June 28, 1960 W. D. STONE 2,942,716

MATERIAL HANDLING APPARATUS

Filed Aug. 18, 1958 4 Sheets-Sheet 1

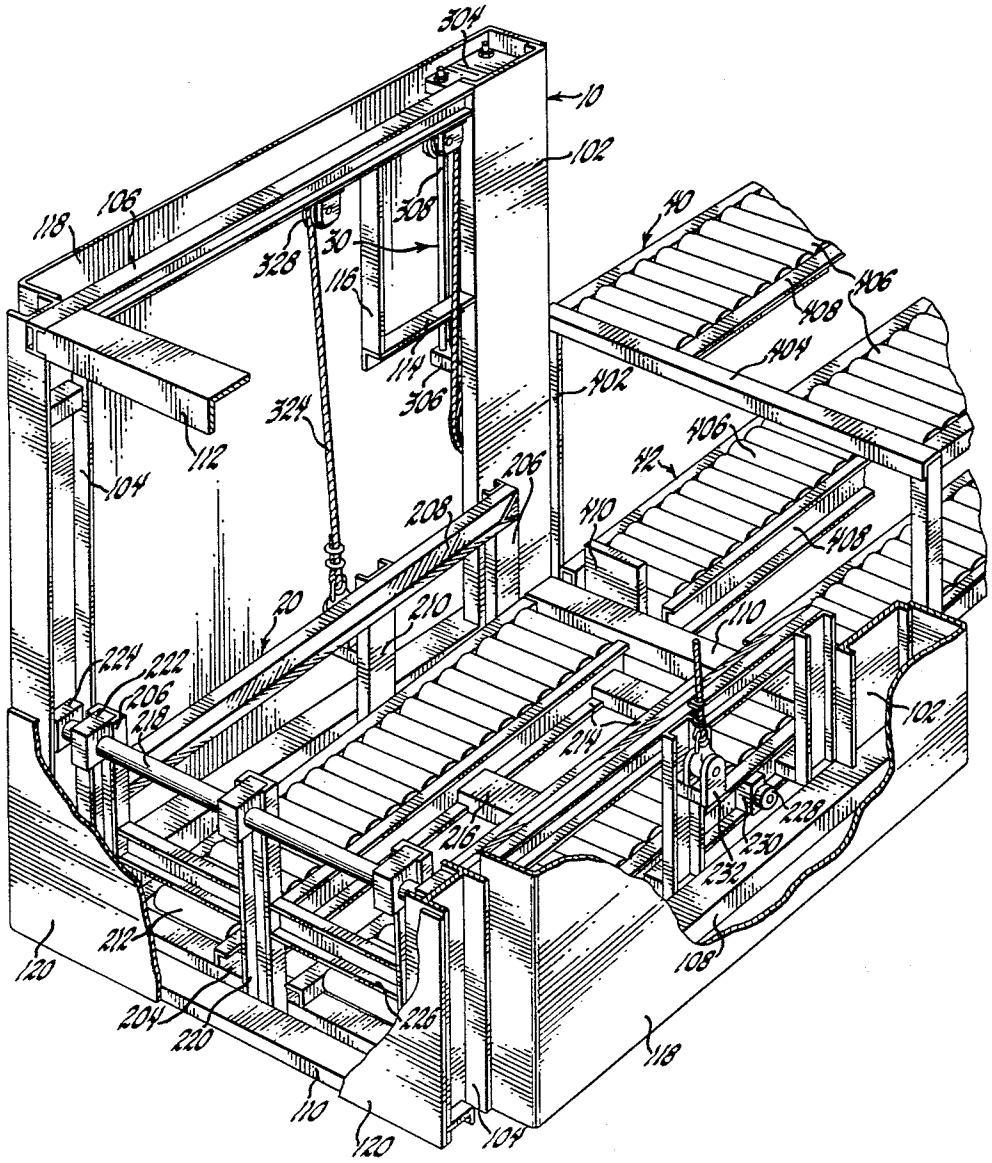


Fig. 1

