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Minkwitz

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[54] **TRANSFER MECHANISM**

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[52] **U.S. Cl.** **104/99,** 104/163, 198/25, 198/85, 198/212

[51] **Int. Cl.** **B61b 13/00**

[58] **Field of Search** ..... 104/99, 35, 96, 165, 166, 104/172 R, 172 C, 163; 198/85, 212, 25, 209

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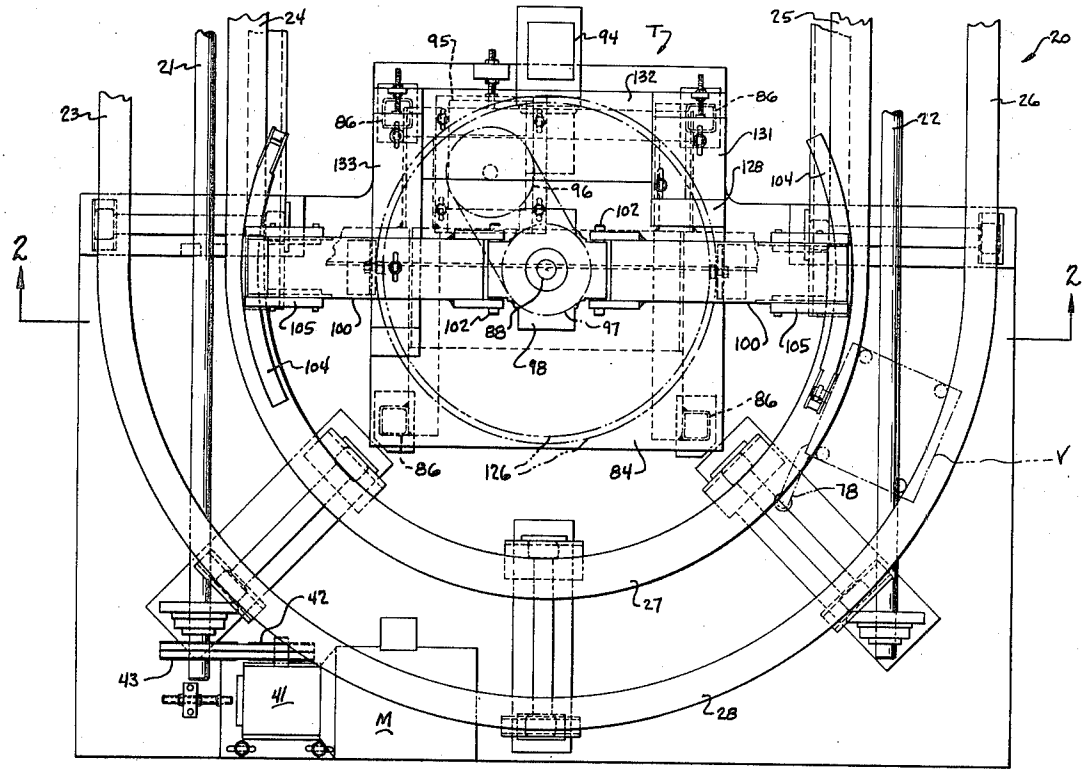
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Primary Examiner—Lloyd L. King
Assistant Examiner—Randolph A. Reese
Attorney, Agent, or Firm—Morsbach & Pillote

[57] **ABSTRACT**

The mechanism is incorporated in a conveyor system of the type which propels vehicles, or pallets, by frictional contact between a rotating drive shaft and a drive wheel carried by the vehicle. The disclosed conveyor system includes two such rotating drive shafts and associated parallel tracks. The mechanism transfers the vehicles from one set of parallel tracks to the other via concentric tracks. An upright drive shaft drives a radially-extending pivoted arm on which is mounted an elongaged, arcuate member. The member has a downwardly inclined ramp at its front to ride over any preceding vehicle, and a depending dog at its rear to engage the vehicle and advance it. A ramp raises the arm at the outlet of the concentric tracks to disengage the vehicle, and lowers the arm to operative position at the inlet thereof.

