June 14, 1966 W. F. MENGEL 3,255,899

MATERIAL HANDLING APPARATUS

Filed Dec. 23, 1963

3 Sheets-Sheet 1

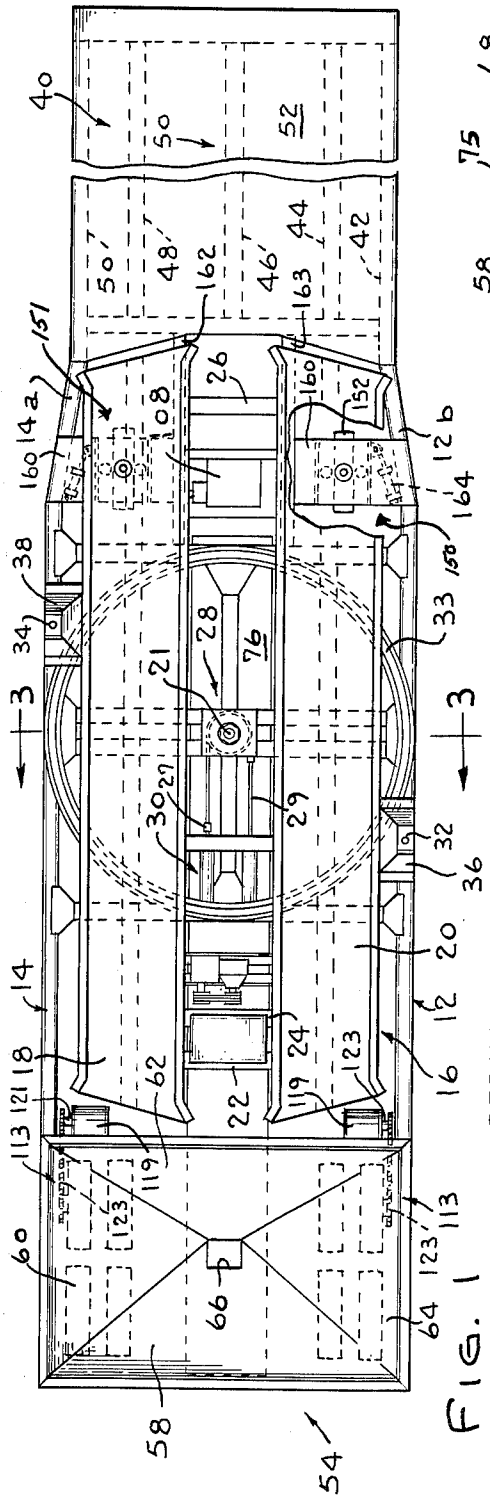


FIG. 1

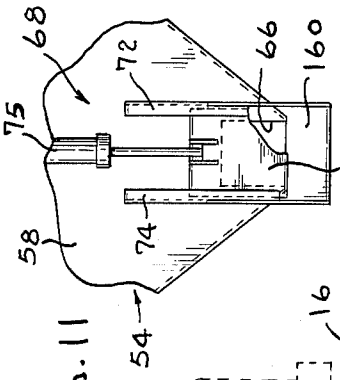


FIG. 11

FIG. 2

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FIG. 3

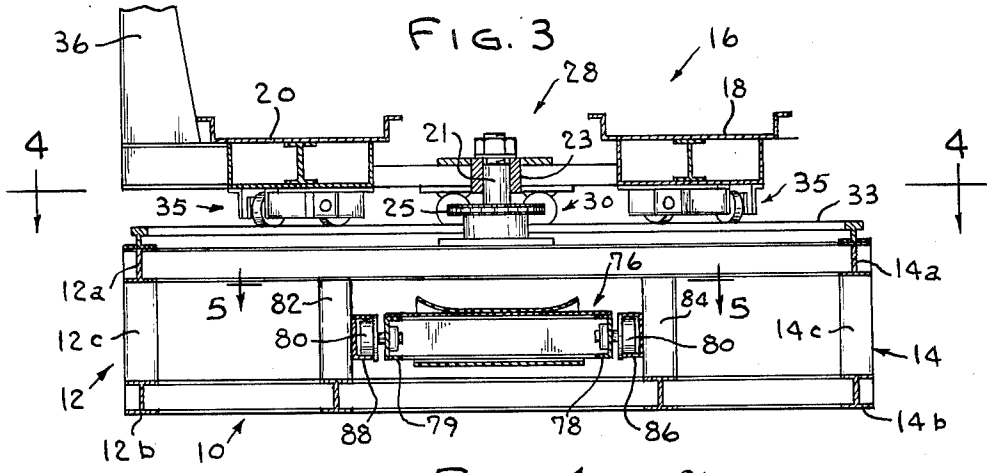


FIG. 4

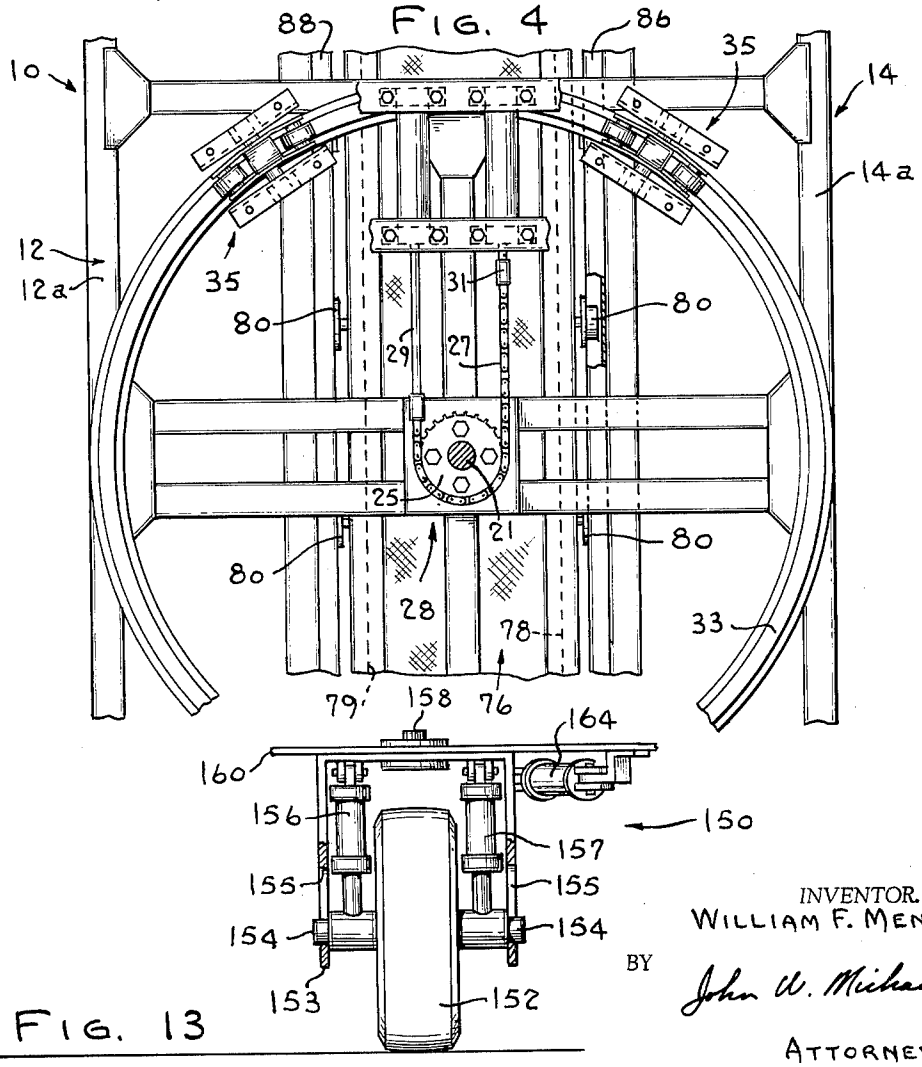


FIG. 13

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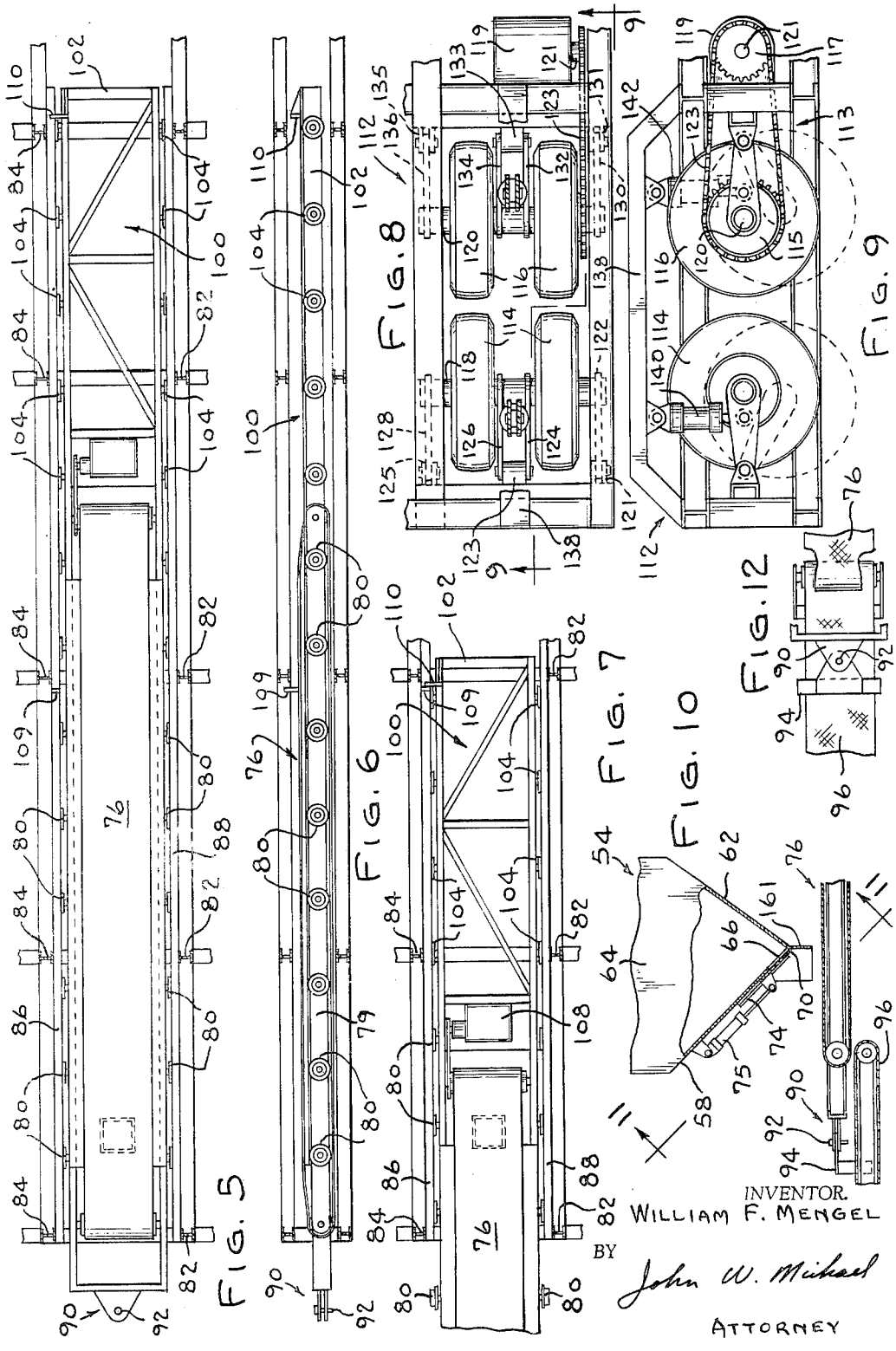


FIG. 5

FIG. 6

FIG. 7

FIG. 8

FIG. 9

FIG. 10

FIG. 12

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MATERIAL HANDLING APPARATUS

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8 Claims. (Cl. 214—44)

This invention relates to apparatus for unloading and distributing material such as concrete and the like.

A vehicle turntable is disclosed and claimed in the co-pending application of William F. Mengel entitled "Vehicle Turntable," Serial No. 291,206 and filed June 27, 1963, now Patent No. 3,185,109, and this invention relates to an improvement over the apparatus disclosed and claimed in that co-pending application.

A general object of this invention is to achieve an overall reduction in the time required in the handling, e.g. unloading and distribution, of material such as concrete and the like.

Another object of this invention is to provide for more rapid unloading of material hauling vehicles at a paving site, for example, while maintaining effective distribution with a minimum of material spill-over.

A further object of this invention is to provide a wider choice in the type of material hauling vehicle to be used.

A more specific object of this invention is to provide a vehicle turntable construction which affords mobility with compactness and includes, as an integral part thereof, apparatus for transferring material to a discharge and distributing device such as a paving spreader.