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MATERIAL HANDLING APPARATUS

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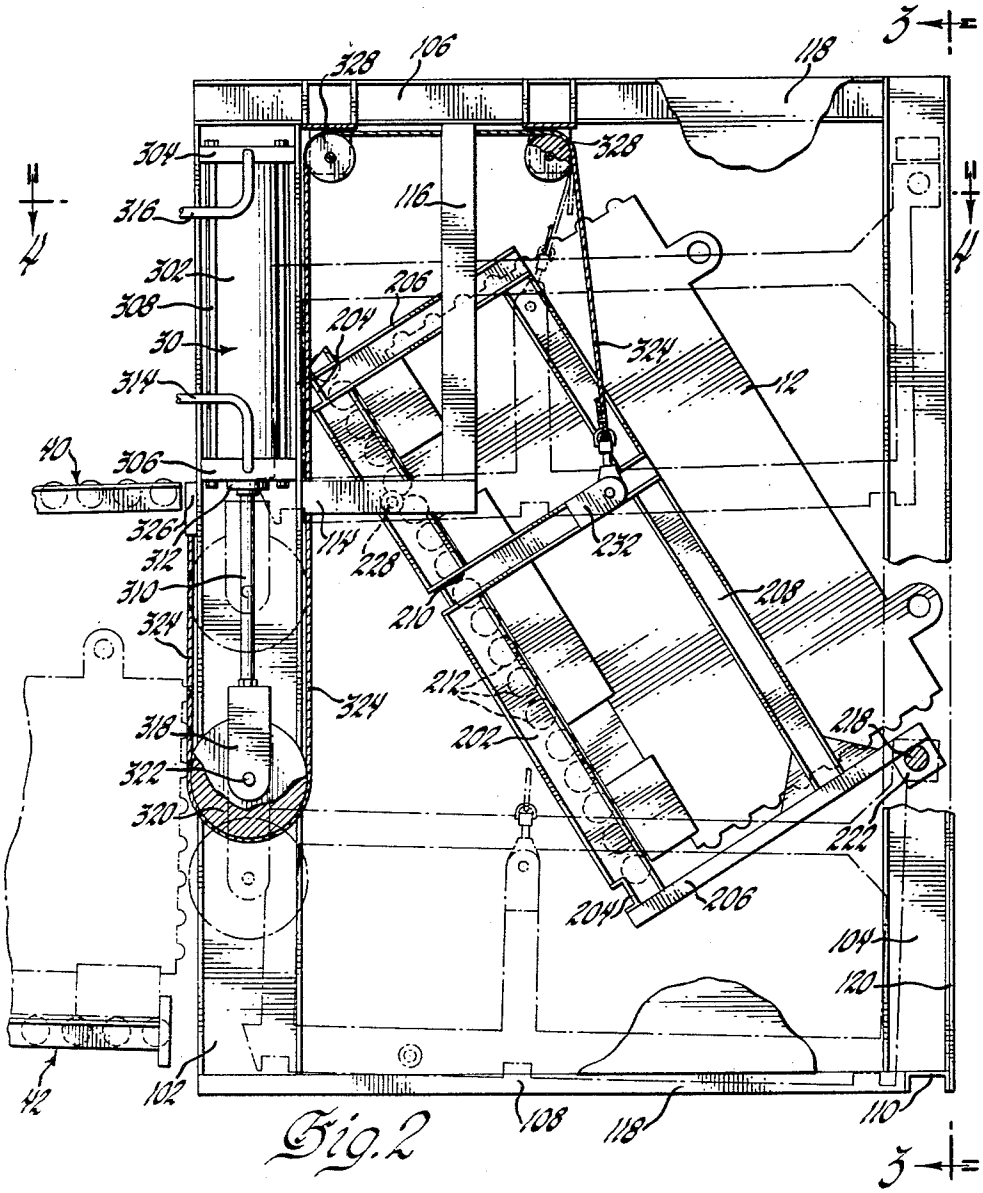


