

[54] **TRAIN OF FREIGHT CARS**

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[58] Field of Search 214/41, 42 R, 42 B, 16 R,
214/83.26, 520; 198/83

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[57] **ABSTRACT**

In a train of like freight cars used, for instance, for removing rubble from a ballast cleaning machine, each car comprises a storage bin defining a top opening delimited by two end edges. A conveyor means having two ends bridges the top opening in the direction of track elongation. The conveyor means has a plurality of conveyor portions including an endless conveyor band mounted for traveling in a conveying path extending in this direction. The endless conveyor band is driven in this path in reversible directions, and at least some of the conveyor portions are mounted for movement so that a selected conveyor means end projects beyond a respective end edge and into overlapping relationship with an adjacent end of one of the conveyor means ends of an adjacent freight car.

19 Claims, 13 Drawing Figures

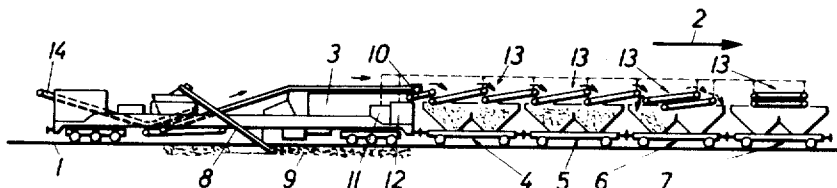


FIG. 1

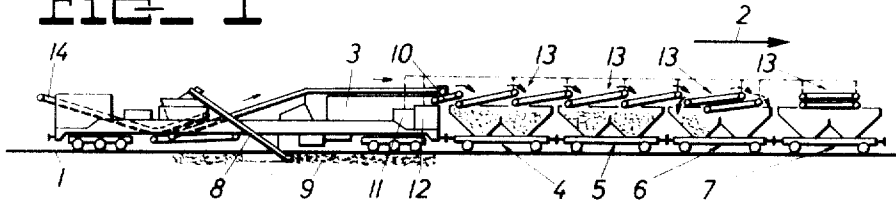