15 Claims, 7 Drawing Figures



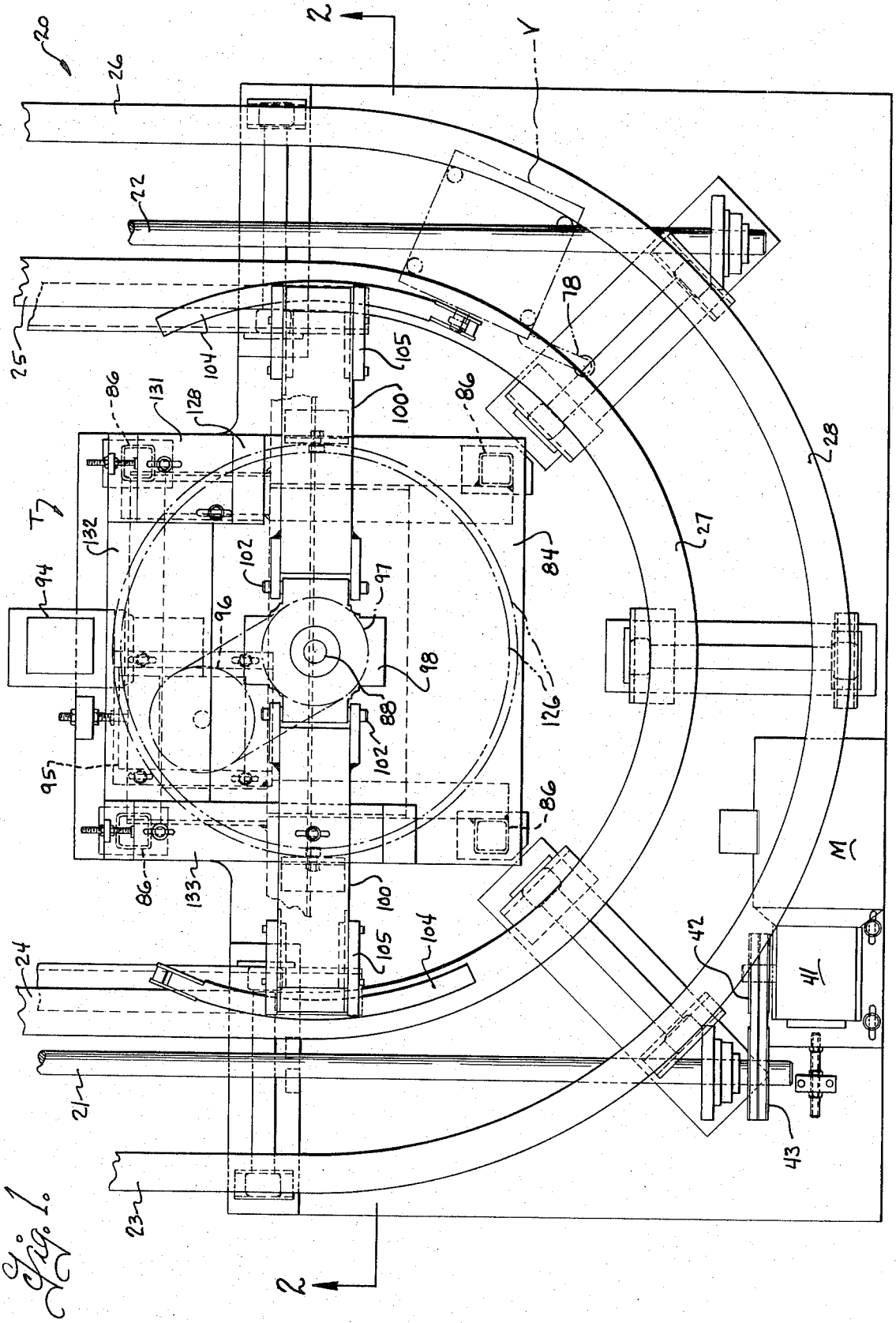

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Fig. 1.

