United States Patent

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[54] **POWER DRIVEN DIRECTIONALLY CONTROLLABLE TRANSFER WHEEL AND SYSTEM**
7 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **198/31,** 193/36, 198/127
[51] **Int. Cl.** **B65g 47/22**
[50] **Field of Search** 198/31 (a2), 31 (a3), 117, 126, 127; 104/31; 193/36

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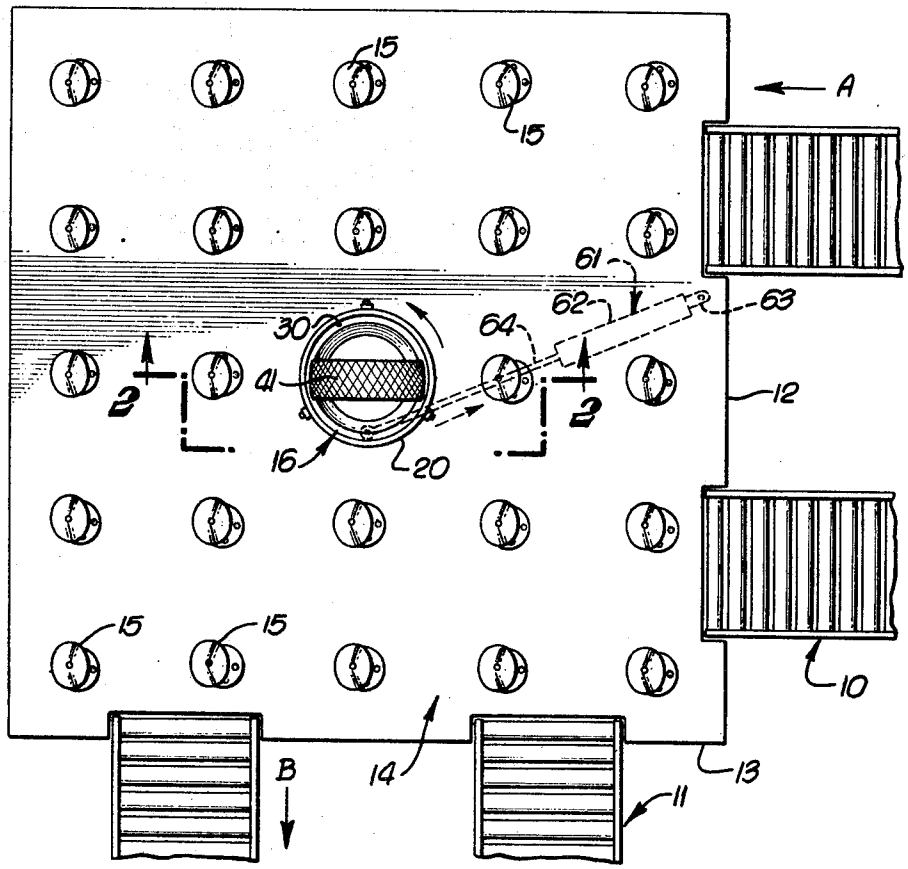
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ABSTRACT: Power driven wheel with traction surface suitably mounted in conjunction with a transfer platform for movement of baggage or freight containers, including boxes and pallets, the wheel disposed on an axis generally parallel to the surface of the platform and projecting into a horizontal plane sufficiently high above the platform to frictionally engage the bottom of the container, for propulsion of same, the mounting providing for directional adjustment of the wheel on a vertical axis to change the direction of propulsion of the container. Preferably the mounting embodies means to lower the wheel to disengage it from a container when a power failure occurs and propulsion is accomplished manually, or when a directional change is being made. The term "wheel" is used in a generic sense, and includes any suitable structure rotatable on an axis, and embodying peripheral means for frictionally engaging the object to be moved.



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SHEET 1 OF 3

FIG. 1.