FIG. 2

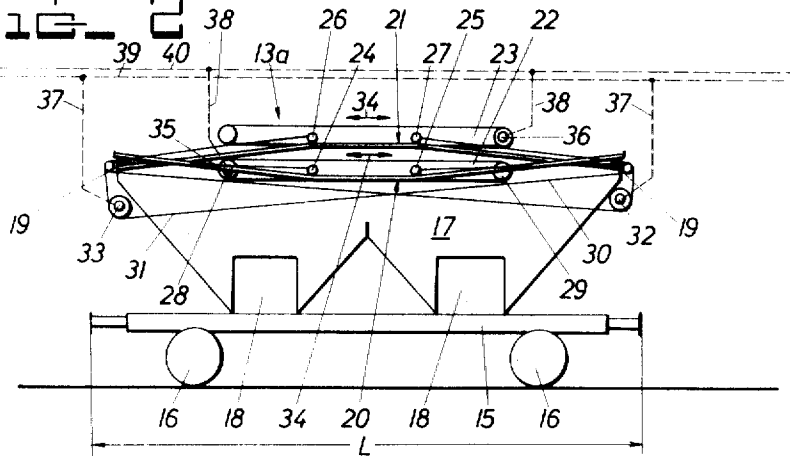


FIG. 3

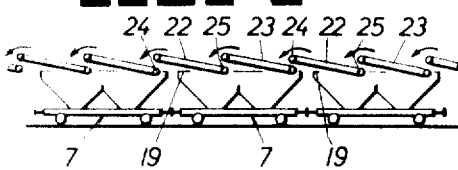


FIG. 4

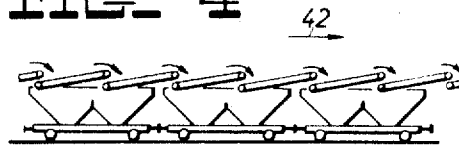


FIG. 5

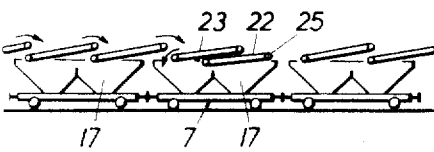


FIG. 6

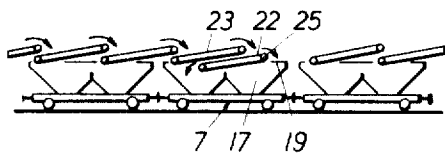
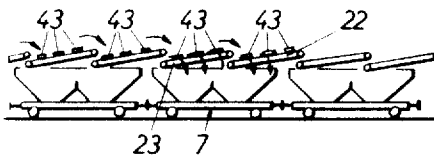
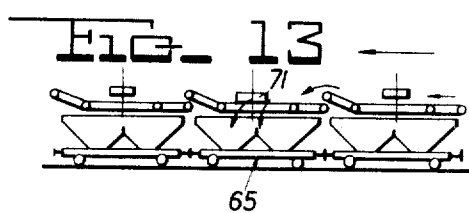
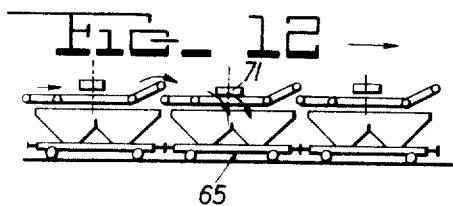
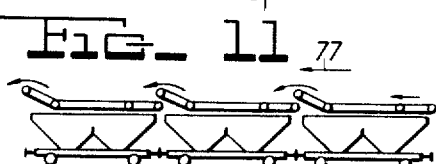
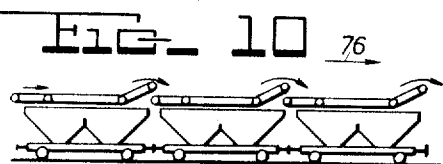
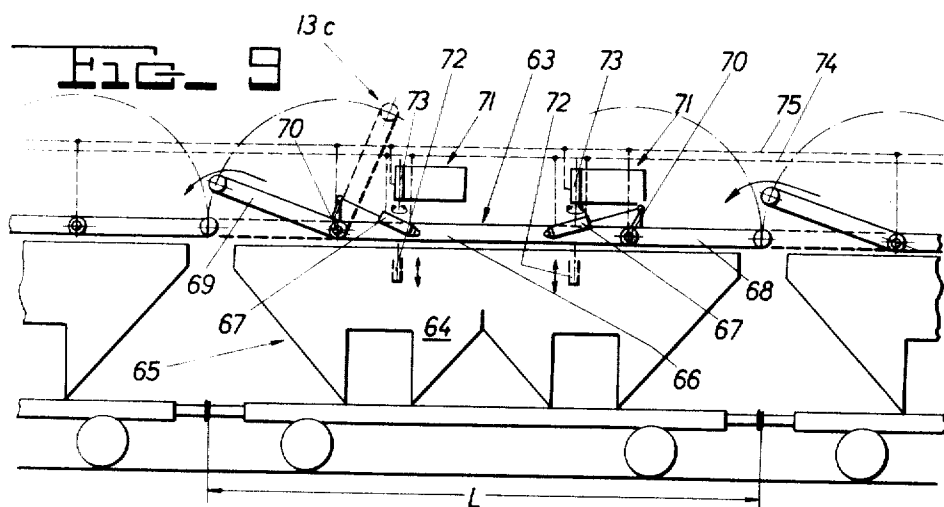
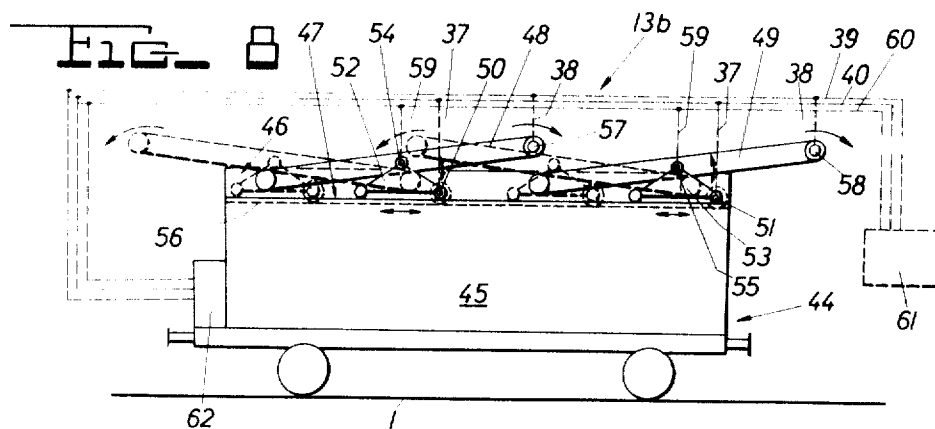


FIG. 7





TRAIN OF FREIGHT CARS

The present invention relates to improvements in a train of at least two like freight cars arranged in succession, for instance for the removal of rubble coming from a ballast cleaning machine. In known trains of this type, each freight car comprises a storage bin defining a top opening delimited by two end edges spaced apart in the direction of the elongation of the track whereon the train is adapted to move, and a conveyor means bridging the top opening in this direction is provided for transporting the rubble or other material.