Fig. 2

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MATERIAL HANDLING APPARATUS

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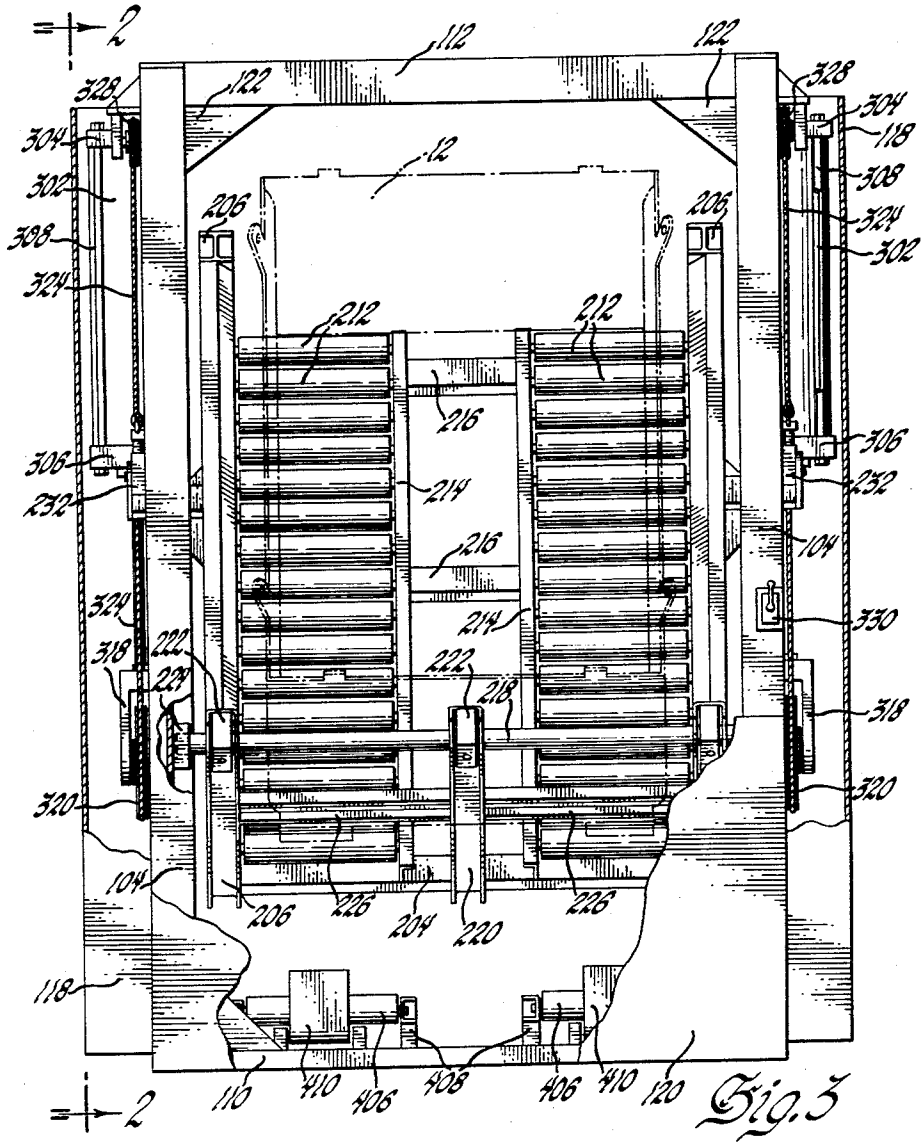