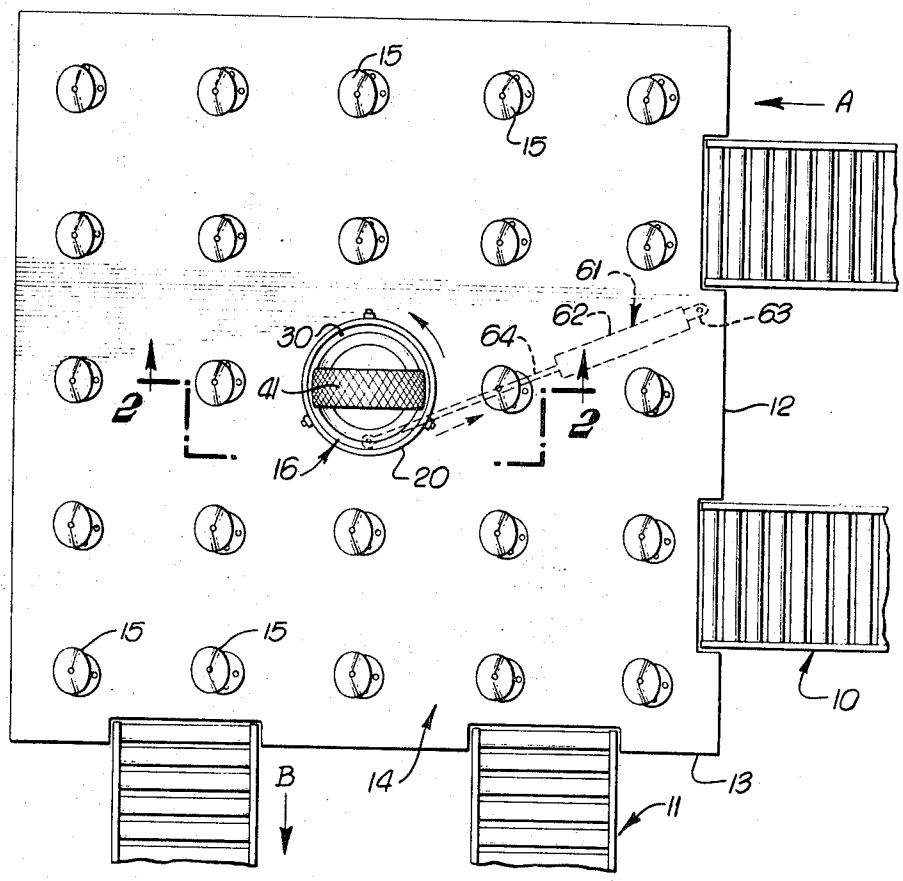
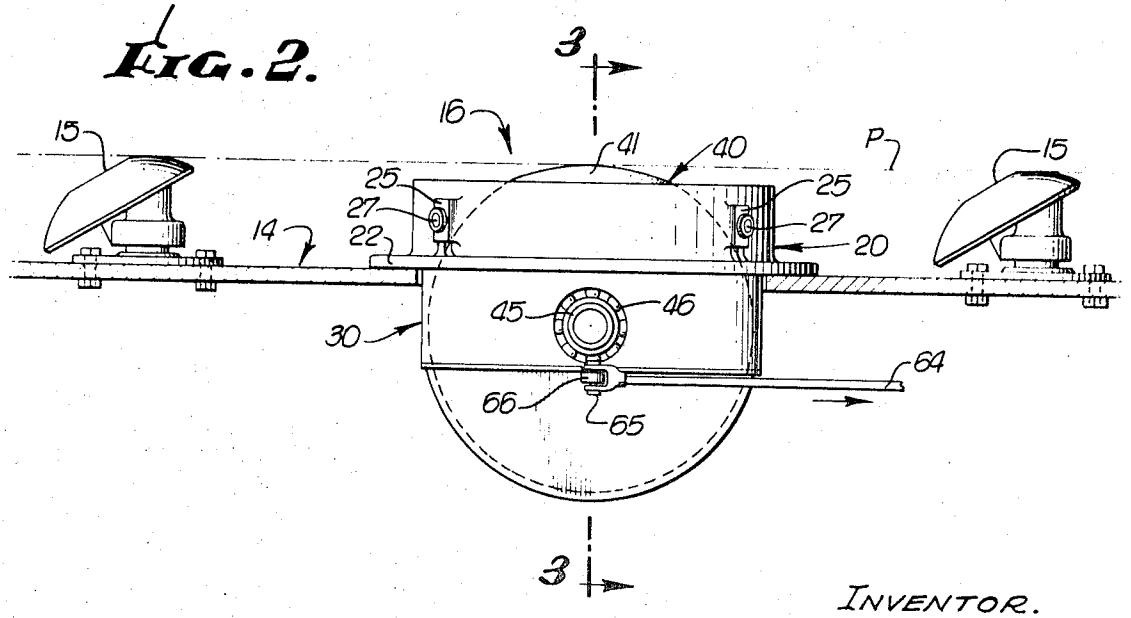