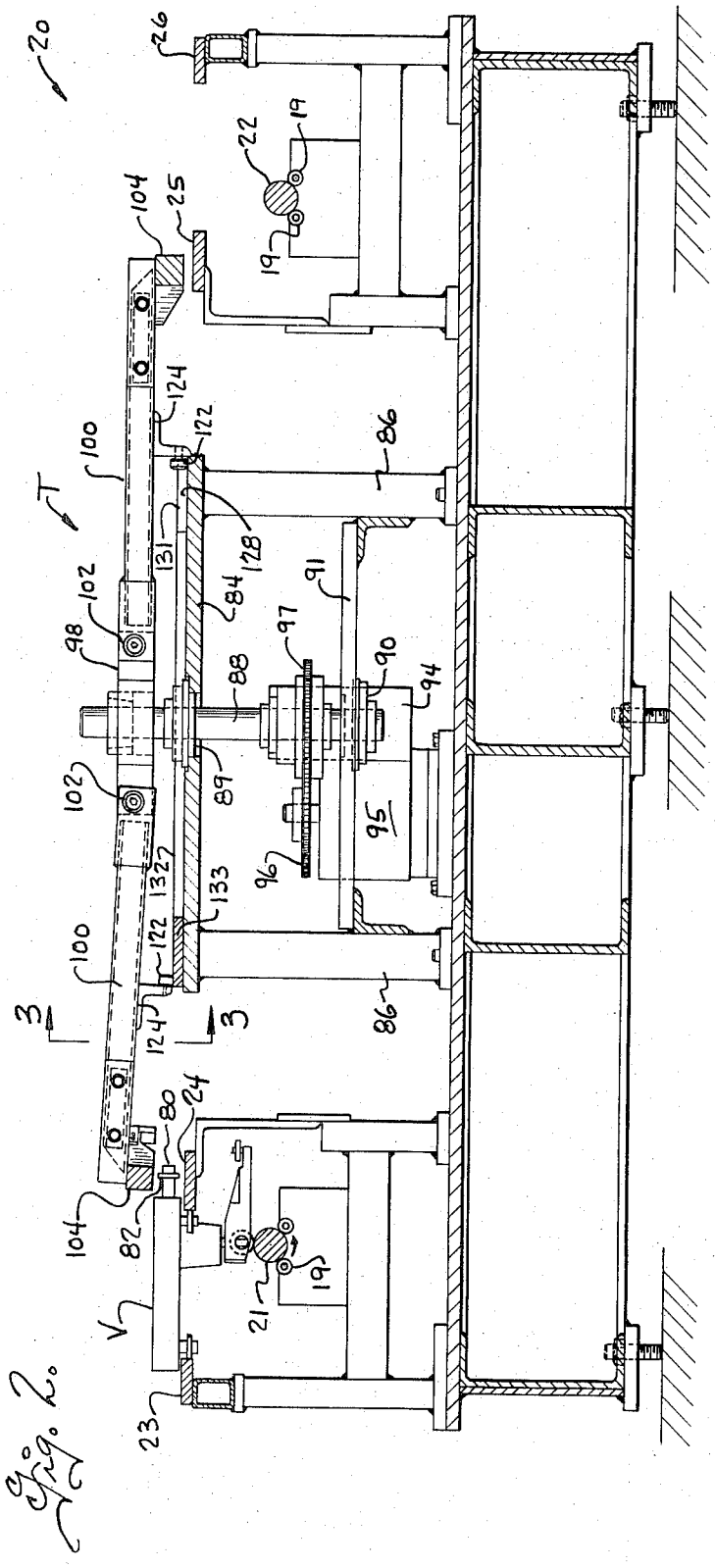

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Fig. 2.

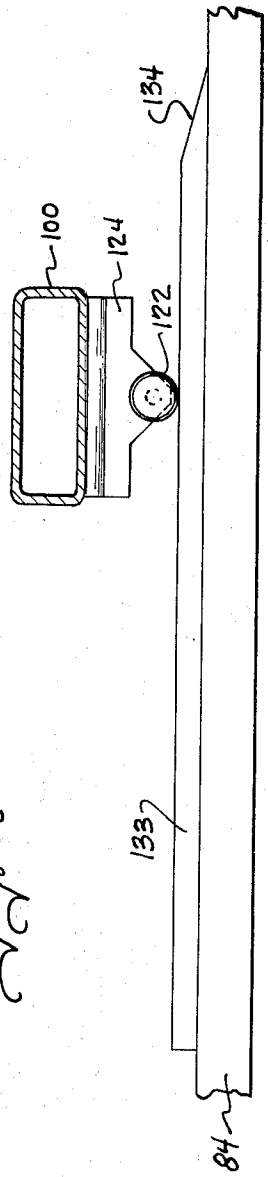

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Fig. 3.

Fig. 4.