Fig. 3

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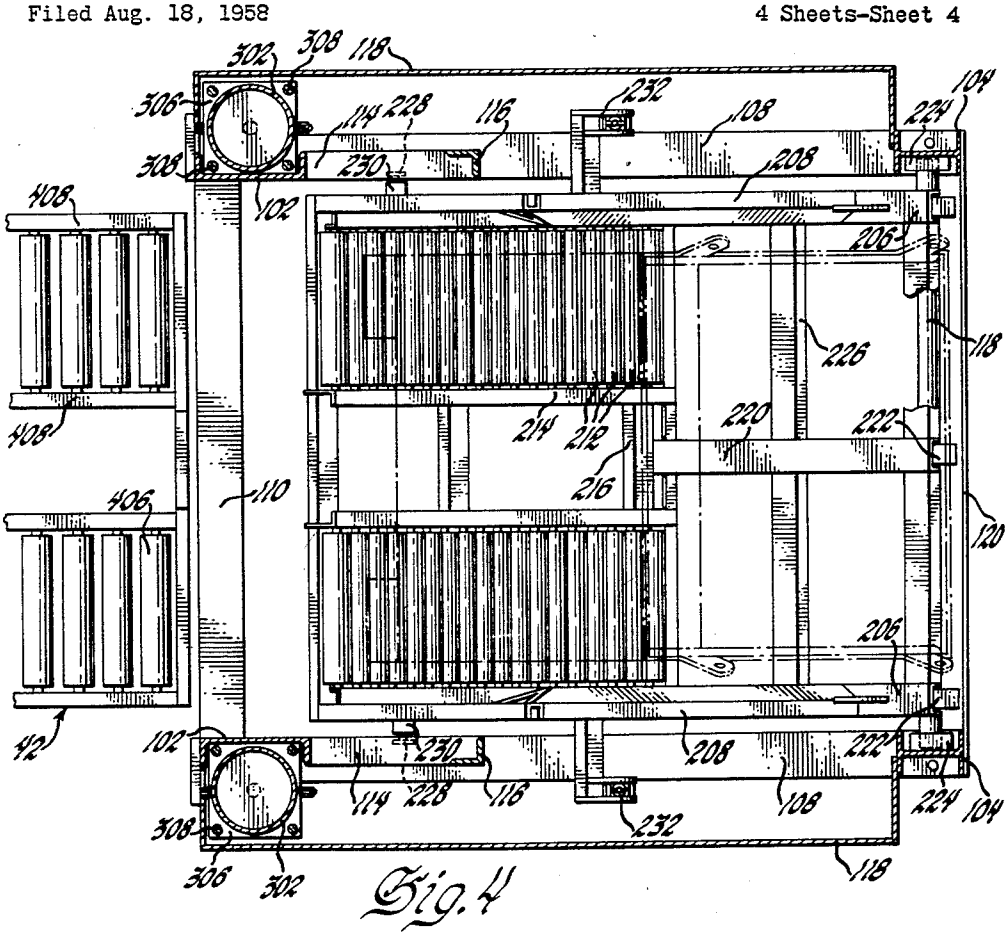


Fig. 4

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MATERIAL HANDLING APPARATUS

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10 Claims. (Cl. 198—19)

This invention relates to material handling apparatus and more particularly to a device for receiving, tipping and raising a parts container to make the parts therein accessible to an assembly line operator.

There has been much difficulty in the past, in assembly line production, in maintaining a supply of small parts in an easily accessible position relative to the assembly line operator. The parts are generally stored, and transferred from place to place, in a container, such as a gondola or the like, the transferral and moving from place to place being accomplished through the use of fork trucks or other factory vehicles. In placing the gondola or container near the assembly line so that the operator may take the parts one by one from the container, a fork truck generally deposits the container adjacent the assembly line. The operator must bend over to remove parts, with increasing difficulty as the parts are used up, providing a very difficult operation. It is costly and time consuming, and particularly objectionable in a facility in which time is very important.

The device in which this invention is embodied comprises an apparatus which receives a gondola or container full of parts, tips the gondola so that the parts are at arm level with respect to the operator, and in such a position that he need not bend over and reach into the entire depth of the container to pick out the parts. When the gondola is empty, the apparatus raises the gondola to an outlet conveyor and allows a second gondola to enter with a minimum of operator effort. The resulting over all operation conserves much time in the assembly line production and provides a great savings in assembly line costs and operator effort.

