# United States Patent

[11] **3,550,802**


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[45] Patented **Dec. 29, 1970**


[54] **POWER-DRIVEN CONTAINER TRANSPORTING DEVICE**
**12 Claims, 16 Drawing Figs.**


[52] **U.S. Cl.** ..... **214/512,** 280/408, 280/43.11, 280/43.22
[51] **Int. Cl.** ..... **B60p 1/44**
[50] **Field of Search** ..... 214/512; 280/408, 411, 412, 43.11, 43.22, 43.23



[56] **References Cited**

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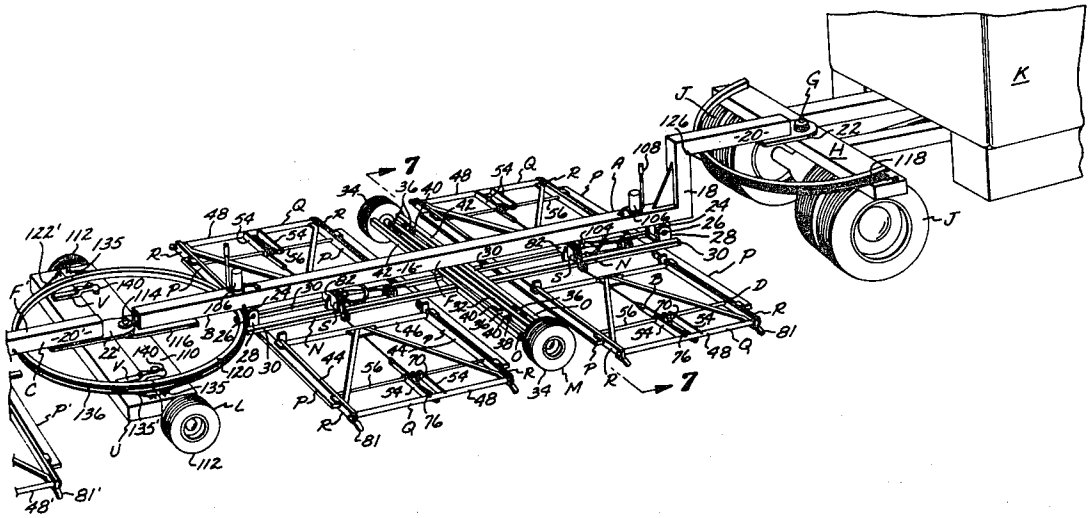
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*Primary Examiner*—Albert J. Makay
*Attorney*—William C. Babcock



**ABSTRACT:** A number of vehicles that can be connected in end-to-end relationship and drawn by a forwardly disposed pair of power-driven wheels, with each vehicle including a number of vertically movable frames which extend outwardly therefrom that are adapted to engage and raise a number of mobile containers to elevated positions whereby they can be transported to a desired location. In addition, at least a portion of the vehicles are provided with pivotally movable rear wheel assemblies that automatically rotate in a horizontal plane to substantially track with the power-driven wheels and permit manipulation of the train of vehicles on narrow streets, around sharp corners, in confined areas, and the like.

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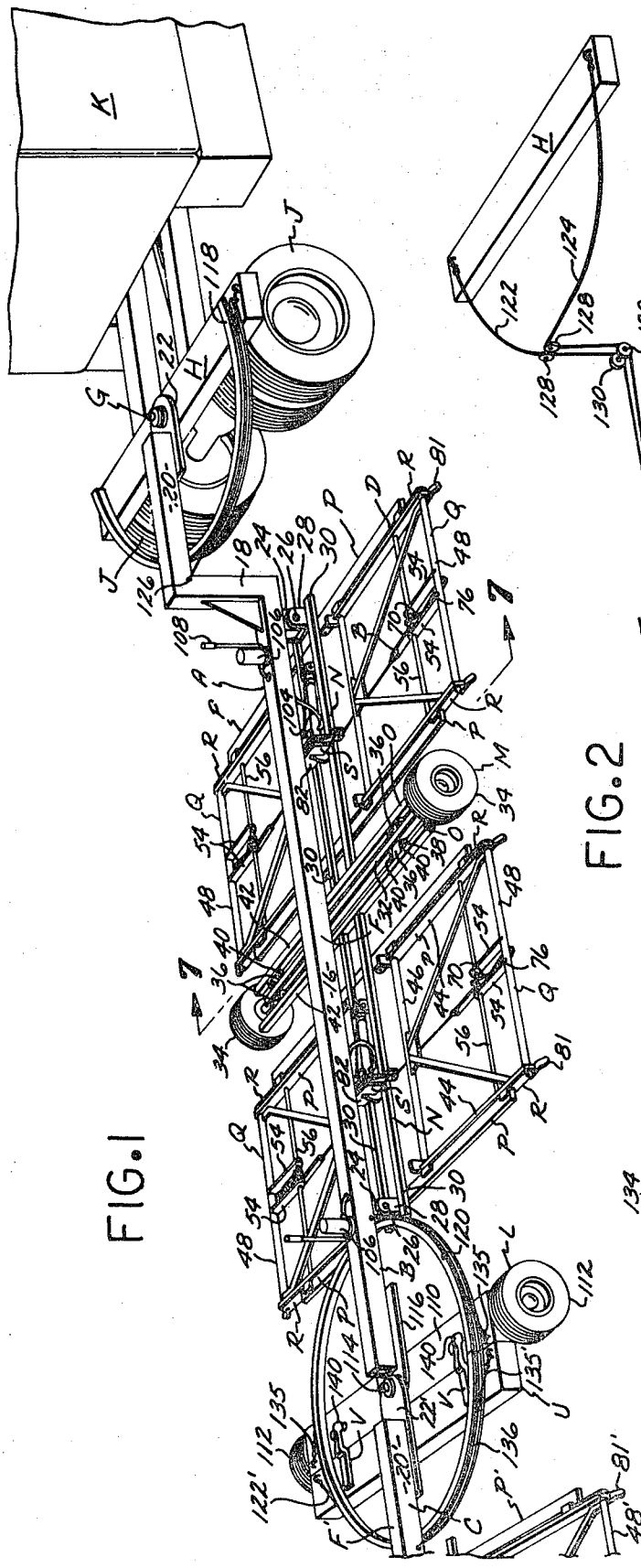