FIG. 2.



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FIG. 3.

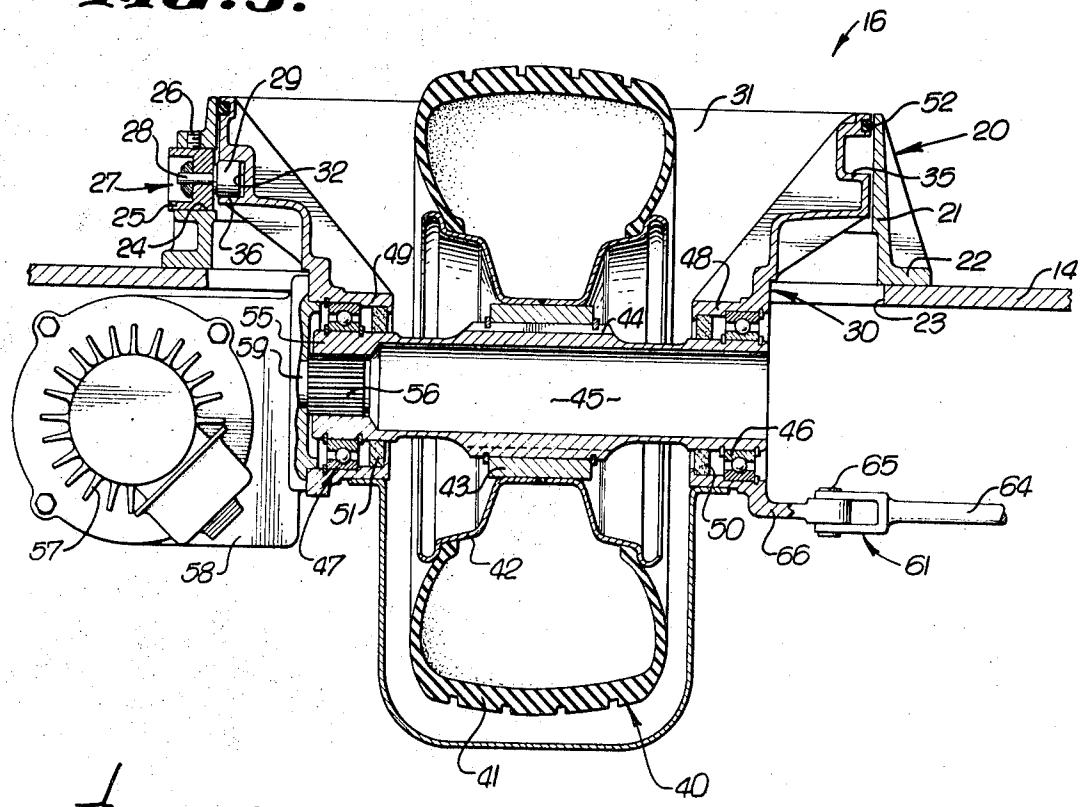
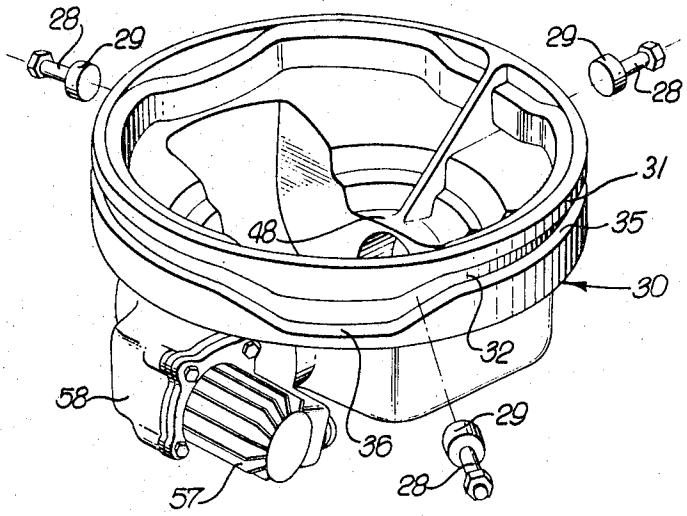