In the drawings:

Figure 1 is a perspective view of the apparatus with parts broken away and in section to illustrate the location of the various parts.

Figure 2 is an elevational view of the apparatus with parts broken away and in section to show the various positions and location of the parts.

Figure 3 is a front elevational view taken substantially along the line 3—3 of Figure 2 and looking in the direction of the arrows with parts broken away and in section to illustrate the parts of the apparatus.

Figure 4 is a plan view taken substantially in the plane of the line 4—4 of Figure 2 and looking in the direction of the arrows to illustrate the location of the parts.

Referring more particularly to the drawings it may be generally seen in Figures 1 through 4 that the apparatus consists of several major parts. The frame, illustrated generally by the numeral 10, supports a carriage assembly 20 in which is received the parts container or gondola 12. A pair of hydraulic cylinders, illustrated generally by the numeral 30, are secured to the frame and, through a pulley and cable arrangement, actuate the carriage to first tip and secondly raise the carriage assembly and the gondola contained therein. A conveyor system, consisting of upper and lower conveyors 40 and 42 respectively, transfer the full gondola into the carriage assembly for use of the

parts therein by the assembly line operator and transfers the empty container from the carriage into the apparatus when the parts have been used and the operator is ready for a second container. The various parts will be described hereinafter in more detail.

The frame 10 is constructed of steel, or other suitable material, and is generally of channel and I beam construction. Four vertical posts, comprising the rear posts 102 and the front posts 104, are disposed at the four corners of the apparatus. Cross rails, such as the top side rails 106, the bottom side rails 108, the front and rear bottom rails 110 and the front top rail 112, are connected to the corner posts. The rear posts 102 are formed from channel steel of sufficient strength to provide the necessary support. The front posts 104 are constructed of I beams as are the rails 106. The bottom rails and the front top rails, 108, 110 and 112 respectively, are constructed of angle or channel steel of sufficient size and strength to provide adequate support. The posts and rails are joined in any suitable manner, as by welding or riveting, to form a rigid superstructure for the entire aparatus.

On either side of the frame and toward the rear of the frame is a cam track 114, located part way between the upper and lower frame rails 106 and 108. A supporting post 116 is secured to one end of the cam track and secured to the upper rail 106. The other end of the cam track is welded, or otherwise secured, to the rear post 102. The purpose and function of the above mentioned cam track will be later described.

Three sides of the machine are covered, or partially covered, by the side end and plates 118 and 120 respectively. The slide plates 118 are formed to completely enclose the side of the apparatus and extend between the front and rear posts 102 and 104. The front plate 120 is attached to the lower rail 110 and to the front posts 104. The front plate extends only partially up the apparatus to permit access to the interior by the assembly line operator. Gusset plates 122 may be provided throughout the frame structure where necessary to provide the proper strength.

The carriage 20 is also constructed generally of channel steel and I beams. The bottom rails 202 and the front and rear rails 204 provide the necessary base frame for the carriage. Vertical corner posts 206 at the front and the rear of the carriage provide support for the upper rails 208 and the front pivot assembly, which will be later described. Intermediate posts 210 provide support for the cable pull block and give added strength to the carriage assembly.

A plurality of rollers 212 are provided on the carriage assembly for ease is movement of a gondola or container onto the carriage from the conveyor 42. The rollers 212 are supported between the side rails 202 and the intermediate rails 214, the intermediate rails being properly spaced by the spacer blocks 216.

The forward end of the carriage assembly is provided with a pivot rod 218 supported by the corner posts 206 and the center post 220. Pivot blocks 222 are welded or otherwise secured to the posts 206 and 220 and receive the pivot rod 218. Slide blocks 224 disposed on each end of the pivot rod 218 are received between the flanges of the frame corner post I beams 104 to guide the vertical movement of the carriage assembly in the beams 104. Proper support for the intermediate post 220 and for the front end of the carriage assembly is provided by the intermediate cross members 226.