FIG. 1

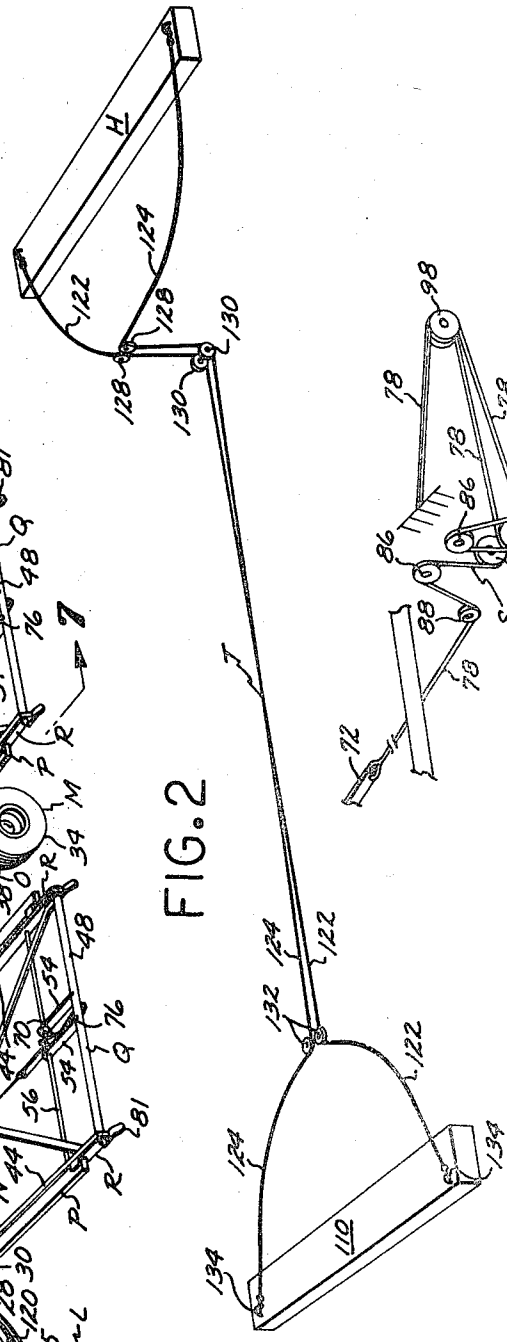


FIG. 2



FIG. 3

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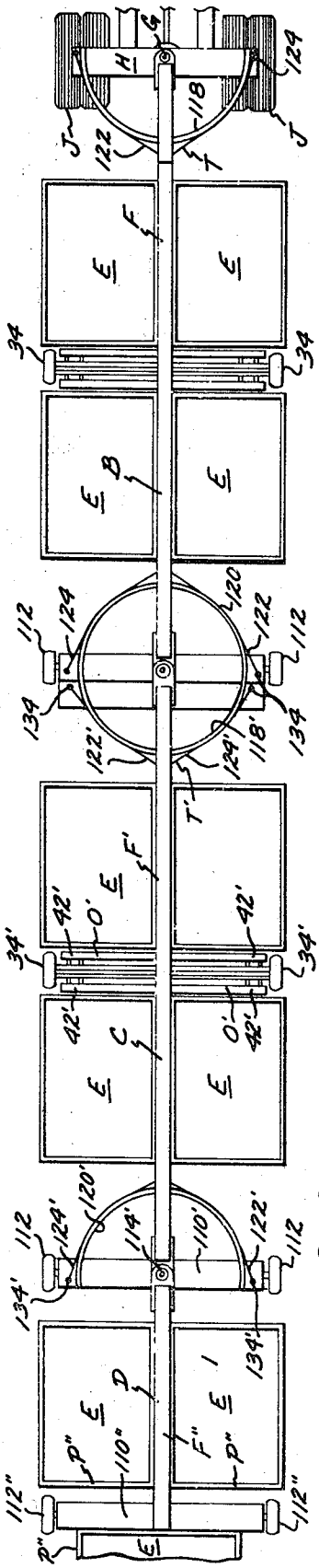


FIG. 4

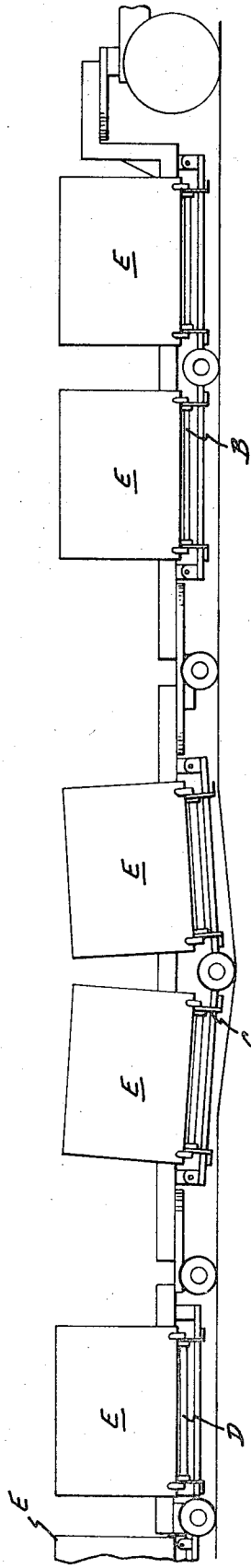


FIG. 5

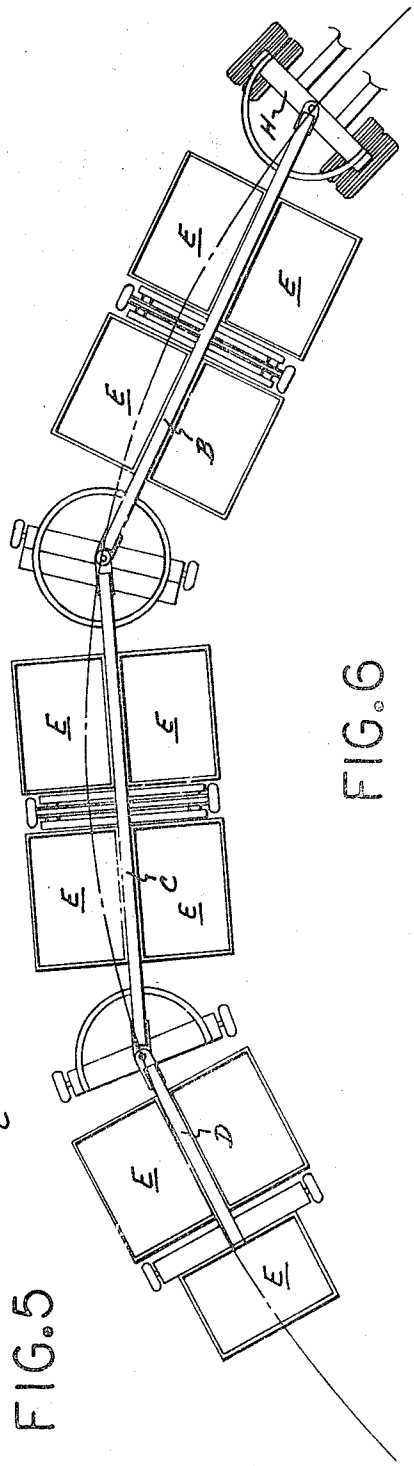


FIG. 6

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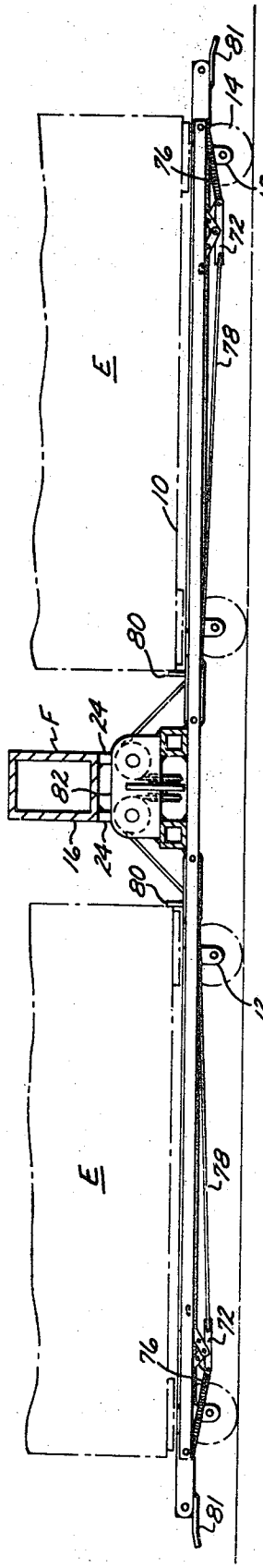