FIG. 4.



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FIG. 5.

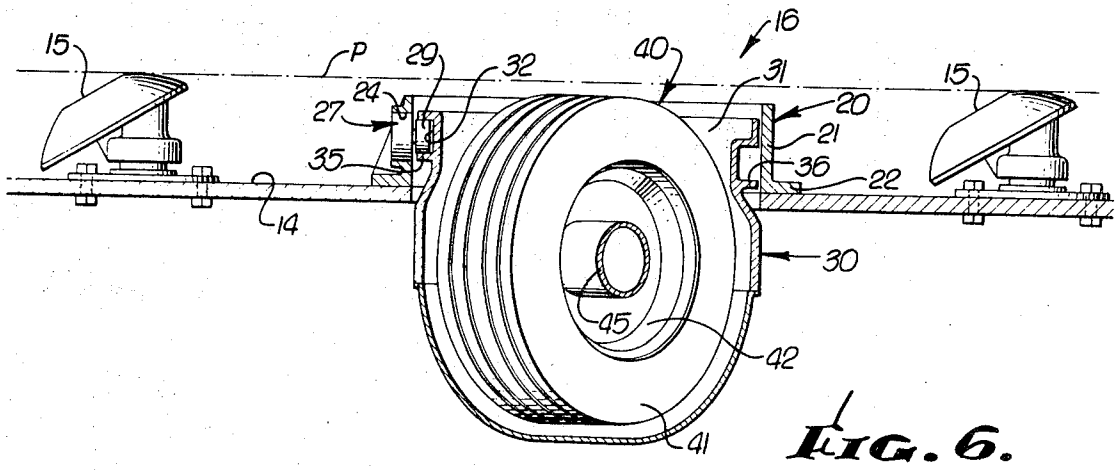


FIG. 6.