For the achievement of these and other objects, this invention proposes a construction which includes a vehicle platform, a material receiving hopper and access means for providing access of a hauling vehicle to the platform. The platform and hopper are so associated that a hauling vehicle can be driven onto the platform to discharge its load directly into the hopper. Preferably the platform takes the form of a turntable supported for movement in a horizontal plane so as to unload the material in a minimum of time. A conveyor, or other suitable distributing device, is also associated with the hopper such that it can move relative to the hopper while the hopper discharges material onto the conveyor. In the preferred embodiment of this invention, the conveyor is connected with the hopper for receipt of material therefrom and is also adapted for connection to a spreader so that the conveyor is movable jointly with the spreader and relative to the hopper, as it delivers material to the spreader. Furthermore, the preferred embodiment also contemplates the provision of self-contained means for moving the material at the job site.

The novel features of this invention are set forth in the appended claims. The invention itself, together with additional objects and advantages thereof, will be more clearly understood from a reading of the following description in connection with the accompanying drawings wherein a preferred embodiment of this invention is illustrated and in which:

FIG. 1 is a top plan view thereof;

FIG. 2 is a side elevation;

FIG. 3 is a section view generally along line **3—3** of FIG. 1;

FIG. 4 is a section view generally along line **4—4** of FIG. 3;

FIG. 5 is a section view generally along line **5—5** of FIG. 3;

FIG. 6 is a side elevation of the portion of the conveyor and its support illustrated in FIG. 5;

FIG. 7 is a partial top plan view of the conveyor and its support illustrating the conveyor in an extended position;

FIG. 8 is a top plan view of one of the wheel carriages;

FIG. 9 is a section view taken generally along line **9—9** of FIG. 8 illustrating the wheels of the carriage in their two positions;

FIG. 10 is a partial side elevation of the hopper, turntable conveyor and spreader conveyor;

FIG. 11 is a partial view taken generally along line **11—11** of FIG. 10 with the turntable conveyor removed;

FIG. 12 is a top plan view of the connection between the turntable and spreader conveyors; and

FIG. 13 is an end section view illustrating one of the front steering wheels.

With particular reference to the drawings, this invention is illustrated as embodied in a combination turntable and material unloading device which includes an elongated frame **10** having longitudinal sides **12** and **14**. Side **12** comprises upper and lower horizontal structural members **12***a* and **12***b* interconnected by a plurality of vertical structural members **12***c* and side member **14** similarly comprises upper and lower horizontal structural members **14***a* and **14***b* interconnected by vertical structural members **14***c*.

A turntable **16**, preferably of the type disclosed and claimed in the above identified co-pending application of William F. Mengel, is supported on the frame. Structurally, turntable **16** includes parallel vehicle tracks **18** and **20** connected for joint movement by transversely extending structural members **22**, **24** and **26**. The turntable is pivotally supported on the frame by support means **28** and pivotal movement of the turntable is achieved through suitable hydraulic mechanism **30** which is connected with support means **28** and is operative to swing the turntable through 180° when it is energized. More particularly and with reference to FIGS. 3 and 4, support means **28** comprises a vertical pin **21** fixed to the frame and extending into a bearing **23** attached to the turntable. Sprocket **25** is fixed relative to pin **21** and is connected to rams **29** and **31** of hydraulic mechanism **30** by chain **27**. Dollies **35** are attached to vehicle tracks **18** and **20** and arranged to ride on a circular rail **33** fixed on the frame so that actuation of the hydraulic mechanism pivots the turntable 180° as a result of the interaction of chain **27** and sprocket **25**. Hydraulic mechanism **30** is controlled from operators **32** and **34** which are supported on opposite sides of the turntable by upstanding supports **36** and **38** so that operators **32** and **34** are accessible from a vehicle disposed on the turntable. It will be appreciated that the specific structure of the turntable forms no part of this invention and any suitable turntable construction could be used, for that reason the construction and operation of the turntable has only been generally described in this application and reliance is placed on the above identified co-pending application for a completion of this disclosure.

As illustrated in the drawings, access ramp **40**, formed by angularly disposed structural supports **42**, **44**, **46**, **48** and **50** and steel plate **52**, is provided at the right end of the frame. The ramp communicates with the turntable to provide access of a hauling vehicle to the turntable. Hopper **54** is supported by frame work **56** at the opposite, or left end, of the structural frame. The hopper is formed by side wall portions **58**, **60**, **62** and **64** which converge inwardly and downwardly and side wall **58** is provided with an opening **66** adjacent its lower end to provide a restricted discharge opening at the bottom of the hopper. Gate mechanism **68** is supported on the outer face of side wall **58** of the hopper and includes plate **70** supported by spaced guide rails **72** and **74** for movement relative to the discharge opening. Hydraulic mecha-

nism 75 is connected to plate 70 to effect movement thereof to open and close opening 66 as desired and thereby control discharge of material from the hopper.