FIG. 7

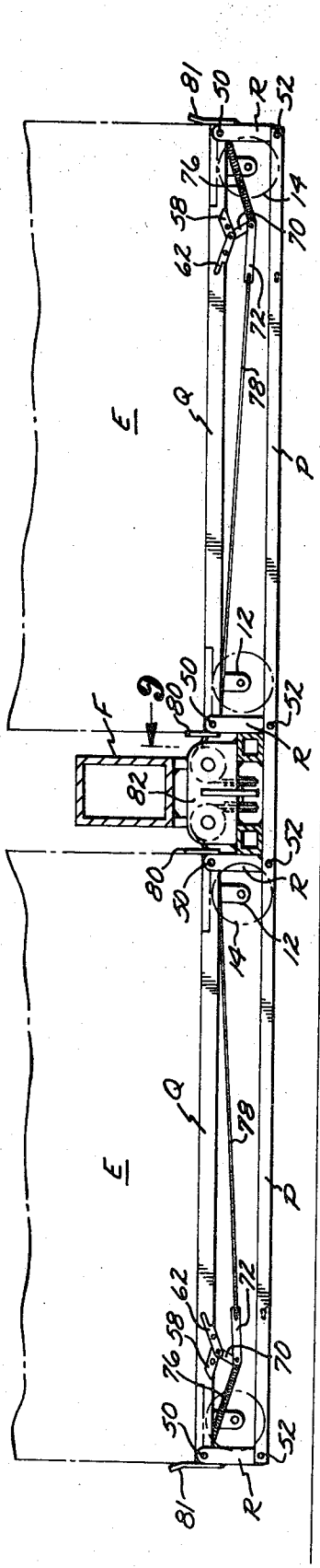


FIG. 8

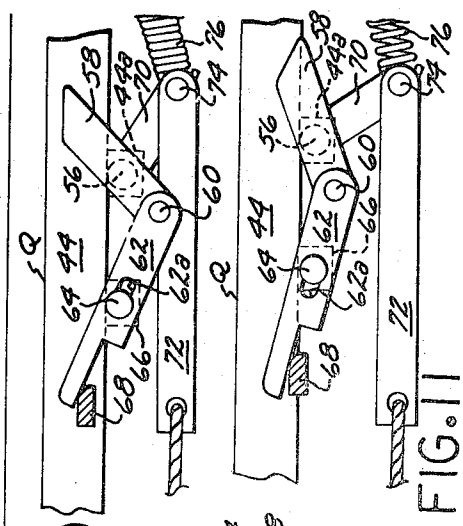


FIG. 10



FIG. 11

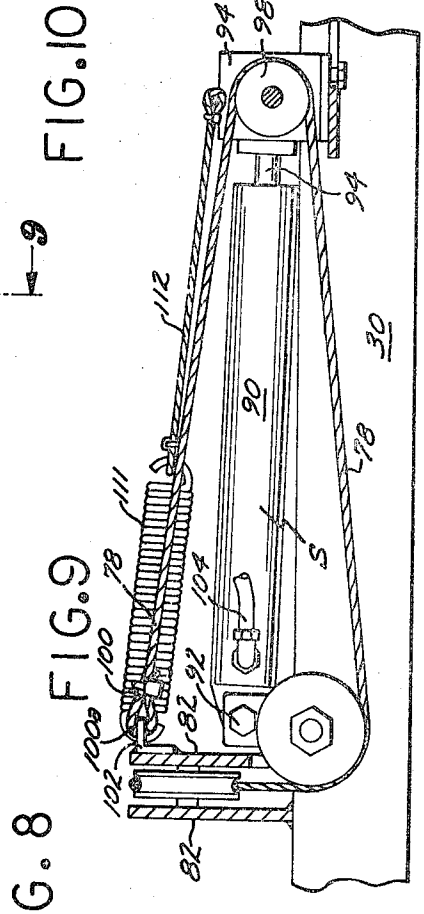


FIG. 9

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FIG.12

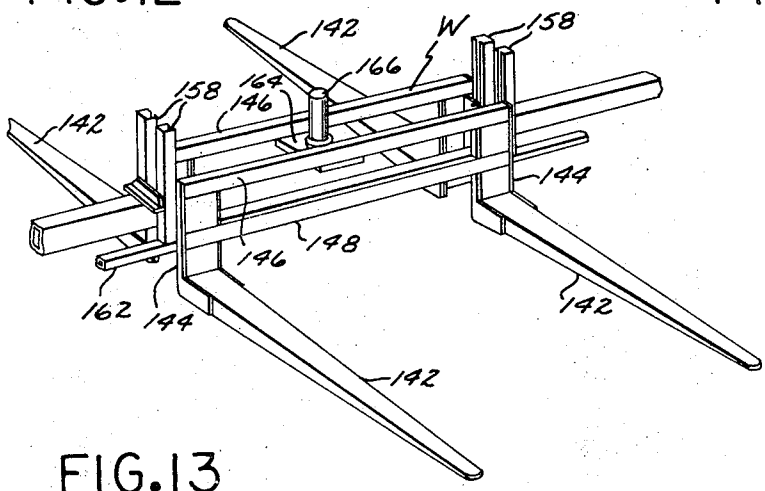



FIG.14

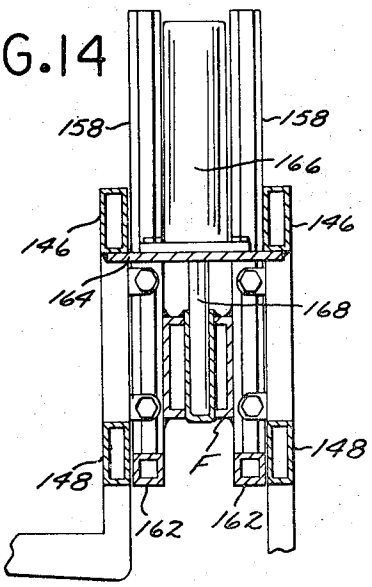
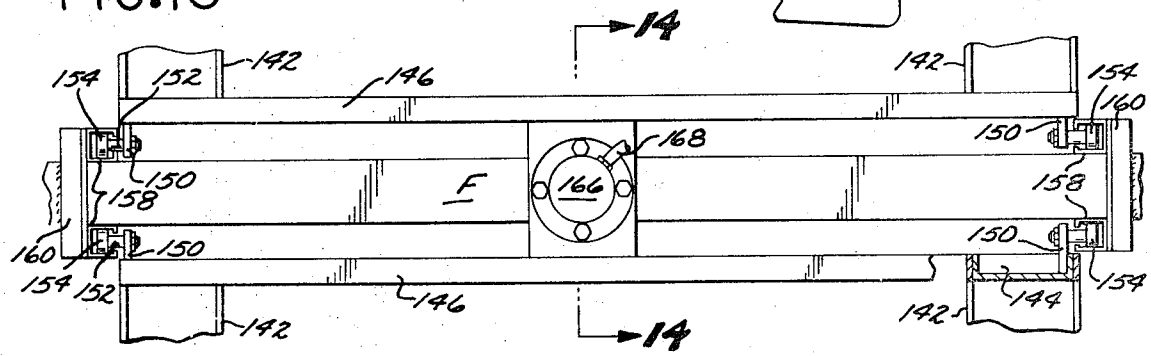



FIG.13



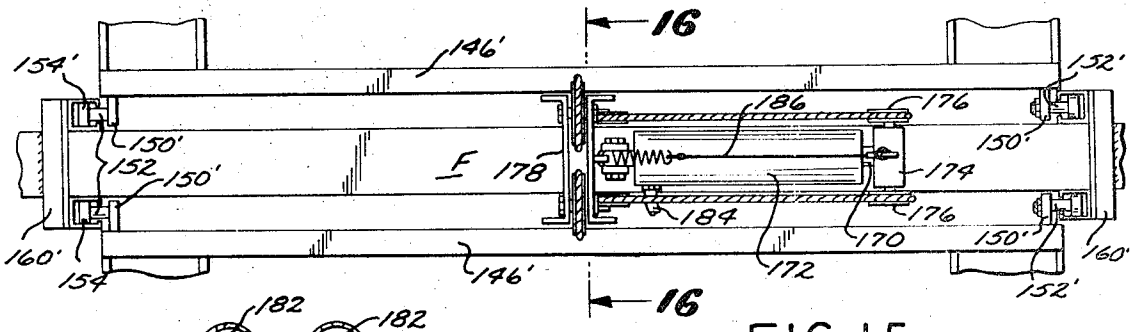




FIG.15

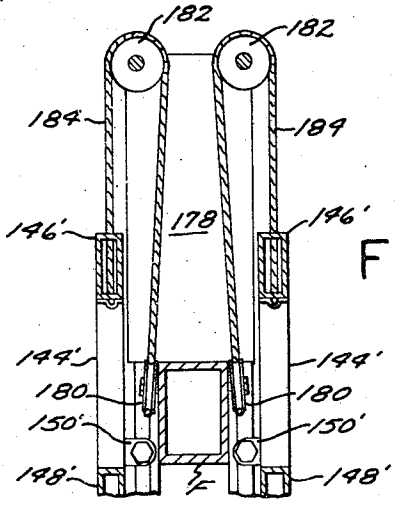



FIG.16

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# POWER-DRIVEN CONTAINER TRANSPORTING DEVICE

## BACKGROUND OF THE INVENTION

1. Field of the Invention

A device for sequentially picking up a number of mobile containers and transporting the same to a desired location where they may be disengaged from the device to rest on the ground surface.

2. Description of the Prior Art

In the collection of trash and refuse from residences and business establishments, it is the present day practice to use expensive trucks for this purpose. After a truck has been loaded, it must be driven to a dump into which the collected refuse is deposited. Such a dump may be many miles from the source of collection, and valuable time is lost in making the trip to and from the dump. To compensate for such time loss, a number of expensive trucks are required, but by use of the present invention only one truck would suffice if the trash or refuse could be collected at a central location, and permit collection of trash and refuse to continue while the truck was traveling to, and returning from the dump.

The present invention overcomes the operational difficulties above described by providing a sequence of vehicles that are connected in end-to-end relationship which are adapted to removably engage a number of trash and refuse carrying mobile containers, and thereafter transported to a desired location. The filled containers are left at the desired location, and empty containers then mounted on the device. The truck carrying the trash and refuse to the dump receives the same at the desired location, and leaves the empty containers to be subsequently picked up by the present invention when it returns to pick up more loaded containers. Thus, the device of the present invention permits substantially continuous gathering of trash and refuse, rather than being interrupted by trips to and from the dump, as is the case with presently available equipment of this type.

## SUMMARY OF THE INVENTION

A sequence of vehicles removably connected in end-to-end relationship that are drawn by a forwardly disposed pair of guidable power-driven wheels, with at least a portion of the supporting wheels on the vehicles being pivotally movable relative thereto following the power-driven wheels as the latter are guided and move forwardly, each of which vehicles are capable of receiving and lifting a number of mobile containers into elevated positions to permit transportation of the containers to a predetermined location.

A major object of the present invention is to provide a sequence of container-transporting vehicles that are so articulated as to track with a pair of forwardly disposed, guidable, power-driven wheels, with the train of vehicles being adapted to follow the power-driven wheels through narrow streets, alleys, or the like, as well as around sharp corners.