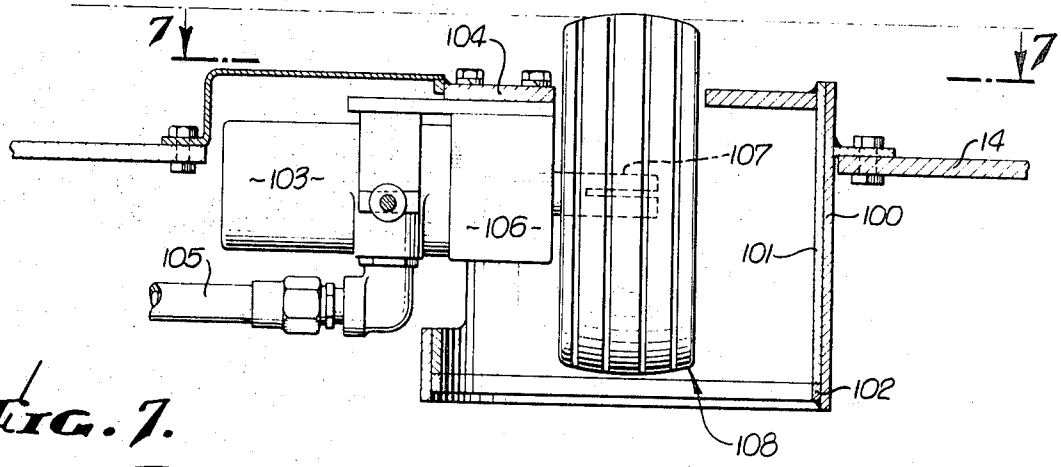
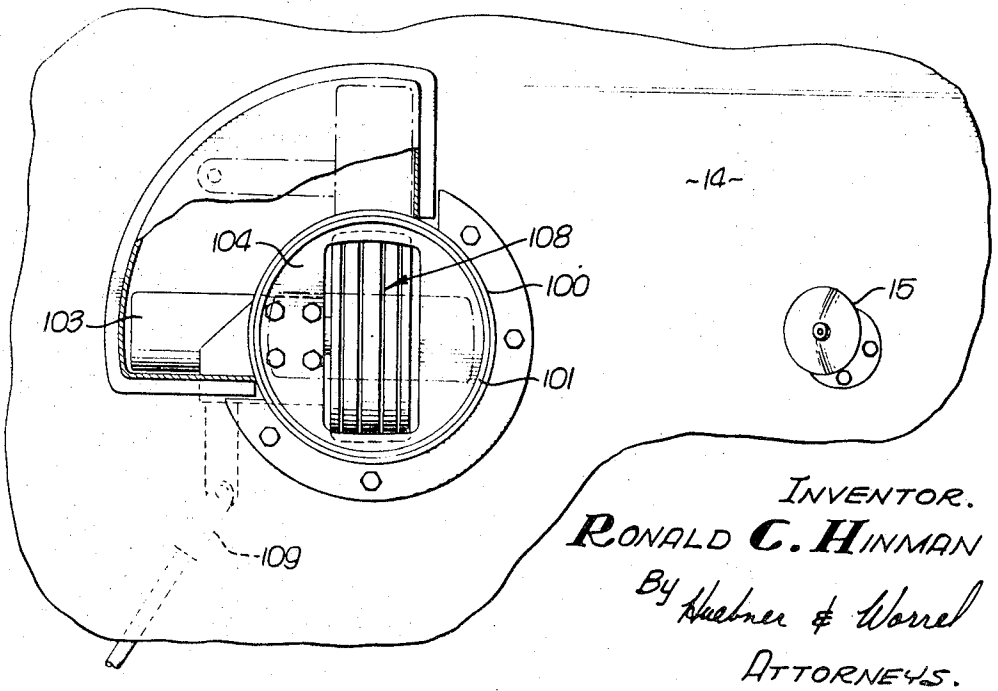


FIG. 7.



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POWER DRIVEN DIRECTIONALLY CONTROLLABLE TRANSFER WHEEL AND SYSTEM

BACKGROUND OF THE INVENTION

In handling baggage or freight containers at air terminals, and in loading or unloading planes, and in warehouses, platforms are sometimes employed which incorporate free rolling omnidirectional support members such as inverted casters or large ball bearings or air lifts. The support members enable the containers to be moved in whatever direction is desired. When used in the plane itself, the containers can remain in the location of ultimate disposition and if necessary may be restrained against shifting by suitable clamps.

Most containers can be pushed by hand, but large heavy containers present some difficulties in that respect. Remote controlled propulsion means have been provided in the form of pneumatic tired power driven wheels. These have been mounted on permanently fixed vertical axes. The result has been that rotation of the wheel will propel the container only in one line of direction. If a change in direction is desired, it has been necessary to employ a second (or more) wheels mounted with their planes of rotation at the desired angles to the plane of rotation of the first wheel.

This results not only in duplication of operating parts, but when in use, one or more of the wheels which remain idle (unless retracted) scuff against the bottom of the container when another wheel is working in contact with the bottom to move the container. Consequently there is not only a tendency to abraid and unduly wear the tires on the idle wheels, but they offer resistance to movement imparted by the driven wheel and place an increased load on the latter. Mechanism for retracting an idle wheel further duplicates the parts needed.