With this arrangement a hauling vehicle, such as that shown in dotted lines in FIG. 2 can be driven onto the turntable from access ramp 40 and turned 180° for discharge of its load directly into the hopper. Although the vehicle illustrated is of the type which is adapted to mix concrete in transit, this particular invention is not limited to use with that type of vehicle and an advantage lies in the fact that it permits the use of other types of vehicles such as standard dump-box type trucks which can quickly discharge a load directly into the hopper thereby materially reducing the material handling time at the paving site.

Reference will now be made to FIGS. 3–7, 10 and 12 for a description of the conveyor which is supported in the frame for receipt and transfer of the materials in the hopper to a spreader or the like. An elongated continuous belt conveyor 76 includes longitudinally disposed structures 78 and 79 which support flanged rollers 80 on opposite sides of the conveyor. The structural frame 10 includes a plurality of vertical supports 82 and 84 disposed on the opposite sides of the conveyor. An elongated channel member 86 is connected to vertical members 84 and opens toward conveyor 76 and, similarly, an elongated channel 88 is connected to vertical supports 82 and opens toward conveyor 76. Rollers 80 are engaged in channels 86 and 88 with the channels providing a guide for the rollers and permitting conveyor 76 to move longitudinally in the structural frame, the rollers being engaged on the lower arm of the channels and clearance being provided between the rollers and the upper arms thereof. The hopper is positioned so that discharge opening 66 is disposed generally in alignment with the longitudinal axis of conveyor 76 and as the conveyor moves relative to the hopper the discharge opening remains above the conveyor to discharge material into the conveyor. Hitch mechanism 90 extends from the left end of conveyor 76 and is arranged for connection, through a pin 92, with a hitch bracket 94 connected to conveyor 96 which can be a part of a mobile spreader such as that disclosed in the co-pending application of William F. Mengel entitled "Spreader," Serial No. 194,818, and filed May 5, 1962. Since the actual spreader design forms no part of this invention it is not described in detail and can take any desired form. However, it will be noted that the hitch arrangement positions the discharge end of conveyor 76 over the end of conveyor 96 with a slight overlap so that material can be discharged from conveyor 76 directly onto conveyor 96. The hitch connection establishes a driving connection between conveyor 76 and the spreader so that movement of conveyor 76 in frame 10 is in accordance with movement of the spreader.

Conveyor 76 is movable in the frame between two extreme positions, one position as illustrated in FIG. 7 fully extended so that opening 66 is positioned over the right end of the conveyor and a second position illustrated in FIG. 5 with the conveyor retracted in the frame and opening 66 positioned over the left end of the conveyor. For stability of the conveyor in its fully extended position an outrigger is provided at the right end of the conveyor and comprises suitable frame work 102 supporting rollers 104 for engagement in channel guides 86 and 88. Outrigger 100 also carries drive means 108 for conveyor 76. The outer extension of conveyor 76 is limited by a stop provided by plate 109 attached to the frame and extending into the path of a second plate 110 fixed to the outrigger, the plates being arranged for engagement to limit the travel of conveyor 76 with its right end position under the discharge opening of the hopper.

The combination turntable and material handling apparatus can be moved along a roadway as desired and through cooperation of carriages 112 provided at one end of the frame and wheel assemblies 150 and 151 positioned at the opposite end and operative to provide steering control in a manner to be described more completely hereinafter. Preferably wheel carriages 112 are provided one on each side of the frame and disposed at the hopper end. Since the wheel carriages are identical only one is illustrated in the drawings and will be described. More particularly, the wheel carriages comprise a pair of dual wheels 114 and 116 supported on axles 118 and 120. Axle 118 is connected to the frame by arms 122, 124, 126 and 128, the arms being pivotally connected to the frame by hinge pins and brackets 121, 123 and 125; similarly, axle 120 is connected to the frame by arms 130, 132, 134 and 136 and hinge pins and brackets 131, 133 and 135. The inner pivot arms 124–126 and 132–134 are connected to an upper frame member 138 by hydraulic mechanisms 140 and 142 which are operative to retract the wheels to the full line position illustrated in FIGS. 2 and 9 thereby lowering the hopper end to the ground for operation or to extend the wheels to the dotted line position to raise the hopper end for movement of the turntable and material handling apparatus to a new location.