Another object of the invention is to supply a sequence of power-drawn vehicles of relatively simple, inexpensive structure that are particularly useful in sequentially picking up mobile containers at spaced positions and transporting the same in elevated positions to a desired location where they are lowered to the ground and disengaged from the vehicle.

A still further object of the invention is to furnish a sequence of power-drawn container-supporting vehicles that are particularly useful in the collection of trash and refuse, and permit such collection to be carried out in a more economical manner than possible by the use of equipment available heretofore.

## DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the first of a series of articulated container-supporting vehicles and the power-driven wheels used in moving the vehicle forwardly;

FIG. 2 is a schematic perspective view of the articulated device used on the first vehicle;



FIG. 3 is a schematic perspective view of a portion of the power means used on the first vehicle in moving container-supporting frames between first and second positions;

FIG. 4 is a top plan view of the sequence of articulated container-transporting vehicles and the power-driven wheels used in moving the same forwardly;

FIG. 5 is a side elevational view of the sequence of articulated container-transporting vehicles traveling over an irregular terrain;

FIG. 6 is a top plan view of the sequence of articulated vehicles and power-driven wheels in the positions they occupy in traversing a curved path;

FIG. 7 is a transverse cross-sectional view of the first vehicle, taken on the line 7–7 thereof in FIG. 1;

FIG. 8 is the same transverse cross-sectional view as that in FIG. 7, but after the container-transporting frames have been raised from first to second positions;

FIG. 9 is a combined longitudinal cross-sectional and side elevational view of one of the hydraulic power units, taken on the line 9–9 of FIG. 7;

FIG. 10 is a side elevational view of one of the units that initially lifts one of the container-supporting frames relative to a fixed pair of arms between which the frame is disposed when in a first position;

FIG. 11 is a second side elevational view of the unit shown in FIG. 10, but after the unit has raised the container-supporting frame with which it is associated relative to the pair of arms between which the frame is disposed when in a first position;

FIG. 12 is a perspective view of a first alternate form of bin-lifting mechanism;

FIG. 13 is a top plan view of the bin-lifting mechanism shown in FIG. 12;

FIG. 14 is a vertical cross-sectional view of the mechanism shown in FIG. 13, taken on the line 14–14 thereof;

FIG. 15 is a top plan view of a second alternate form of bin-lifting mechanism; and

FIG. 16 is a vertical cross-sectional view of the mechanism shown in FIG. 15, taken on the line 16–16 thereof.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The container-transporting device A, as best seen in FIGS. 1, 4, 5, and 6, includes first, second and third vehicles B, C, and D, respectively, that are pivotally connected in end-to-end relationship. Each of the vehicles B, C, and D is adapted to engage and support a number of generally rectangular containers E in elevated positions to permit the containers to be transported to a predetermined location where the containers are lowered to a supporting surface and disengaged from the vehicle.