SUMMARY OF THE INVENTION

The principal object of the invention is to provide a system for moving and shuttling cargo or baggage containers including boxes and pallets incorporating a novel single propulsion wheel for moving the containers and controllable for changing the angle of travel.

This is accomplished by mounting a power driven wheel in a cradle or housing below the horizontal plane of the bottom of the container. The mounting includes a fixed support frame resting on the structure of the platform or other fixed elements. The support frame carries cam followers. The term "cam followers" is used in a broad sense to include any suitable means coacting between the housing and the support frame. The followers engage a cam race on the exterior of the housing, and the housing is thus supported by the fixed frame. This arrangement enables the housing, with its wheel, to be rotatably adjusted on a vertical axis. The cam race also preferably is designed so that the housing travels down and up when being rotated from one driving direction to another.

When the wheel is in its up position, it is in traction with the bottom of the container. It can be dropped down out of engagement in the event of a power failure or during the shifting of direction.

Although under some conditions the change in direction might be accomplished manually, it is preferable that a remotely controlled power device be employed for the purpose.

For convenience of illustration the wheel mounting is shown as having its driving positions disposed at 90° adjustments. Obviously the structure can be designed for other adjustments, ranging from 0° to 180°.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of one example of the system;

FIG. 2 is a side elevation partly in section, as generally indicated by the line 2–2 in FIG. 1. The wheel is shown elevated in driving position;

FIG. 3 is a vertical section taken on the line 3–3 of FIG. 2;

FIG. 4 is an exploded perspective view of some of the parts of the wheel-mounting means;

FIG. 5 is a view generally similar to FIG. 2, but with more parts in section, and showing the wheel shifted 45° to its retracted position during change in direction;

FIG. 6 is an elevation, partly in section, of a second form of the wheel assembly, wherein the wheel can be adjusted on a vertical axis, but does not retract during the adjustment; and

FIG. 7 is a top plan view taken on line 7–7 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The system, as generally disclosed in FIG. 1, comprises any suitable roller or belt conveyors **10** and **11** terminating at sides **12** and **13** respectively of a transfer or storage platform **14**. The platform may be located in an air terminal, a warehouse, as a floor structure in an airplane, or in any other environment desired.

Mounted on the platform is a plurality of omnidirectional casters **15**. The casters illustrated are the subject matter of a copending application filed by Glynn H. Williams, Ser. No. 762,902, filed Sept. 26, 1968. Alternatively, other forms of casters, balls, air lift or other devices may be used which allow the containers (not shown) to follow the direction of the wheel drive.

Located preferably about the center of the platform is the wheel assembly **16** which will be described later in detail.

A freight or cargo container or pallet may be delivered on the conveyors **10** in the direction of arrow A. It can be moved to the desired position on the platform by the wheel assembly **16**. Thereupon the wheel assembly may be actuated to change the driving direction 90°, and propel the container off the platform onto the conveyors **11** in the direction of the arrow B.

The wheel assembly **16** is shown in detail in FIGS. 2—5.

It comprises an annular fixed mounting frame **20** in the form of a vertical wall **21** rising from a horizontal flange **22**. The latter rests upon the platform **14** above an aperture **23** therein. Variations in this structure may be made, so long as the frame is rigidly supported.

The wall **21** is interrupted and formed with openings **24** at three peripheral evenly spaced locations for reception of blocks **25** held in place by set screws **26**.

These blocks carry cam followers **27** each of which includes a shaft **28** with an enlarged annular head **29**. The followers support, at selected elevations, a wheel housing **30**. If desired, the heads **29** may be replaced by simple pins or by rollers journaled on the shafts **28**.

The housing embodies an annular sidewall section **31** formed with an external cam race **32** in which the follower heads **29** operate.

The cam race ranges from a high (peak) position **35** (right-hand side of FIG. 3) to a low (valley) position **36** (left-hand side of the same FIG.).