Carriages 112, through chain and sprocket drives 113 connected to wheels 116, provide the driving force for moving the apparatus from one location to another. More particularly, sprocket 115 is fixed to axle 120 and sprocket 117 is connected to a suitable hydraulic motor 119 by shaft 121. Drive chain 123 connects the sprockets and hydraulic motor 119 is controlled from a suitable central control station (not shown) on the turntable and material handling apparatus. When energized, motor 119 drives sprocket 117 and driving movement is transmitted to wheels 116 through chain 123, sprocket 115 and axle 120. The chain and sprocket drives permit movement of wheels 116 between their retracted and extended positions without disturbing the drive connection. It will be appreciated that although one drive has been described, an identical drive arrangement is provided for the other wheel carriage.

Wheel assemblies 150 and 151 are identical and only one assembly is illustrated in FIG. 13 of the drawings. Wheel assembly 150 includes wheel 152 disposed in a wheel housing 153. To raise and lower the ramp end of the turntable and material handling apparatus wheel 152 is mounted for vertical movement relative to housing 153. For example, wheel 152 is carried on axle 154 which extends through vertical slots 155 in the wheel housing. Hydraulic cylinders 156 and 157 are connected between the wheel housing and axle 154 and are operative to selectively extend the wheel to raise the ramp end (the full line position of FIG. 13) or retract the wheel to lower the ramp end onto the ground for operation (the position of FIG. 2). Wheel assemblies 150 and 151 are also operative to steer the turntable and material handling apparatus during movement. To this end each wheel assembly is provided with a vertical pin 158 fixed to the wheel housing and extending through a fixed plate 160 extending between and fixed to structural members 12*a* and 14*a* and members 162 and 163. Hydraulic cylinders 164 are connected between wheel housing 153 and structural members 162 and 163 and are operative, when energized, to turn wheel assemblies 150 about pins 158 for steering.

It will be appreciated that the various hydraulic cylinders of the apparatus can be controlled from the same central control station (not shown), that is all except those for actuating the turntable.

In operation, the turntable and material handling apparatus of this invention is, for example, positioned as desired relative to a concrete spreader with conveyor 76 in its extended position. Hitch 90 is attached to hitch bracket 94 of the spreader conveyor to connect conveyor 76 for unitary movement with the spreader and wheel carriages 112 and steering wheel assemblies 150 and 151

are retracted to lower the structural frame onto the ground. A hauling vehicle is driven onto the turntable from ramp **40** and the turntable is activated to position the vehicle for discharge into hopper **54**. The hopper discharges concrete, or other material, onto conveyor **76** and conveyor **76** transfers the concrete to spreader conveyor **96** from which it is distributed onto the ground as desired. Conveyor **76** moves relative to the hopper in accordance with spreader movement and continues to receive material and transfer it to the spreader conveyor as it is moved by the conveyor. A discharge chute **161** is provided adjacent the discharge opening to insure discharge of material onto the conveyor with a minimum of spillage. It will be appreciated that unloading of the hauling vehicle can be accomplished simultaneously with discharge of material from the hopper onto the conveyor or these operations may be accomplished in two separate steps as desired. After the vehicle is unloaded it is properly positioned to be driven off the turntable, thus it will be noted that the vehicle need not be backed onto or off of the turntable. It will also be noted that, although preferred as presenting the most effective combination, conveyor **76** need not be an integral part of the turntable and material handling apparatus as it could be constructed to receive a spreader conveyor directly. Conveyor **76** will track under the discharge opening and transfer material to spreader conveyor **96** and, when conveyor **76** is in its fully retracted position discharge opening **66** can be closed, wheel carriages **112** and wheel assemblies **150** and **151** lowered to raise the frame and hydraulic motor **119** energized to move the turntable and material handling apparatus forward, or as desired, to accommodate additional movement of the spreader.