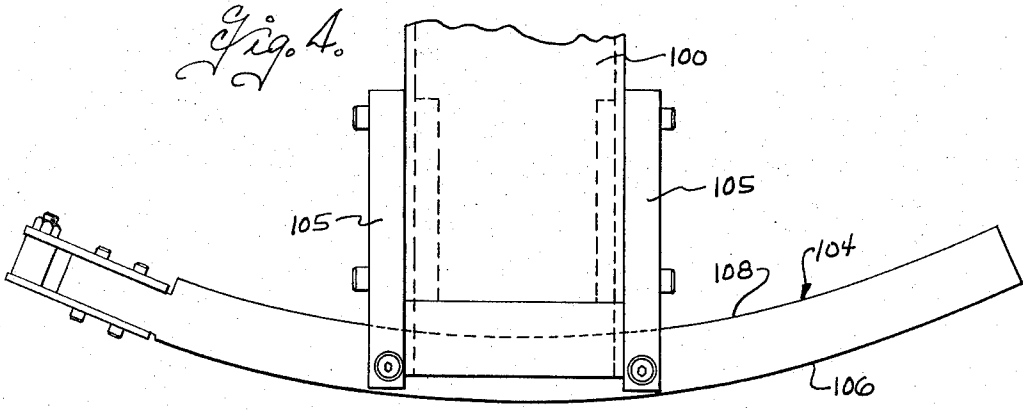


Fig. 5.

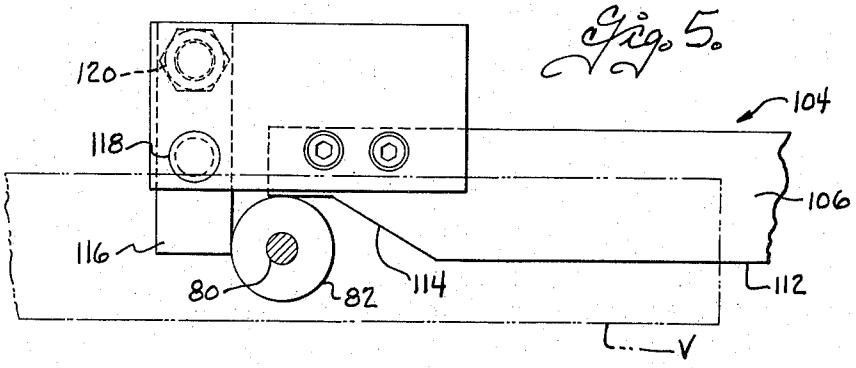


Fig. 6.

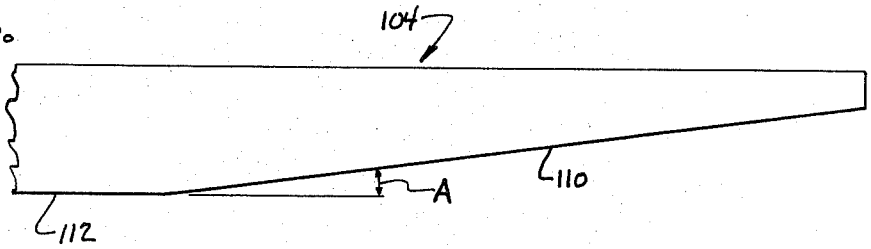
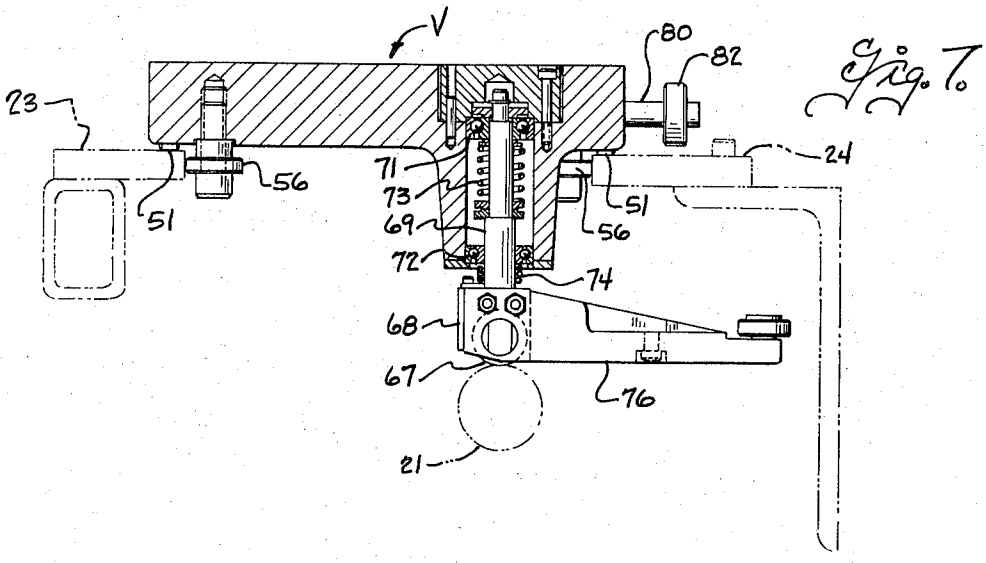