A pair of cams 228, secured to cam blocks 230, are mounted on the sides of the carriage assembly beneath the cam track 114 of the frame 10. The cams 228, when the carriage is moved upwardly, will engage the cam track 114 and are adapted to move along the cam track, bearing against the underside of the horizontal leg of the cam track angle 114. Cable pull blocks 232 are

secured to the intermediate posts **210** and receive the carriage actuating cable in a suitable manner.

The piston and cylinder assemblies **30** are secured to the rear frame posts **102** and consist of cylinders **302** which have conventional pistons therein. The cylinder heads **304** and the closure members at the bottom **306** are held together by tie bolts **308**. The piston rods **310** extend through suitable bushings **312** in the bottom closure members **306**. Air inlet and outlet passages **314** and **316** are connected to the cylinder heads and to the closure members **306** and suitably connected to an air supply means of any conventional type.

A yoke **318** is secured to the end of each of the piston rods **310** and each carries a sheave wheel **320** on an axle shaft **322** through the arms of the yoke member. A cable, or rope of suitable strength, **324** is secured to the frame, as at **326**, and passes around the sheave wheel and over the pulleys **328** attached to the top rails **106** of the frame **10**. The cables extend to the cable pull blocks **232** mounted on the carriage assembly **20**. It may be seen that as the piston and sheave wheel move downwardly, with the cable **324** attached to the frame as at **326**, the carriage assembly will be raised.

The conveyors **40** and **42** may be attached to the frame posts **102** and rear bottom rail **110**, or they may be placed adjacent the machine and not connected. A plurality of vertical posts **402** and cross rails **404** support the roller conveyors. The rollers **406** are secured between the longitudinal rails **408** and are slightly inclined with respect to the apparatus to provide a gravity feed for the gondola or parts container. The lower conveyor **42** is inclined toward the machine and the upper conveyor **44** is inclined away from the machine. Gondola stops **410** are located between the apparatus and the lower conveyor to provide a stop for incoming cars when the carriage assembly is full. The stop **410** may be actuated in any conventional manner either by manual operation or by an electro-mechanical system.

The operation of the apparatus is as follows: The apparatus is placed adjacent the assembly production line at one of the operator work stations. The conveyor assemblies **40** and **42** extend from the rear of the machine and away from the production line. It may be seen then that a full container or gondola may be gravity fed along the lower conveyor **42**, past the stop **410** and onto the rollers **212** of the carriage assembly **20**. The stop **410** is then raised to prevent further cars from passing into the apparatus. The operator then actuates a conventional air switch, illustrated generally by the numeral **330**, which may be of any well known construction but preferably being a three position switch. Positions 1 and 3 would be air inlet and outlet to the air cylinder **302** and position 2 of the switch would be a hold position that is neither air inlet nor air exhaust.

As the gondola moves onto the conveyor assembly **20**, the operator would put the switch **330** at the air inlet position, which would force the piston in the cylinder **302** downwardly carrying the piston rod **310** and the sheave wheel **320**. It may be seen that the sheave wheel and piston rod will act against the cable **324**, drawing up the rear end of the carriage assembly **20**. The location of the cable pull block **232** is such that the carriage assembly and gondola car will pivot about the front pivot rod **218** before the slide blocks **224** will move upwardly in the side posts **104**. The carriage assembly and pivot blocks **222** rotate about the rod **218** until the cams **228** contact the cam track **114**. The carriage assembly and sheave wheel would be in the position shown in full lines in Figure 2. The gondola is then accessible to the assembly line operator for removal of parts.

