 from the retracted to the container-supporting condition is facilitated by a bellcrank 250 on the pin 220 that is rotated by an arm control member 252. It is to be understood that an arm control member 252 is provided for each support arm. The control member 252 is carried by a spreader bar (not shown) and is actuatable to effect rotation of the bellcrank 250 by any suitable means, for example, an electrically operated solenoid or a hydraulic actuator.

In operation, after seating of a shipping container on an underlying plurality of the support arms 210, the control member 252 is actuated in a manner to bias the bellcrank 252 and the arm 210 to the container-support condition. Thereupon, the spreader bar is retracted and coupled to another container, which is then placed in vertically aligned relationship above the first container. This process is repeated until any desired number of containers are stacked in vertically aligned relationship.

To effect unloading of the stacked shipping containers, the uppermost container is coupled to the spreader bar in the conventional manner and removed from the stack. Movement of the next subsequent container upwardly automatically effects retraction of the arms 210 thereabove. In this regard, it is to be noted that the spreader bar is movable past the arm 210 when it is in the support condition, whereas the container engages the arm so as to either be seated thereon or effect retraction thereof.

From the foregoing description, it should be apparent that each successive container is independently supported by the system of the instant invention. In one embodiment, as each container moves downwardly through the last increment of movement into engagement with its associated support arm, it biases an associated trip lever to condition the next higher support arm for engagement with the next container. This successive and automatic positioning of both the support arms and trip levers is effected by what amounts to a novel lost motion linkage therebetween.

In a second embodiment, each successive overlying support arm is biased into a supporting condition by energization of an actuator on a complementary spreader bar.

In both embodiments, movement of the containers upwardly automatically biases the upper support arms to a retracted condition.

It is also to be noted, that because of the independent support of the shipping containers, the invention has utility for the stacking of trays, pallets, etc., which are inherently incapable of being stacked upon each other due to the absence of vertically extending support members.

It is to be understood that the specific constructions of the improved container stacking system herein disclosed and described are presented for the purpose of explanation and illustration and are not inteded to idicate limits of the invention, the scope of which is defined by the following claims.

What is claimed is:

1. A system for stacking shipping containers or the like in independent vertically aligned relationship comprising a vertically extending load accepting member, a first container support arm on said member for supporting a first shipping container, a trip lever engageable with the first shipping container, a second container support arm on said member overlying said first arm in vertically spaced relationship, and means connecting said trip lever with said second container support arm, said trip lever being operable upon movement of the first shipping container into the supported condition on said first arm for conditioning said second support arm for the engagement and support of a second vertically aligned shipping container.

2. A system for stacking shipping containers or the like in independent vertically aligned relationship comprising a vertically extending load accepting member, a first container support arm extending laterally of said member in load transfer relationship therewith for supporting a first shipping container, a trip lever engageable with the first shipping container, a second container support arm extendable laterally of said member in load transfer relation therewith and overlying said first arm in vertically spaced relationship, a rigid operating rod connecting said trip lever and said second container support arm, said trip lever being operable upon movement of a first shipping container into the supported condition on said first arm for conditioning said second support arm for engagement and support of a second vertically aligned shipping container.

3. A system for stacking shipping containers or the like in independent vertically aligned relationship comprising a vertically extending load accepting member, a first container support arm on said member for engaging and supporting a first shipping container, a first trip lever engageable with said first shipping container, a second container support arm on said member overlying said first arm in vertically spaced relationship and movable between a retracted and a container supporting condition, means connecting said first trip lever and said second container support arm for moving said second container support arm into a container accepting condition upon engagement of said first trip lever with said first shipping container, a second trip lever engageable with the second shipping container upon movement thereof into the supported condition on said second arm, a third container supporting arm, and a lost motion connection between second trip lever and said third container supporting arm for moving said third container support arm to the container supporting condition for the support of a third shipping container.

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