Fig. 7.



TRANSFER MECHANISM

BACKGROUND

The invention pertains to conveyor systems in which propulsion is achieved by traction between a drive wheel and a longitudinal rotary shaft, and more particularly to transfer mechanism for use in such a system.

One early patent disclosing a rotary drive shaft and a pair of traveling friction wheels engaged therewith at an angle to its axis, was issued May 7, 1889 to Whitecomb R. Judson, U.S. Pat. No. 402,674. This mechanical movement has been adapted for various uses including street railways (see U.S. Pat. No. 423,872 issued Mar. 18, 1890 to said Judson), and conveyor systems (see U.S. Pat. No. 3,356,040 issued Dec. 5, 1967 to Per Borje Fonden). Each of these latter two patents provided structure for "switching" or "turn-outs". Judson provided a plurality of short lengths of drive shaft connected by a type of universal coupling to provide a generally curved drive shaft. Fonden provides drive shafts at right angles to each other, and stops the vehicle or "truck" prior to transfer to another drive shaft. It is desirable to provide a transfer mechanism which eliminates the Judson curved drive shaft, and which does not require stopping the vehicle prior to transfer.

The assignee of the present invention has, in the past, transferred vehicles or pallets from one drive shaft to a second spaced therefrom. The mechanism used sensed whether the second drive shaft had room to accommodate a vehicle and was rendered inoperative unless there was such room. It is desirable to provide a transfer mechanism which eliminates such sensing apparatus. By doing so, it is possible to utilize the transfer pathway to store vehicles until room is available on the second drive shaft.

SUMMARY

The present invention relates to a transfer mechanism for use in conveyor systems of the type having a longitudinal rotary drive shaft and a drive wheel frictionally engaged therewith.

It is an object of the present invention to provide a transfer mechanism for easily moving a pallet or vehicle into and/or out of position where it is driven by a rotary drive shaft.

Another object is to provide a transfer mechanism for use in a conveyor system of the type described which can store vehicles until room is available on the drive shaft.

Still another object of the present invention is to provide a transfer mechanism of simplified construction and which easily and effectively transfers vehicles from one rotary drive shaft to another.

Another object is to provide a transfer mechanism in accordance with the preceding object, and having an elongated member mounted on the end of a radially-extending arm and which are driven to perform the transfer operation.

Yet another object is to provide mechanism in accordance with the preceding object and where the elongated member is mounted for movement between operative and inoperative positions.

These, and other objects and advantages of the present invention, will become apparent as the same becomes better understood from the following detailed description when taken in conjunction with the accompanying drawings.

DRAWINGS

FIG. **1** is a plan view of one end of a machine incorporating the present invention, the other end being identical to the end illustrated;

FIG. **2** is a cross-sectional view taken generally along line **2—2** of FIG. **1**;

FIG. **3** is a sectional view taken generally along line **3—3** of FIG. **2**;

FIG. **4** is a top view, on an elongated scale, of the arcuate, elongate member mounted at the outer end of the arm;

FIGS. **5** and **6** are fragmentary elevations of the rear and front portions, respectively, of the arcuate, elongate member shown in FIG. **4**, and on a still larger scale than FIG. **4**; and

FIG. **7** is a cross-sectional view through the vehicle or pallet.

DESCRIPTION

Reference is now made more particularly to the drawings which illustrate the best presently known mode of carrying out the invention and wherein similar reference characters indicate the same parts throughout the several views.