When the gondola or container is empty, and the operator desires a full container, the air switch **330** is again actuated to the air inlet position. The piston is further forced downwardly, along with the piston rod **310** and the sheave wheel **320**, and the cams **228**, acting against the cam tracks **114**, prevent further pivotal movement of the carriage assembly and the gondola in the direction of the assembly line operator. The slide blocks **224** then move upwardly, guiding the carriage assembly, caused by the tension in the cable **324**, and the cams rolling along the track **114**, move the rear end of the carriage assembly toward the rear of the apparatus. The piston continues to move downwardly until the slide blocks **224** contact the stop blocks **124** located between the flanges of the I beams **104**, at which time the rear end of the carriage assembly is adjacent the upper conveyor **40**.

The carriage assembly is slightly canted toward the conveyor assembly so that gravity will move the empty gondola from the carriage assembly and onto the upper conveyor **40**. This position is shown in Figure 2 in dashed and dotted lines, the carriage assembly being in its uppermost indicated position and the sheave wheel being in its lowermost indicated position.

The operator may now move the air switch **330** to the exhaust position and the weight of the carriage assembly is sufficient to force the sheave wheel **320**, piston rod **310** and piston upwardly into the cylinder **302** and expel the air through the conduit **314**. The carriage assembly will then lower to the position indicated in Figure 2 in dashed and dotted lines adjacent the lower conveyor assembly **42**. The conveyor limit stop **410** is then actuated to allow a second gondola to enter the carriage assembly and the cycle is repeated.

It may be noted that any length may be provided for the conveyor assemblies **40** and **42**. At the beginning of the day's work, three or more full gondolas may be placed on the lower conveyor and any empty gondolas removed from the upper conveyor **40**. Presuming the operator's daily requirements to be three or more gondola cars, it may be seen that only one filling operation is necessary for the lower conveyor **42**.

It is not desired to limit this application to assembly line facilities, as it may be applicable to any installation where small parts are stored in gondolas or other containers, nor is it desired to limit the invention to the particular means for operating the structure as described. A pair of hydraulic, pneumatic or air-draulic cylinders, oran electric motor and drive unit, could be used depending upon the application location, the load rating requirements and economies of operation.

I claim:

1. Means for making a parts container available to an assembly line comprising a frame, carriage means slidably and pivotally secured in said frame, means for first tipping and secondly raising said carriage means, and conveyor means for transferring parts containers into and out of said carriage means and said frame when said carriage means is properly positioned with respects thereto.

2. Means for making available a parts storage container to an assembly line comprising a frame, a carriage slidably and pivotally received in said frame, roller means in said carriage for receiving a parts storage container, hydraulic means for first tipping and secondly raising said carriage and the parts container received therein, and first and second conveyor means adjacent said frame, said first conveyor means transferring said parts container to said carriage when said parts container is full and said second conveyor means transferring said parts container from said carriage means when said parts container is empty.

3. A device for making parts containers available to a production assembly line comprising a frame, carriage means receivable in said frame, slide blocks secured to said carriage means and receivable in said frame to guide the vertical movemnet of said carriage means, means secured to said frame for first tipping and secondly raising said carriage means in said frame, and conveyor means adjacent said frame for transferring parts containers to and from said carriage means when said carriage means is properly positioned with respect thereto.

4. A device for receiving and tipping a parts container for accessibility to a production assembly line compris-

ing a frame, a carriage slidably and pivotally receivable in said frame, roller means in said carriage to receive parts containers therein, slide blocks secured to said carriage and slidably received in said frame to guide the vertical movement of said carriage within said frame, pivot means secured to said carriage and received in said frame to allow pivotal movement of said carriage within said frame and about the forward end of said carriage, cam means secured to said carriage and abutting said frame at the upper limit of the pivotal movement of said carriage to prevent further pivotal movement of said carriage about the front end thereof, hydraulic means secured to said frame and operatively connected to said carriage to first pivot said carriage and secondly raise said carriage and the parts container received therein, and conveyor means adjacent said frame to transfer a parts container to and from said carriage when said carriage is properly positioned with respect thereto.