Each container E has a flat bottom 10 and legs 12 (FIGS. 6 and 7) which depend from the corners thereof. Each leg 12 rotatably supports a wheel 14. Because of the wheels 14, the containers E can be moved inwardly toward the vehicle B, C, or D on which it is to be transported, or moved outwardly therefrom after arrival at a desired location.

The first vehicle B, as best seen in FIG. 1, includes a longitudinally extending drawbar F provided with a raised, horizontal forward extension that is pivotally connected by a pin G to substantially the center of a crossmember H which occupies a fixed position above a pair of guidable, power-driven, pneumatic-tired wheels J. The wheels J are illustrated in FIG. 1 as being the rear wheels of a tractor K.

The first pneumatic-tired wheel assembly L is pivotally connected to the rear end of the drawbar F. A second pneumatic-tired wheel assembly M is disposed under the drawbar F intermediate the power-driven wheels J and the first wheel assembly L.

First and second elongate rigid supports N are axially aligned and in longitudinally spaced relationship. The supports N are situated under drawbar F, and the first ends of supports N are pivotally connected to the drawbar. Second ends

of the supports N are pivotally connected by assemblies O to the second wheel assembly M. Due to the pivotal connections above described, the second wheel assembly M may, as the first vehicle A travels, move upwardly and downwardly relative to the drawbar F over rough terrain.

Pairs of transverse arms P extend outwardly in opposite directions from the supports N, as may best be seen in FIG. 1. The lateral spacing between the arms P in each pair is less than the distance between oppositely disposed legs 12 to permit each container E to be rolled inwardly toward drawbar F to straddle a pair of the arms.

A number of container-supporting frames Q are provided, which when in first positions, are disposed within the confines of the pairs of arms P. The frames Q are pivotally connected to the pairs of arms P with which they are associated by a number of links R, best seen in FIG. 8.

Power means, best seen in FIGS. 1, 3, and 9, are provided for pulling the frames Q and containers E supported thereon upwardly and inwardly toward the drawbar F, with the frames as they so move inwardly, rising to second positions where the wheels 14 of containers E supported on the frames are out of contact with the ground surface. When the containers E are disposed in the second position, they can be transported by the device A to a desired location. Upon arrival at the intended destination the power means S is actuated to allow the frames Q to return to first positions where the wheels wheels of the containers E rest on the ground surface. The containers E may there be rolled outwardly from the device A and disengaged therefrom.

Articulating means T (shown in FIG. 2) extend between the first wheel assembly L and the crossmember H, which means automatically pivot the first wheel assembly to permit it to track with the power-driven wheels J as the device A is moved forwardly along a curved path (FIG. 6).

The second vehicle C is identical to the first vehicle B, other than that the forward end of the drawbar in the second vehicle terminates above a crossmember U. The drawbar of the second vehicle C does not include a raised, horizontal, forward extension. The crossmember abuts against the first wheel assembly L, and is removably secured thereto by locks V, as may best be seen in FIGS. 1 and 4. Elements in the second vehicle C common to those comprising the first vehicle B are designated by the same identifying numerals used in conjunction with the first vehicle, but to which primes have been added.

The third vehicle D is, in effect, a trailer for removably supporting a number of containers E and will be described in detail later.

Drawbar F of first vehicle B, as shown in FIGS. 7 and 8, is preferably of hollow rectangular cross section The drawbar F, as may be seen in FIG. 1, includes a relatively long horizontal section 16 that develops on the forward end into a riser 18 from which a substantially horizontal extension 20 projects forwardly. Extension 20 is rigidly secured to a plate 22 that pivotally engages the pin G.

Drawbar section 16 has two longitudinally spaced pairs of lugs 24 depending therefrom, as best seen in FIGS. 1 and 7. A transverse rod 26 extends through each pair of these lugs 24. Each rod 26 pivotally supports two downwardly extending plates 28 on the ends thereof, which plates are secured to the first ends of two parallel, longitudinally extending, laterally spaced bars 30.

Second wheel assembly M includes a transverse elongate rigid member 32 that rotatably supports two pneumatic-tired wheels 34 on the ends thereof. Two pairs of laterally spaced lugs 36 project forwardly and rearwardly from member 32. A pin 38 extends through each lug 36 and pivotally engages two laterally spaced plates 40 forming a part of the pivot assembly O. The plates 40 are secured to two crossmembers 42 located forwardly and rearwardly of member 32 and parallel thereto, as shown in FIG. 1. Second ends of bars 30 abut against crossmembers 42 and are welded or otherwise rigidly secured thereto.

Each pair of bars 30, as may best be seen in FIG. 1, has a pair of arms P affixed thereto, with the arms extending outwardly in opposite directions from the supporting bars. When the frames Q are in first positions they are located between one of the pair of arms P.

Each frame Q is defined by two parallel, laterally spaced side pieces 44 that are connected to a first inner end piece 46 and a second outer end piece 48. The inner and outer ends of each side piece 44 are provided with links R pivotally connected thereto by pins 50, as shown in FIG. 8. The lower end of links R are pivotally connected to arms P by pins 52, as shown in FIG. 8. The links R are substantially parallel to the arms P when the frames Q are in the first position shown in FIGS. 1 and 7.

Two parallel, laterally spaced elongate plates 54 project inwardly from the center of each frame Q (FIG. 1). Each pair of plates 54 rotatably engages a shaft 56, the ends of which are journaled in portions 44*a* of the side pieces 44 and project therethrough. Actuating members 58 are secured to the projecting ends of each shaft 56, as may be seen in FIGS. 10 and 11. When the frames Q are in a first position the actuating members 58 are disposed as illustrated in FIG. 10.

Each actuating member 58 has a pin 60 projecting therefrom that pivotally engages a link 62 in which a longitudinally extending slot 62*a* is formed. Each slot 62 slidably and pivotally engages a pin 64 that is supported from one of the side pieces 44 by a lug 66, as shown in FIGS. 10 and 11. An inner recessed end of each link 62 slidably engages lug 68 that extends from the interior surface of the most adjacent arm P. A lever 70 is rigidly secured to the center of each shaft 56 and depends downwardly and outwardly therefrom when the frame 62 with which it is associated is in the first position shown in FIGS. 1 and 10.