Referring to FIGS. **1** and **2**, a machine indicated generally by the numeral **20** has two longitudinal, rotatable drive shafts **21** and **22** mounted parallel to each other. The drive shafts **21** and **22** are journaled in a plurality of spaced rollers **19**, best shown in FIG. **2**. The rollers are so located that the tops of the shafts are unobstructed for a purpose hereafter explained. A pair of spaced tracks **23** and **24** are arranged parallel to shaft **21** to define a pathway along which vehicles V may move. A similar pathway is defined by another pair of spaced tracks **25** and **26** which are arranged parallel to shaft **22.** At the end of the tracks **23–26,** is a transfer mechanism T associated with an inner arcuate track **27** which interconnects tracks **24** and **25**; and an outer arcuate track **28** which interconnects tracks **23** and **26.** Tracks **27** and **28** are preferably concentric and have a common arc center for a purpose which will hereafter become apparent. At the other end of the machine is an identical transfer mechanism interconnecting the other ends of tracks **23–26.** In this manner, the tracks form a definite trackway or pathway in the form of a closed loop conveyor.

A motor M is arranged to drive shaft **21** via a gear box **41** and pulleys **42** and **43,** as seen in FIG. **1.** Identical structure at the other end of the machine is provided for driving shaft **22.**

Referring particularly to FIG. **7,** the pallet or vehicle V is provided with four wheels **51** which engage the upper side of the trackway, and four other wheels **56** mounted for rotation about a vertical axis to engage the inner edge of the rails **23–28** and prevent side sway of the vehicle as it is conveyed. Finally, four wheels (not shown) may be provided for engaging the bottom side of the tracks. In this manner, the pallets may be permanently mounted in the trackways with utmost stability.

Each pallet or vehicle V is provided with a freely rotatable driving wheel **67** which is pressed against the top of the driving shaft **21** or **22.** Wheel **67** is rotatable mounted in a yoke **68** at the lower extremity of a shaft **69.** Shaft **69** is rotatable mounted in bearing **71** and **72**

and the wheel **67** is pressed against the drive shaft by means of a compression spring **73** circumjacent shaft **69.** A helical tension spring **74** exerts a force on the yoke **68** to resiliently urge the axis of rotation of the driving wheel **67** at an angle relative to the axis of rotation of the drive shaft, the drive wheel and drive shaft being so oriented that the drive wheel in the angular position thereof contacts the drive shaft along a horizontal tangent thereto. When the drive shaft **21** or **22** is rotated, the wheel **67** will roll against the drive shaft. When the axis of the wheel **67** is disposed at an angle, for example 35° to the axis of the drive shaft, the rotation of the latter produces a longitudinal force on the drive wheel. This longitudinal force is the driving force of the vehicle, and the drive wheel will follow a helical path along the drive shaft.

An outwardly extending arm **76** is connected to the yoke **68** and extends past the side of the pallet. The arm **76** is thus swingable with the drive wheel **67** and moves between a stop position in which the axis of drive wheel **67** is parallel to the axis of the drive shaft, and a drive position at an angle thereto as described above. Work stations (not shown) located along the conveyor system, may have stops for engaging the arm **76** and to move to the stop position. When the stop is removed, spring **74** will return the drive wheel **67** to the drive position and the vehicle V will be advanced away from the work station. A rearwardly extending arm **78** (see FIG. **1**) is provided on each vehicle V to engage the arm **76** of a succeeding vehicle. In this manner, as two vehicles approach each other, collisions are prevented. An outwardly extending stub shaft **80** is provided on the inner side of the vehicle V at the longitudinal midpoint thereof and carries a roller **82** which is engaged by the transfer mechanism T.

Referring again to FIGS. **1** and **2,** the transfer mechanism T is supported on a table **84** which, in turn, is supported by a plurality of tubular legs **86.** An upright drive shaft **88,** located at the common arc center, is mounted on the table **84** by means of an upper bearing **89** and has, at its lower end, another bearing **90** mounted in a stringer **91.** A motor **94** drives the shaft **88** via a gear box **95** and sprockets **96** and **97.** At the upper end of shaft **88** is mounted a quadrifid member **98** which rotates when the shaft **88** is driven. A pair of outwardly-extending arms **100** are pivotally mounted on the member **98** by way of a pivot pin **102** having an axis extending crosswise of the arm. Two additional arms **100** could be mounted on the member **98** if desired. As a safety measure, the drive train can incorporate a slip clutch or torque limiting device arranged to operate when drive pressure exceeds a preselected amount.