5. Apparatus for receiving and tipping a parts container for accessibility to a production assembly line comprising a frame, carriage means slidably and pivotally secured in said frame, hydraulic means secured to said frame, cables operatively secured to said hydraulic means and said carriage to slide and raise said carriage within said frame, and conveyor means adjacent said frame to transfer a parts container to and from said carriage means when said carriage means is properly positioned with respect thereto.

6. Apparatus for receiving and tipping a parts container for accessibility to a production assembly line comprising a frame, carriage means slidably and pivotally secured in said frame, an hydraulic cylinder secured to said frame and having a piston therein and a piston rod extending axially therefrom, a sheave wheel rotatably secured to the outer end of said piston rod, a pulley secured to said frame above said carriage means, a cable secured at one end to said frame and passing around said sheave wheel and around said pulley and secured at its other end to said carriage means to first pivot and secondly raise said carriage means upon actuation of said piston within said cylinder, and conveyor means adjacent said frame to transfer a parts container to and from said carriage means when said carriage means is properly positioned with respect thereto.

7. The apparatus defined in claim 6 having a plurality of cylinders secured to said frame, a piston having a piston rod in each of said cylinders, a sheave wheel rotatably secured to each of said piston rods, and a plurality of cables secured to said frame and to said carriage means and each being actuated by one of said pistons and said associated sheave wheel to first tip and secondly raise said carriage means within said frame.

8. Apparatus for receiving and tipping a parts container for accessibility to a production assembly line comprising a frame, carriage means slidably and pivotally secured in said frame, an air cylinder secured to said frame and having a piston therein and a piston rod axially extending therefrom, air inlet and exhaust means operatively connected to said cylinder to actuate said piston therewithin, cable and pulley means secured to said frame and to said piston rod and to said carriage

to first tip and secondly raise said carriage with actuation of said piston, and conveyor means secured to said frame to transfer a parts container to and from said carriage means when said carriage means is properly position with respect thereto.

9. Apparatus for tipping and raising a parts container for accessibility to a production assembly line comprising a frame, carriage means slidably and pivotally secured in said frame, means secured to said frame and operatively connected to said carriage means to first tip and secondly raise said carriage means in said frame upon operation of said hydraulic means, first conveyor means secured to said frame to transfer a full parts container into said carriage means when said carriage means is adjacent thereto, and second conveyor means vertically spaced from said first conveyor means and secured to said frame to transfer a parts container from said carriage means when said carriage means is adjacent thereto.

10. Apparatus for tipping and raising a parts container for accessibility to a production assembly line comprising a frame; carriage means slidably and pivotally secured in said frame; hydraulic means secured to said frame and operatively connected to said carriage means to first tip and secondly raise said carriage means in said frame on operation of said hydraulic means; and conveyor means secured to said frame to transfer a parts container to and from said carriage means when said carriage means is properly positioned with respect thereto; said carriage means including a plurality of rollers in said carriage to receive a parts container therein, slide blocks secured to said carriage and slidably received in said frame to guide the vertical movement of said carriage within said frame, pivot means secured to said carriage and received in said frame to allow pivotal movement of said carriage within said frame and about the forward end of said carriage, cam means secured to said carriage and abutting said frame at the upper limit of the pivotal movement of said carriage to prevent further pivotal movement of said carriage about the front end thereof; said hydraulic means including a cylinder secured to said frame and having a piston therein and a piston rod axially extending therefrom, a sheave wheel rotatably secured to the outer end of said piston rod, a pulley secured to said frame above said carriage means, and a cable secured to said frame and passing around said sheave wheel and around said pulley and secured to said carriage means to first pivot and secondly raise said carriage means upon actuation of said piston within said cylinder; said conveyor means including a first conveyor secured to said frame to transfer a full parts container into said carriage means when said carriage means is adjacent thereto, and a second conveyor vertically spaced from said first conveyor and secured to said frame to transfer said parts container from said carriage means when said carriage means is adjacent thereto.

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