The housing is thus adjustable by rotation on a vertical axis from a downwardly retracted position (FIGS. 3 and 5) to an elevated position (FIG. 2).

In the retracted position, the wheel **40**, later described in detail, is out of contact with the bottom of a container, the plane of which is represented by broken line P. In the elevated position, the wheel periphery encroaches above such plane, for traction, and its tire will be flattened somewhat as illustrated in FIG. 2.

The wheel **40** illustrated in the drawings embodies a pneumatic tire **41** mounted on a rim **42**. The latter is fixed to a hub structure **43** which is keyed, as at **44**, to an axle **45**. An axle of relatively large diameter is preferred, and for lightness in structure, preferably is hollow. Other forms of "wheel" can be employed, as indicated in the Abstract of the Disclosure, and the term "wheel" is used in the generic sense in the claims, unless specifically limited.

The axle is journaled in bearing assemblies **46** and **47** which are maintained in housing sleeves **48** and **49**.

It is desirable to install sealing rings **50** and **51**. Also, a sealing ring **52** is shown between the wall **21** of the mounting frame and the sidewall section **31** of the housing.

The bore of the axle **45** is reduced at one end as shown at **55**, and is supplied to engage with a spline drive **56** deriving its power from an electric motor **57**. The motor is equipped with a reduction gear box **58** through which rotation is imparted to a drive shaft **59**. The latter terminates in the spline drive **56** identified. Other types of motor may be substituted.

The motor and its appurtenances are mounted on the housing **30**.

The housing may be rotated to adjust the vertical mean plane of the wheel and consequently the direction of propulsion by a hydraulically operated linkage **61**. This may include a hydraulic cylinder **62**, pivoted at **63**, with a piston connecting rod **64** coupled at **65** to an arm **66** extending from the housing **30**. Other forms of power source can readily be substituted to change the position of the wheel. Moreover, it is within the scope of the invention to make provision for attaining the adjustment manually. Thus, the arm **66**, or other appendage which can be grasped, or to which a connection may be made for remote actuation, may be adapted for manual operation.

By way of example, and not of limitation, the hydraulic linkage illustrated will rotate the housing through a horizontal arc of 90°. This will change the direction of wheel propulsion in the same amount. By virtue of the path defined by the cam race, the wheel is downwardly retracted during the transition, (see FIGS. **3** and **5**), and at each extreme of the 90° adjustment is advanced upwardly into traction position, (see FIG. **2**). Change in the mechanical design can be readily made to provide a range of adjustment from 0° to 180°.

A second form of wheel assembly, which is illustrated in FIGS. **6** and **7**, is simpler and less costly than the form first described, but sacrifices the feature of lowering the wheel during transition.

This form as illustrated comprises a fixed support cylinder **100**, mounted on the platform **14**. A wheel housing **101** is supported in the cylinder by a retaining ring **102** which is welded to the wall of the cylinder, and the housing thus can be rotated in the cylinder.

A hydraulic motor **103** is shown mounted on a shelf **104** of the cylinder. The motor is supplied through a hydraulic line **105**. Power is delivered through a bearing block **106** (with reduction gears if necessary) to an axle **107** of wheel **108**. Any other suitable type of motor may be substituted.

The housing can be rotated for adjustment by a hydraulic linkage **109** which is similar to the linkage **61** of the first form described.

Obviously any suitable arrangement coacting between a fixed support and a rotatably adjustable wheel mounting may be substituted for the parts illustrated and described.

In this case the tire of the wheel remains in contact with the bottom of a container while the transition takes place.

In either of the forms described above, the pneumatic tire affords a resilient pressure against the object it moves. Such may be supplemented, or in case the wheel periphery if not sufficiently resilient, it might be desirable to spring load the wheel in order to urge it into proper traction engagement with the object.

Although I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent structures and apparatus.