An elongated arcuate member **104** is adjustably mounted at the outer end of each arm **100** by way of mounts **105** best shown in FIG. **4.** The arcuate member **104** has an outer face **106** which is preferably disposed at an arc radially located from said common arc center, and an inner face **108** which is concentric therewith. Adjacent the front end of the arcuate member **104** is a downwardly inclined cam face **110** leading to a flat bottom side **112.** Angle A in FIG. **6** is advantageously 7° 30°. At the rear edge of the arcuate member **104** is a recess **114** and a downwardly-extending dog **116** which depends almost to the level of bottom side **112.** The dog **116** is mounted by a pivot pin **118** and a releasable retainer **120** which, as a safety measure, will allow the dog **116** to pivot when drive pressure becomes too great. In an alternate construction, dog **116** may be provided with a spring arrangement which allows an amount of "give" when the dog contacts the roller **82.**

In operation, as the shaft **88** is rotated, the arms **100** are swung and the arcuate member **104** moves through a circular path. When a vehicle is approached, cam face **110** rides over the roller **82** disposed at the side of the vehicle V. The arm then pivots about pivot shaft **102** as the elongate member is cammed upwardly. The roller then rides on bottom face **112** and into recess **114** where it is engaged by dog **116.** In this manner, the roller **82** serves as a catch and the dog **116** drives the vehicle V along the trackways. **27, 28** to the second drive shaft **22.** Such transfer occurs unless a preceding vehicle is disposed in the trackway. In that event, the cam face **110** engages the roller **82** of the preceding vehicle and disengages the roller **82** of the driven vehicle. For this purpose, the length of the lower face **112** is preferably at least equal to the length of a vehicle. Thus it can be seen that the arcuate member **104** moves vertically between operative and inoperative positions.

Similar disengagement by upward movement of the arm **100** when the arcuate member **104** reaches a position adjacent shaft **22** is provided by additional mechanism. As shown in FIG. **3,** arm **100** has a roller **122** mounted thereon outwardly of pivot pin **102,** by means of an angle bracket **124.** As the arm is swung, the roller **122** travels through a path **126** shown by phantom lines in FIG. **1.** When the elongate member is in the vicinity of drive shaft **22,** so that the drive shaft can then become operative for driving the vehicle V, the roller **122** engages an up-ramp **128** to ride up onto the upper surface of plates **131–133** mounted on the table **84.** As shown in FIG. **1,** plates **131–133** are arranged in a U-shaped configuration with their upper surfaces along path **126.** Plate **133** is disposed adjacent drive shaft **21,** and has a down ramp **134** positioned so that the dog **116** is moved from an inoperative position to an operative position to engage the wheel **82** of a vehicle V at the outlet of the tracks **23** and **24.** The positioning of this ramp is important since the circular path of the arcuate member **104** could bring it into an end-wise engagement with the outer end of shaft **80** and cause a jam up.

While a preferred embodiment of the invention has herein been illustrated and described, this has been done by way of illustration and not limitation, and the invention should not be limited except as required by the scope of the appended claims.

The embodiments of the invention in which an exclusive property of privilege is claimed are defined as follows:

1. A transfer mechanism for use in a conveyor system which includes a frame; first and second rotary drive shafts mounted on the frame in spaced relation to each other; means for rotating the rotary drive shafts; a first pair of tracks mounted parallel to the first rotary drive shaft; a second pair of tracks mounted parallel to the second rotary drive shaft; a pair of concentric, semicircular tracks interconnecting the first and second pair of tracks; a plurality of vehicles movably supported on the tracks; a drive wheel on each vehicle; and means mounting the drive wheel for engagement with the rotary drive shafts and at a position oblique to the axis of the rotary drive shafts to drive the vehicle as the rotary

drive shafts are rotated; the transfer mechanism including:

an elongate member for engaging one of the vehicles;

drive means for driving the elongate member through a path concentric with the concentric tracks to move the engaged vehicle therealong;

mounting means for mounting the elongate member for movement between an operative position engaged with the vehicle and an inoperative position removed therefrom; and

the elongate member having means at its forward end for engaging a preceding vehicle and camming the elongate member to inoperative position;

whereby the vehicles are transferred from the first pair of tracks to the second pair of tracks unless a preceding vehicle is encountered by the elongate member.