In one known apparatus for removing the rubble produced during cleaning of the track ballast, several telescopically movable conveyors are mounted on a transport car for movement from location to location in their retracted position while they are moved apart to reach several rubble storage cars at the operating location. This arrangement has the disadvantage that conveyance of rubble or like material is possible only in a single direction and, furthermore, when storage cars are removed from, or added to, the train, guide rails, conveyor bands and auxiliary mechanisms must be removed or added, thus making operations relatively cumbersome and difficult.

It is the primary object of this invention to overcome these disadvantages and to provide conveyor means of the first-described type which may be readily assembled with the train under various operating conditions and which greatly increases the efficiency of removal.

This and other objects are accomplished in accordance with the invention with a conveyor means which has a plurality of conveyor portions including an endless conveyor band mounted for traveling in a conveying path extending in the direction of track elongation, and means for driving the endless conveyor band in reversible directions in this path. At least some of the conveyor portions are mounted for movement so that a selected one of its ends projects beyond a respective one of the end edges of the storage bin top opening and into overlapping relationship with an adjacent end of the conveyor means of an adjacent one of the successively arranged freight cars. Drive means is provided for so moving the conveyor portions. The conveyor portions may be mounted for displacement in the direction of track elongation or for pivoting the selected ends thereof for this movement.

This arrangement multiplies the usefulness of the apparatus and makes it most adaptable to various operating conditions. In the first place, such a conveyor means may be used for transporting material, such as rubble, in both directions. Also, a train consisting of freight cars with such conveyor means may be lengthened or shortened at will, or separated at any desired point, with no additional work. This is particularly useful in connection with high-efficiency ballast cleaning machines which often require two-directional transport of material simultaneously. The movability of the conveyor portions and the reversibility of the driving direction of the endless conveyor band make a uniform loading of the entire storage bin on each car possible. No protective devices need be mounted between the individual cars since the conveying direction of the conveyor band is reversed at the start of transporting the material to the next succeeding car until the conveyor means end has been moved into the overlapping rela-

tionship so that it covers the interspace between the cars. Thus, no interruption of the loading operation is required during the transition from one to the next car. Loading of the individual cars can be effected at any point of the train, for instance the first or the last car of the train, or any intermediate car, may be loaded first without requiring any additional work. For example, loaded cars may be uncoupled and taken away without interrupting the operation and empty cars may be coupled to the train. Thus, uninterrupted loading operations are possible for an extended time span.

The above and other objects, advantages and features of the present invention will become more apparent from the following detailed description of certain now preferred embodiments thereof, taken in conjunction with the accompanying drawing wherein

FIG. 1 is a side elevational schematic view of a work train including a ballast cleaning machine and like freight cars arranged in succession and carrying loading and transfer conveyor means;

FIG. 2 shows one of the freight cars of FIG. 1 on an enlarged scale;

FIGS. 3 to 6 are side elevational views showing the cars with the conveyor means in different operating positions;

FIG. 7 is a similar side elevational view showing deflector means in cooperation with the conveyor means for loading the storage bins on the cars;

FIG. 8 is a view similar to that of FIG. 2 of another embodiment;

FIG. 9 is also a view similar to that of FIG. 3 of yet another embodiment; and

FIGS. 10 to 13 are views similar to those of FIGS. 3 to 6, showing the cars of FIG. 9 with the conveyor means in different operating positions.

Referring now to the drawing and first to FIG. 1, a work train movable in the direction of arrow 2 on track 1 is shown to include a ballast cleaning machine 3 of any useful design and several like freight cars 4, 5, 6, 7 arranged in succession. Each freight car comprises a storage bin defining a top opening delimited by two end edges spaced apart in the direction of the elongation of track 1.

The schematically illustrated ballast cleaning machine, which forms no part of the invention, is shown to comprise bucket conveyor 8 which removes ballast 9 and transports the removed ballast to a vibratory screen where clean ballast is separated from rubble. The clean ballast is returned to the track bed in a manner forming no part of this invention while the rubble is moved away by elongated conveyor bands including a transfer conveyor 10 to loading and transfer conveyor means 13 of freight cars 4, 5, 6 and 7.

Mains (schematically shown in broken lines) connect the drives for the conveyor means of each freight car to common power source 11 and remote control 12.