Although this invention has been illustrated and described in connection with particular embodiments thereof, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

What I claim is:

1. Apparatus of the type described comprising, in combination,

a generally elongated horizontally extending frame,

a generally elongated turntable,

means supporting said turntable on said frame for pivotal movement in a horizontal plane,

means communicating with said turntable for providing vehicle access thereto,

hopper means supported on said frame adjacent to and for access from said turntable and including means defining a discharge passage adjacent the lower end of said hopper means,

means connected with and controlling movement of said turntable in said horizontal plane for positioning a vehicle supported on said turntable for discharge of said material into said hopper means,

generally elongated conveyor means,

means including elongated guide means on one of said frame and said conveyor means extending generally parallel to the longitudinal axis of said frame and roller means on the other of said frame and said conveyor means arranged for engagement with said guide means and supporting said conveyor means for movement below said hopper means between a position extended from said frame and a position within said frame, the movement of said conveyor means being in the path in general alignment with the discharge opening of said hopper means,

and hitch means on said conveyor means for connecting said conveyor means to an external source of motive power to provide movement of said conveyor means between its positions in accordance with movement of said external source.

2. The apparatus of claim **1** including sets of carriage means relatively spaced longitudinally on said frame and comprising traction members and means for moving said traction members vertically relative to said frame between a first position wherein said traction members are disposed within said frame and a second position depending therefrom,

and also including means connected to one set of said traction means for supplying motive power thereto.

3. The apparatus of claim **2** including means connected to and operative to move a set of said traction means to steer said apparatus.

4. Apparatus of the type described comprising, in combination,

a frame,

a vehicle platform,

means supporting said platform in said frame for movement in a horizontal plane,

means communicating with and providing vehicle access to said platform,

a material receiving hopper supported on said frame adjacent to and for access from said platform,

means defining a discharge passage for flow of material from said hopper,

elongated conveyor means,

traction means spaced along said frame in a given direction and operative to support said frame for movement,

first support means relatively spaced on said frame in said given direction and extending in said given direction,

second support means spaced longitudinally on said conveyor means and engaging said first support means and cooperating therewith to support said conveyor means for movement relative to said frame in general alignment with said discharge and in said given direction between a position extending exteriorly from said frame in said given direction and a position within said frame,

and said conveyor means including hitch means for connecting said conveyor means to an exterior source of motive power to provide movement of said conveyor means between its positions in accordance with movement of said external source.

5. The apparatus of claim **4** including means connecting said traction means in said frame and operative to move said traction means vertically relative to said frame between a first position wherein said traction means is disposed within said frame and a second position depending therefrom,

and means connected to said traction means for applying motive power thereto.

6. Apparatus of the type described comprising, in combination,

frame means,

a vehicle platform,

means supporting said vehicle platform on said frame means for movement in a horizontal plane,

means communicating with and providing vehicle access to said platform,

material receiving and discharge means disposed adjacent said platform means for access thereto by a vehicle from said platform,

elongated conveyor means supported in said frame means,

first support means relatively spaced on said frame in the direction of the longitudinal axis of said conveyor and extending in the direction of said longitudinal axis,

second support means spaced longitudinally of said conveyor means and engaging said first support means and cooperating therewith to support said conveyor means for movement relative to said frame in the direction of said longitudinal axis between a position extending from said frame and a position within said frame, motion of said conveyor means between its position being in general align-

ment with said material receiving and discharge means to receive material herefrom,

and said conveyor means including a material transporting portion extending from a point intermediate the ends of said conveyor means toward one end of said conveyor means and an outrigger frame portion extending from the opposite end of said conveyor means to a point adjacent said conveyor means to provide a counterbalance for said material transporting portion.

7. The apparatus of claim 6 including means for connecting said conveyor means to and for movement with an external source of motive power to effect longitudinal movement thereof.

8. Apparatus of the type described for use in a combination with a material spreader comprising, in combination,

frame means,

a vehicle platform,

means supporting said vehicle platform on said frame means for movement in a horizontal plane,

material receiving and discharge means disposed adjacent to and for access from said platform,

elongated conveyor means supported in said frame,

first support means relatively spaced in said frame in a direction parallel to the longitudinal axis of said conveyor means and extending parallel to said longitudinal axis,

second support means spaced longitudinally on said conveyor means and engaging said first support means and operative therewith to support said conveyor means from said frame for movement in the direction of said longitudinal axis between a position extending from said frame means and a position within said frame means, said movement of said conveyor means being in general alignment with said material receiving and discharge means to receive material therefrom,

and means for connecting said conveyor means to and for joint movement with said spreader and so that said conveyor means is movable relative to said frame in accordance with movement of said spreader and is operative to transfer material from said hopper to said spreader.

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