An elongate pull member 72 is pivotally connected to the lower end of lever 70 by a pin 74. A tensioned helical spring 76 is provided for each of the levers 70, and is connected to the pin 74 thereof, as shown in FIGS. 10 and 11. The outer end of each spring 76 is connected to the end piece 48 with which it is associated. Each spring 76 tends to at all times maintain the frame Q with which it is associated in the first position shown in FIG. 7.

A cable 78 extends inwardly and upwardly from each pull member 72 to one of the power means S, best seen in FIGS. 1 and 8. The legs 12 of each container E are so spaced that the legs straddle on eof the pair of arms P when the container is rolled inwardly toward the drawbar F. The bottom 10, when a container E is so straddling one of the pairs of arms P, is at such an elevation as to be disposed slightly above one of the frames Q, as shown in FIG. 7. Each frame Q is in the first position shown in FIGS. 1 and 7 when a container E is rolled inwardly relative thereto. Inward movement of each container E, relative to a pair of arms P, is limited by a pair of first stops 80 that project upwardly from first end piece 46. Second stops 81 are mounted on the links R to hold the containers E on the frames Q when the frames are in the second positions shown in FIG. 7.

When it is desired to lift one of the containers E from the first position (FIG. 2) to the second position illustrated in FIG. 8, the cable 78 associated with that particular container is caused to move the pull member 72 connected thereto inwardly toward drawbar F. Inward movement of one of the pull member s 72 causes lever 70 connected thereto to pivot in a clockwise direction, as viewed in FIGS. 10 and 11.

Such movement of lever 70 results in actuation of members 58 to pivot in a clockwise direction (FIGS. 10 and 11). This movement of actuating members 58 causes pivotal and slidable movement of a pair of links 62 relative to the pins 64. Slidable and pivotal movement of a pair of links 62 results in the exertion of a force on the lugs 68, as shown in FIGS. 7, 10, and 11, that lifts one of the frames Q and container E upwardly relative to one of the pair of arms P. Such movement of a pair of links 62 terminates when the right-hand end of the slots 62*a* in links 62 contact the pins 64. Further inward move-

ment of one of the cables **78** exerts an inward force on second end piece **48**, shown in FIG. **1**, to complete the movement of the frame Q of which the end piece forms a part of the second position illustrated in FIG. **8**.

The reason for using the combination of elements shown in FIGS. **10** and **11** to initiate upward movement of the frames Q and containers E supported thereon is that when the frames are in the first positions (FIG. **7**) the cables **78** are at but a slight angle relative to the longitudinal axes of the links R. Before the cables **78** can exert a substantial torque on the links R, the links must be pivoted upwardly and inwardly to the extent that the outer ends of the longitudinal axes thereof are elevated a substantial distance above the centers of the pins **52**. Such initial upward movement of the links R is accomplished by use of the combination of elements shown in FIGS. **10** and **11**.

Each set of oppositely disposed pairs of arms P has one of the power means S associated therewith that is mounted at substantially the center of one pair of bars **30**, as may best be seen in FIGS. **1**, **3**, **7**, **8**, and **9**. Each power means S includes two parallel, spaced plates **82** that are transversely positioned on one of the pairs of bars **30** and rotatably support first, second and third pairs of pulleys **84**, **86**, and **88**, respectively, best seen in FIG. **3**. A hydraulic cylinder **90** extends forwardly from each pair of plates **82** and is connected thereto by a pin **92**, best seen in FIG. **9**. A piston rod **94** is slidably mounted in each cylinder **90**. Each piston rod **94** has a block **96** mounted on the forward end thereof that is slidably keyed to one pair of bars **30**. Each block **96** rotatably supports a fourth pair of pulleys **98**. The two cables **78** used in moving oppositely positioned frames Q from first to second positions, each engage third, second, first, and fourth pulleys **88**, **86**, **84**, and **98**, respectively, as shown in FIG. **3**. Loops **100***a* are formed in the ends **100** of cables **78** (FIG. **9**) that are secured to brackets **102** which extend outwardly from one of the plates **82**.

A flexible conduit **104** extends from the rear end of each hydraulic cylinder **90** to a conventional hydraulic pump **106** mounted on the drawbar F, as shown in FIG. **1**. Actuation and control of fluid to and from each pump **106** is accomplished by means of handle **108**, as best seen in FIG. **1**. One end of a tensioned helical spring **111** (FIG. **9**) is connected to a cable **112** that extends forwardly and is affixed to block **96**. Spring **111** tends to at all times maintain piston **94** and block **96** in the position shown in FIG. **9**. When fluid is discharged from one of the pumps **106** by actuation of the handle **108** associated therewith, block **94** is moved forwardly, and frames Q and containers E may be lifted from the first to the second positions shown in FIG. **7**.

The first wheel assembly L (FIG. **1**) includes a second crossmember **110** that rotatably supports two pneumatic-tired wheels **112** on the ends **30**. A vertical pin **114** projects upwardly from the center of the second crossmember **110** and pivotably engages an opening (not shown) in an elongate plate **116** secured to the rear end of the drawbar section **16**, as shown in FIG. **1**.

A semicircular grooved first guide **118** is secured to the first crossmember H (FIG. **1**) and extends rearwardly therefrom under the drawbar extension **20**. A second semicircular grooved guide **120** is affixed to the upper surface of the second crossmember **110**, and extends forwardly therefrom under the rear portion of the drawbar section **16**.

The first ends of two cables **122** and **124** are affixed to the outer upper portions of the first crossmember H, as may be seen in FIGS. **1** and **2**, and these cables slidably engage the first guide **118**. The cables **122** and **124** enter the hollow interior of the drawbar F through two oppositely disposed openings **126** in the extension **20** thereof. After entering the confines of the drawbar extension **20**, cables **122** and **124** engage first and second pairs of pulleys **128** and **130**, respectively. The cables **122** and **124** thereafter extend rearwardly through the drawbar section **16** where they cross one another to engage a pair of pulleys **132**. After passing over the third pair of pulleys **132**, the cables **122** and **124** exit through oppositely disposed openings **134** in the side of the drawbar extension **16** (FIG. **1**) to slidably engage the second grooved guide **120**. The free ends of the cables **122** and **124** are secured to the upper surface of the second crossbar **110** by conventional fastening means **135**.

When the first crossmember H and power-driven wheels J pivot relative to the drawbar F, the cables **122** and **124** move relative to one another to pivot the second drawbar **110** to the extend that the wheel **112** substantially tracks with the power-driven wheels J. The second vehicle C, as may best be seen in FIGS. **4** and **5**, as well as partially in FIG. **1**, is of the same structure as that of first vehicle B, with the exception that it does not include the drawbar riser **18**, and, due to this omission, the section **16'** and extension **20'** of drawbar F' forming a part of the second vehicle are in longitudinal alignment.