It will be clearly understood by those skilled in the art that the train may comprise more or fewer freight cars than the four shown in FIG. 1, and the cars may be loaded seriatim or at random, beginning with the car next to the ballast cleaning machine. Particularly where a high-efficiency ballast cleaning machine is used, a further train of successive like freight cars may be coupled to machine 1 at the rear thereof, seen in the working direction, so that no interruption is encountered in the operation and all rubble may be continuously removed as it is produced by the cleaning machine, in

which case another elongated conveyor 14 may transfer the rubble to the conveyor means of the cars of the further train.

Car 7 is shown on an enlarged scale in FIG. 2 which illustrates a particularly sturdy and operationally dependable conveyor means construction.

Car 7 includes a platform frame 15 mounted on undercarriages 16, 16 for mobility on track 1. Storage bin 17 is carried by frame 15 and defines a top opening delimited by two end edges 19, 19 spaced apart in the direction of track elongation, the bin having two discharge chutes 18, 18 for removing any particulate material, such as ballast or rubble, received in the bin upon opening and proper adjustment of the chutes.

Two guide rails 20, 21 bridge the top opening of storage bin 17 in the direction of track elongation and each of the guide rails has two ends substantially at the level of end edges 19, 19 of the top opening and a center portion at levels different or staggered from each other, the level of the center portion of guide rail 20 being below the level of the end edges and the level of the center portion of guide rail 21 being above the level of end edges 19, 19. The conveyor means 13a consists of conveyor portions 22, 23 each including an endless conveyor band and arranged in overlapping relationship. The conveyor portions are mounted for displacement in the direction of track elongation on the guide rails, rollers or equivalent friction-reducing means 24, 25 supporting conveyor portion 22 on guide rail 20 while rollers 26, 27 support conveyor portion 23 on guide rail 21. In this manner, the conveyor portions may be so displaced that a respective one of their ends 28, 29 projects beyond a respective end edge 19 of the top opening and into overlapping relationship with an adjacent end of the conveyor means of an adjacent freight car, see, for instance, car 5 in FIG. 1. The overlapping relationship places the conveyor means ends on adjacent cars in superposed position, i.e., one above the other.

The illustrated drive means for the displacement of the conveyor portions on their guide rails includes a cable or chain drive 30, 31 for the respective conveyor portions, the cable or chain being driven by motor means 32, 33, respectively, which may be a hydraulic motor. The power-driven winch 32, 33 for the respective conveyor portion 22, 23 is arranged in the region of one end of a respective guide rail while a guide roll guides the respective cable or chain in the region of the other end of the respective guide rail. Thus, cable 30 has one end linked to conveyor portion 22 in the region of its roller 24 and is trained over a guide roll to power-driven winch 32 whence it is trained over a guide roll at the other end of the car and led into the region of roller 25 where the other cable end is linked to conveyor portion 22. Similarly, cable 21 has one end affixed to conveyor portion 23 at roller 26, is trained over a guide roll to power-driven winch 33 and led back over another guide roll at the opposite end into the region of roller 27 where it is linked to conveyor portion 23.

Thus, when the winches are rotated, the conveyor portions 22, 23 are displaced in the directions of doubleheaded arrows 34, 34, depending on the direction of rotation of the winches. Furthermore, each conveyor portion is associated with a further drive 35, 36 for reversing its direction of displacement. Using two separate guide rails for the conveyor portions makes the operation of the conveyor means very simple and permits

rapid changes in the direction of material conveyance and transfer.

The control for the operation of drives 32, 33 and 35, 36 is shown only schematically, the power and rotational control being transmitted thereto from main lines 39, 40 by branch lines 37, 38 connecting the respective drives to the main lines. If desired, each car may carry its own power source and control but it will be preferred to control all drives from a common power source 11 and a remote control 12 on ballast cleaning machine 3. It will be useful to incorporate limit switches in the control to limit the displacement of the conveyor portions on their guide rails when the conveying direction of conveyor means 13 is reversed, such limit switches being positioned in the region of the guide rail ends so that the operator need not manually control the conveyor means displacement.

Complete bridging of the storage bin top opening by conveyor means 13 will be assured in the illustrated embodiment by providing two conveyor portions of substantially equal length, with their combined length corresponding substantially to length L of the freight car, including its couplings, when the two conveyor portions are in operating position, as seen in FIG. 1 at cars 4 and 5, or in the various operating positions shown in FIGS. 3 to 6.

When it is desired to convey material over a succession of cars 7, as shown in FIG. 3, in the direction of arrow 41, conveyor portions 23 are displaced in a direction opposite to the conveying direction until the front ends (as viewed in the conveying direction) of conveyor portions 23 are positioned in the range of front end edge 19 of the associated storage bin top opening. At the same time, the second conveyor portions 22 are displaced in the conveying direction until their rear ends project beyond the associated freight car to be superposed over the front ends of the conveyor means in the next adjacent car while their front ends subtend the rear ends of the other conveyor portion on the same car, thus forming a continuous length of conveyor means bridging all the cars.