2. A transfer mechanism as set forth in claim **1** wherein the mounting means mounts the elongate member for vertical movement and the inoperative position is at a level above the operative position.

3. A transfer mechanism as set forth in claim **2** wherein the concentric tracks have a common arc center; the drive means includes a shaft having an axis at said arc center; and the mounting means includes an outwardly-extending arm to which the elongate member is secured, and a pivot axis cross-wise of the arm permitting swinging movement thereof in the vertical direction.

4. A transfer mechanism as set forth in claim **3** wherein the arm has a depending wheel mounted outwardly of said pivot axis for engaging the frame to position the elongate member at said operative position.

5. A transfer mechanism as set forth in claim **4** including ramp means on the frame for engagement by the depending wheel to raise the arm and elongate member to inoperative position when the vehicle reaches the second pair of tracks, and to return the arm and elongate member to operative position adjacent the first pair of tracks.

6. A transfer mechanism as set forth in claim **5** wherein:

the concentric tracks have a common arc center;

the elongate member has an arcuate outer face, a downwardly inclined cam face at its forward end for camming the elongate member to inoperative position, and a depending dog at its rear end;

the vehicle has a catch extending outwardly toward the arc center for engagement by the depending dog, the catch including a roller on which the cam face rides;

the drive means includes a shaft having an axis at the arc center; and

the mounting means includes a radially-extending arm to which the elongate member is secured, and a pivot axis crosswise of the arm permitting swinging movement thereof in the vertical direction.

7. A transfer mechanism as set forth in claim **2** in which the elongate member has a downwardly inclined cam face at its forward end for camming the elongate member to inoperative position.

8. A transfer mechanism as set forth in claim **7** wherein the vehicle has a catch extending outwardly therefrom toward the arc center, and on which the cam face rides; and the elongate member has a depending dog at its rear end for engaging the catch to move the vehicle.

9. A transfer mechanism as set forth in claim **1** wherein the elongate member has an arcuate outer surface, a cam face at its forward end for engaging a preceding vehicle and camming the elongate member to inoperative position, and a dog on the same side as the cam face for engaging the vehicle to advance it along the concentric tracks.

10. A transfer mechanism for use in a conveyor system which includes a frame; an elongate rotary drive shaft having a smooth exterior and mounted on the frame; a pair of parallel tracks mounted parallel to the drive shaft; a plurality of vehicles movably supported on the tracks; a drive wheel on each vehicle; means mounting the drive wheel for engagement with the rotary drive shaft and at a position oblique to the axis of the rotary drive shaft to advance the vehicle toward the outlet of the parallel tracks as the rotary drive shaft is rotated; and a pair of semicircular tracks having a common arc center and an inlet end connected to the outlet end of the parallel tracks; the transfer mechanism including:

a member having means for engaging a vehicle at the inlet end of the semicircular tracks;

a shaft having an axis at said arc center;

a radially-extending arm operatively connected to the shaft and having an outer end to which the member is mounted, the arm having a crosswise-extending pivot axis intermediate its ends to permit swinging movement thereof in the vertical direction and, hense, movement of the member between an operative position engaged with the vehicle and an inoperative position raised therefrom; and

means for moving the member from the inoperative position to the operative position at the inlet end of the semicircular tracks to engage a vehicle and advance it along the semicircular tracks.

11. The combination of claim **10** in hich the member is elongated, has an outer face radially spaced from the common arc center, and at its forward end has a downwardly inclined cam face for engaging a preceding vehicle and camming the elongated member to its inoperative position.

12. The combination of claim **11** in which the means for engaging a vehicle is located at the rear end of the elongated member, and the distance from said means to the cam face is at least as great as the length of a vehicle.

13. The combination of claim **11** in which the vehicle has a catch extending outwardly therefrom toward the arc center and on which the cam face rides; and the elongate member has a depending dog at its rear end for engaging the catch to advance the vehicle.

14. The combination of claim **10** wherein the last-mentioned means includes a depending wheel on the arm and mounted outwardly of said crosswise-extending pivot axis.

15. The combination of claim **14** wherein the last-mentioned means includes a ramp on the frame for engagement by the depending wheel.

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