A plate **22'** is secured to drawbar extension **20'**. Plate **22'** pivotally engages pin **114**, and also overlies the central portion of third crossmember U as illustrated in FIG. **1**. Third crossmember U has a third semicircular grooved guide **136** extending rearwardly therefrom under drawbar extension **20'**. The third crossmember U is removably held in abutting contact with the second crossmember **110** by conventional locking means **140** that may be trailer-hitch assemblies, or the like. The forward ends of cables **122'** and **124'** are secured to cross member U. The cables **122'** and **124'** continue rearwardly through the drawbar F' (FIG. **4**) to slidably engage a semicircular grooved guide **120'** secured to the upper surface of a fourth cross member **110'**. The rear ends of the cables **122'** and **124'** are connected to the upper surface of the crossmember **110'** by fastening means **134'**.

The third vehicle D includes a horizontal drawbar F'', to the forward end of which a plate **22''** is affixed, and this drawbar pivotally engages the pin **114'**. The rear end of the crossbar F'' is rigidly secured to a crossmember **110''** that rotatably supports pneumatic-tired wheels **112''**. Two pairs of arms P'' extend outwardly in opposite directions from the sides of the drawbar F'', and another pair of arms P'' extend rearwardly therefrom. The three pairs of arms P'' serve to movably support frames O'' in the same manner as the frames O are supported from arms P in the first vehicle B.

In use, operation of the present invention is most simple. The containers E are rolled into a position to straddle the pairs of arms P, P' or P'', with the frames Q, Q' or Q'' being in the first position. Pumps **106** are then actuated to move the frames Q, Q' or Q'', and the container E disposed thereabove into an elevated second position. The power-driven wheels J are thereafter caused to move the device A forwardly, and with the first, second and third vehicles B, C and D following the same, in the manner shown in FIG. **6**, due to the articulation controls T and T'. When a desired destination is reached, the above-described operation is reversed to deposit the containers E from the device A on the ground surface.

A first alternate from of bin-lifting mechanism W for heavy bins is shown in FIGS. **12—14**, which is adapted as a substitute for the bin-lifting mechanisms previously described and illustrated in FIGS. **1** and **7—11** inclusive.

The mechanism W includes two pairs of forks **142** that are in transverse alignment and extend outwardly from opposite sides of the drawbar F or F'. Each pair of forks **142** is supported from the lower ends of a pair of uprights **144** that are connected by upper and lower rigid members **146** and **148**, respectively. The uprights **144** each have two or more brackets **150** extending inwardly that support short shafts **152** on which rollers **154** are rotatably supported. The rollers **156** rotatably engage vertical slotted guides **158** which are rigidly secured to drawbar F by clips **160**. The longitudinally aligned guides **158** are connected on their lower ends by elongate stop members **162**.

A transverse cross piece **164** extends between upper members **146** and supports a vertical hydraulic cylinder **166**. A piston **168** depends from cylinder **166**, and the lower end thereof is secured to drawbar F, as shown in FIG. **14**. Hydraulic fluid under pressure may be discharged into the lower in-

terior portion of cylinder **166** from a source (not shown) through a conduit **168**. Fluid may also be discharged from the cylinder through the same conduit **168** by valve means (not shown).

When it is desired to transport a roller-supported container E on the device A which includes the lifting mechanism W, the container is rolled to a position where a pair of forks **142** extend thereunder. Hydraulic fluid under pressure is then discharged to cylinder **166**, with the forks **142** being lifted to an elevated position where the bins E supported thereon may be transported on the device A to a desired destination. During such transportation, pressure, must of course, be maintained on the fluid in cylinder **166**. Upon arrival at the destination, pressure on the fluid in cylinder **166** is slowly relieved, with the fork **142** and bins E supported thereon moving downwardly due to force of gravity until the bins rest on the ground. The bins E may then be rolled outwardly away from the transporting device A to permit further use of the latter.

The second alternate form of bin-lifting mechanism Y shown in FIGS. **15** and **16** embodies certain of the elements used in the first form W. Those elements in the second form of mechanism Y which are common to the first form W are identified herein by the same numerals to which primes have been added.

Two oppositely disposed pair of forks **142'** in the second form of bin-lifting mechanism Y are raised by movement of a piston rod **170** that is slidably in a horizontal position on the upper surface of drawbar F. Piston rod **170** has a transverse cross piece **174** on the forward end thereof which rotatably supports two first pulleys **176** on the ends thereof. An upright **178** is secured to the upper surface of drawbar F adjacent the rear end of cylinder **172**, as shown in FIG. **15**. Two second pulleys **180** and third pulleys **182** are rotatably supported from drawbar F and the upper portion of upright **178**.

Two cables **184** are provided, the first ends of which are secured to upright **178**, with the cables engaging first, second and third pulleys **176**, **180**, and **182**, with the second cable ends being secured to the rigid members **146'**. Hydraulic fluid under pressure is supplied to the interior end portion of cylinder **172** most adjacent upright **178** through a conduit **184** from a source (not shown).

The hydraulic fluid so discharged into cylinder **172** moves cross piece **174** away from upright **178**, and the forks **142'** are raised on the transporting device A as a result thereof. The forks **142'** and containers E are supported in an elevated position only when pressure is maintained on the hydraulic fluid in cylinder **172**. When the maintenance of pressure on the fluid in cylinder **172** is terminated the forks **142'** will move downwardly to their lowermost position by force of gravity.

A spring-loaded cable **186** extends between upright **178** and cross piece **174**, and tends at all times to maintain the cross piece in the position shown in FIG. **15**. The second form Y of the lifting mechanism serves the same function as the first form W, and the method of use thereof accordingly need not be repeated.

I claim:

**1.** In combination with a pair of laterally spaced, guidable, pneumatic-tired, power-driven wheels provided with a first crossmember situated thereabove that occupies a fixed position relative to said wheels, a first vehicle for transporting a plurality of generally rectangular, mobile, flat-bottomed containers, from the corners of which wheel-supporting legs project downwardly, which first vehicle comprises:

a. an elongate drawbar including a raised horizontal forward extension;

b. first means for pivotally connecting said extension to substantially the center of said crossmember;

c. a first pneumatic-tired wheel assembly pivotally connected to the rear end of said drawbar;

d. a second pneumatic-tired wheel assembly under said drawbar, intermediately disposed between said extension and said first wheel assembly;

e. two elongate rigid supports in axially aligned and longitudinally spaced relationship situated under said drawbar, with first ends of said supports being pivotally connected to said drawbar;

f. second means for pivotally connecting second ends of said supports to said second wheel assembly to maintain said second wheel assembly in a transverse position relative to said drawbar and permit said second wheel assembly to move vertically when said first vehicle traverses an uneven terrain;

g. first and second pairs of transverse arms rigidly secured to said supports and extending outwardly in opposite directions therefrom with said arms in each of said pairs being laterally spaced a distance less than that between oppositely disposed legs on one of said containers;

h. a plurality of container-supporting frames which when in a first position, are disposed between said first and second pairs of arms;

i. a plurality of links pivotally connecting said frames to said arms to permit said frames to move upwardly to second positions above said arms when said frames are pulled inwardly towards said drawbar;

j. power means for selectively drawing said frames inwardly towards said drawbar to move said frames and containers supported thereon to said second positions where said containers can be transported on said vehicle to a desired location; and

k. third means operatively connecting said first wheel assembly and said first crossmember for pivoting said first wheel assembly to substantially track with said power-driven wheels as said vehicle moves forwardly to transport said containers to a desired location, with said containers being removable from said vehicle when said location has been reached by operating said power means to move said frames to said first position.