I claim:

1. A power driven traction element assembly for propelling in selectively different lines of direction cargo or baggage containers having a bottom structure and resting upon support means enabling movement of the containers in more than one line of direction, the assembly comprising: a fixed support, a housing within the support, means coacting between the support and the housing to mount the housing on the support for rotational adjustment of the housing on a vertical axis, a rotary traction element mounted on a horizontal axis in the housing, the traction element being engageable with the bottom structure of a container, and power means for driving the traction element, the means to mount the housing on the support comprising a cam race on one and a cam follower on the other, the cam race having a peak and a valley, whereby the housing will be elevated with respect to the support in one position of rotational adjustment and will be retracted downwardly in another position of rotational adjustment, the elevated position bringing the rotary traction element into a horizontal plane for traction engagement with a container, and the retracted position removing the wheel from such traction engagement plane.

2. A power driven traction wheel assembly for propelling in selectively different lines of direction cargo or baggage containers having at least a portion of their bottoms flat and resting upon support means enabling movement of the containers in more than one line of direction, the assembly comprising: a wheel mounted upon an axle, means mounting the axle horizontally, a power unit coupled to drive the wheel, means to elevate the wheel and axle into an uppermost position and to lower the wheel and axle into a lowermost position, the uppermost position serving to extend a segmental periphery of the wheel into the horizontal plane of a container bottom disposed above the wheel, the lowermost position serving to withdraw the wheel from said horizontal plane, the means to elevate and lower the wheel and axle including structure to angularly turn the wheel and axle on a vertical axis in order to shift the direction of propulsion with the wheel and axle being lowered during one phase of the turning movement, and raised if the turning movement is continued or reversed in another phase of said movement.

3. A power driven traction element assembly for propelling in selectively different lines of direction loads sustained upon support means enabling movement of the loads in more than one line of direction, the assembly comprising: a rotary traction element mounted upon an axle, means mounting the axle horizontally, a power unit coupled to drive the traction element, means to elevate the traction element into an uppermost position and to lower it into a lowermost position, the uppermost position serving to extend a peripheral portion of the traction element into the horizontal plane of a load disposed above the wheel, the lowermost position serving to withdraw the traction element from said horizontal plane, the means to elevate and lower the traction element including structure to angularly turn the traction element on a vertical axis in order to shift the direction of propulsion with the traction element being lowered and then raised during the turning movement.

4. A power driven traction element assembly for propelling in selectively different lines of direction cargo or baggage containers having a bottom structure and resting upon support means enabling movement of the containers in more than one line of direction, the assembly comprising: a fixed support embodying a generally annular cylindrical section, a generally annular housing nesting within said section, means coacting between the support and the housing mounting the housing in the support for rotational adjustment of the housing on a vertical axis, a rotary traction element carried by the housing on a horizontal axis, the traction element being engageable with the bottom structure of a container, and power means for driving the traction element, the power means also being carried by the housing, whereby the housing, traction element and power means may be rotationally shifted as a unit bearing upon the generally annular cylindrical section of the fixed support.

5. A power driven traction element assembly as defined in claim **1** wherein the cam race is on the exterior of the housing, and the cam follower is carried by the support.

6. A power driven traction element assembly as defined in claim **1** wherein the support has a generally annular inner surface section, the housing has a generally annular external surface section concentric with the inner surface section of the support and contiguous thereto, and there is a plurality of cam followers spaced equidistantly around the contiguous annular surfaces.

7. A power driven traction wheel assembly for propelling in selectively different lines of direction cargo or baggage containers having at least a portion of their bottoms flat and resting upon support means enabling movement of the containers in more than one line of direction, the assembly comprising: a wheel keyed upon an axle, means including a journal mounting the axle horizontally, a power unit coupled with the axle to drive the same, means to elevate the wheel and axle into an uppermost position and to lower the wheel and axle into a lowermost position, the uppermost position serving to extend a segmental periphery of the wheel into the horizontal plane of a container bottom disposed above the wheel, the lowermost position serving to withdraw the wheel from said horizontal plane, the means to elevate and lower the wheel and axle including structure to angularly turn the wheel and axle on a vertical axis in order to shift the direction of propulsion with the wheel and axle being lowered and then raised during the turning movement.