**2.** A combination as defined in claim **1** wherein said links are substantially parallel to said arms when said frames are in said first positions, which combination further includes:

a. a plurality of cables operatively connected to said power means and extending outwardly to said frames; and

b. fourth means mounted on said frames and connected to said cables for initially lifting said frames relative to said arms when said power means moves said cables inwardly relative to said frames, which fourth means after said initial movement transfers the inwardly directed forces from said cables to said frames without said relative movement to pivot said frames on said links to said second positions.

**3.** A combination as defined in claim **1** wherein said first wheel assembly includes a second crossmember that is parallel to said first crossmember when said power-driven wheels and the wheels of said first assembly are in longitudinal alignment, which third means comprises:

a. first and second arcuate grooved guides affixed to said first and second crossmembers, which guides extend towards one another;

b. pulley means mounted on said drawbar; and

c. first and second crossed-over cables extending longitudinally along said drawbar to engage said pulley means and said first and second cables rigidly secured to said first and second crossmembers.

**4.** A combination as defined in claim **2** wherein an individual one of said power means is operatively associated with each of said pair of arms for concurrently lifting two of said frames disposed between said pair of arms and situated on opposite sides of said drawbar.

**5.** A combination as defined in claim **4** wherein each of said power means further includes:

a. a hydraulic cylinder longitudinally disposed on one of said supports and pivotally connected thereto;

b. pump means for supplying fluid under pressure to said cylinder;

c. a piston rod slidably movable in said cylinder;

d. first pulley means mounted on the outer end of said piston rod, which first pulley means movably engages looped portions of two of said cables; and

e. second pulley means for maintaining said cables in said looped positions, with first ends of said cables being connected to said power means, and said outwardly extending portions of said cables being moved inwardly as said first pulley means moves away from said hydraulic cylinder.

6. A combination as defined in claim 1 which further includes a second vehicle comprising:

a. a second elongate drawbar pivotally connected to the rear end of said drawbar of said first vehicle;

b. a third pneumatic-tired wheel assembly pivotally connected to the rear end of said second drawbar;

c. a fourth pneumatic-tired wheel assembly under said second drawbar located intermediate the forward end of said second drawbar and said third wheel assembly;

d. two elongate rigid second supports situated under said drawbar and in alignment with and longitudinally spaced from one another, with first ends of said second supports being pivotally connected to said second drawbar;

e. fourth means for pivotally connecting second ends of said second supports to said fourth wheel assembly to maintain said fourth wheel assembly in a transverse position relative to said second drawbar and permit said fourth wheel assembly to move vertically when said second vehicle traverses an uneven terrain;

f. third and fourth pairs of transverse arms rigidly secured to said supports and extending outwardly therefrom in opposite directions, with said arms in each third and fourth pairs being laterally spaced a distance less than that between oppositely disposed legs of one of said containers;

g. a plurality of second container-supporting frames which when in first positions are disposed between said third and fourth pairs of arms;

h. fifth means for movably supporting said second frames on said third and fourth pairs of arms;

i. power means for selectively moving said second frames and fifth means to second positions above said arms where containers supported on said frames can be transported on said vehicle to a desired location; and

j. sixth means operatively connecting said third wheel assembly to said first wheel assembly for pivoting said third wheel assembly to track with said power-driven wheels and said first wheel assembly as said vehicle moves forwardly.

7. A combination as defined in claim 6 wherein said sixth means further includes:

a. a second transverse crossmember secured in a fixed position to the upper rear portion of said first wheel assembly;

b. third and fourth semicircular grooved guides that extend towards one another from said second crossmember and said third wheel assembly;

c. pulley means mounted on said second drawbar; and

d. first and second crossed-over cables extending longitudinally along said second crossbar to engage said pulley means and said first and second cables rigidly secured to said second crossmember and said third wheel assembly.

8. A combination as defined in claim 1 which further includes a third vehicle, comprising:

a. a third drawbar pivotally connected to the rear end of said second drawbar;

b. three fifth pairs of arms extending outwardly from the sides and rear end of said third drawbar;

c. three third container-supporting frames, which when in first positions, are disposed between said three fifth pairs of arms;

d. power means for raising said third frames to second positions where containers supported by said frames may be transported to a desired location; and

e. a fifth pneumatic-tired wheel assembly rigidly secured to said third drawbar for movably supporting said third vehicle.

9. A combination as defined in claim 6 wherein said fifth means comprise a plurality of links pivotally connected to said second frames and said second and third pairs of arms.

10. A combination as defined in claim 9 wherein an individual one of said power means is operatively associated with each of said pairs of arms for concurrently lifting two of said second frames disposed between said pairs of arms, situated on opposite sides of said second drawbar.

11. In combination with a pair of laterally spaced, guidable pneumatic-tired, power-driven wheels provided with a first crossmember situated thereabove that occupies a fixed position relative to aid wheels, a first vehicle for transporting a plurality of generally rectangular, mobile, flat-bottomed containers, from the corners of which wheel-supporting legs project downwardly, which first vehicle comprises:

a. an elongate drawbar including a raised horizontal forward extension;

b. first means for pivotally connecting said extension to substantially the center of said crossmember;

c. a first pneumatic-tired wheel assembly pivotally connected to the rear end of said drawbar;

d. a second pneumatic-tired wheel assembly intermediately disposed under said drawbar in a supporting position between said extension and said first wheel assembly;

e. a plurality of pairs of spaced parallel forks extending outwardly in transverse alignment from opposite sides of said drawbar;

f. a plurality of pairs of uprights secured to the inner ends of said forks;

g. a plurality of sets of upper and lower horizontal rigid members connected to said pairs of uprights;

h. a plurality of pairs of brackets secured to the inner surfaces of said uprights;

i. a plurality of rollers rotatably supported from said brackets;

j. a plurality of vertical guides extending upwardly from said drawbar, which guides are movably engaged by said rollers;

k. power means operatively associated with said drawbar and each two pairs of transversely aligned forks for concurrently moving said two pairs to elevated positions, which two pairs when in engagement with two of said containers holds said bins at elevated positions whereby said bins may be transported on said vehicle to a desired destination; and

l. second means operative connecting said first wheel assembly and said first crossmember for pivoting said first wheel assembly to substantially track with said power-driven wheels as said vehicle moves forwardly to transport said containers to a desired location, with said containers being removable from said vehicle when said location has been reached by operation of said power means to move said forks into lowered positions where said containers rest on a supporting surface and may be rolled outwardly away from said vehicle.

12. A vehicle as defined in claim 11 wherein said power means are hydraulically operated.