In the operating position of the conveyor means shown in FIG. 4, the conveyor portions are oppositely displaced so as to convey material over all the cars in the direction of arrow 42.

On the other hand, in the operating positions illustrated in FIGS. 5 and 6, the storage bin 17 of intermediate car 7 is being loaded by displacing conveyor portions 22, 23 of this car so that the overlapping conveyor portions are fully within the top opening of this bin, i.e., inwardly spaced from the end edges of the bin. One half of the bin is first loaded by moving the endless band of conveyor portion 23 against the general conveying direction (FIG. 5). After this half has been filled, the conveying direction of this endless band is reversed so that it travels in the general conveying direction (FIG. 6), thus transferring the material to conveyor portion 22 from whose end, which is inwardly spaced from end edge 19, the material drops into the other half of the bin. After this half is loaded, the conveying direction of the endless band of conveyor portion 22 is reversed so as to load the center part of the bin while this conveyor portion is continuously or intermittently displaced in the general conveying direction. Thus, after the bin has been completely filled, the forward end of conveyor portion 22 has been displaced sufficiently for it to overlap the rear end of the conveyor means of the next adja-

cent car so to transfer the material thereon thereto upon reversal of its conveying direction. The next car is then loaded in the same manner.

As schematically shown in FIG. 7, to assure proper feeding and conveying of the material during loading, deflectors 43 may be associated with each conveyor portion along their length. As indicated in this figure, the deflectors may be moved between a rest position, wherein they are out of the conveying path of the material on the endless conveyor bands, and an operating position at the car being loaded, i.e., center car 7, wherein successive deflectors are moved into the path of the material being conveyed on conveyor portions 22, 23 to deflect successive portions of the material into bin 17. The deflector operation may be so controlled that a first deflector is inserted into the conveying path to fill a first portion of the bin and is then moved out of the path after this portion has been filled to permit the material to move on to the next inserted deflector, and so on. The operation and function of such deflector means will be more fully described in connection with FIG. 9.

Another embodiment of the present invention is illustrated in FIG. 8, this structure being very simple while the pivotal positioning of the ends of the conveyor portions make possible a particularly varied and sensitive adjustment in the conveying of the material over the entire train of cars. In this embodiment, the freight car may be a dump-type hopper car 44 whose hopper or storage bin 45 has an open top delimited by end edges or rims 46. The car carries a guide rail 47 bridging the open top and extending in the direction of track elongation substantially parallel to the plane of the track. Conveyor means 13b is constituted by two conveyor portions 48, 49, respective carriages 52, 53 being movable on the guide rail and each conveyor portion being pivotally mounted on a respective carriage intermediate the ends of the conveyor portion so that the conveyor portions may be pivoted at their center point about a horizontal axis extending transversely to the direction of track elongation. Drives 54 and 55 are mounted on the carriages to power the pivotal movement of the conveyor portions. Thus, the conveyor portions may be so pivoted as that their conveying planes enclose an acute angle with the plane of the track, i.e., a horizontal plane. This enables the conveyor means to operate without difficulty on tangent track as well as in super-elevated curves.

The conveyor portions are displaceable along the guide rail by rack-and-pinion drive comprising pinions 50, 51 on carriages 52, 53, which mesh with rack 56 along the guide rail. When conveyor portions 48, 49 are in the position shown in full lines in FIG. 8, the top opening of the hopper is bridged and the material is transferred over this hopper in the conveying direction indicated by the arrows in full lines. When the conveying direction is to be reversed, the conveyor portions are displaced into the positions shown in broken lines.

When it is desired to load hopper 45, rather than to transfer material thereover, deflectors may be operated in the manner described hereinabove in connection with FIG. 7 or the two conveyor portions are displaced inwardly in the manner shown in FIGS. 5 and 6, for instance, and the conveying direction of their endless bands are selectively reversed by operation of drives 57, 58 to fill successive portions of storage bin 45. As

explained in connection with FIG. 2, power and control is supplied to drives 50, 51, 54, 55 and 57, 58 by means of power and control lines 37, 59, 38 connected to main lines 39, 60, 40. The main lines are, as shown in FIG. 1, connected to a common power source on the ballast cleaning machine and to control 61 although they could also be locally controlled by a control 62 on each car. The remote control of all drives for the displacement and/or pivoting of the conveyor portions makes it possible to assure a continuous operation along the entire train for the transfer and loading of the material from, to and into selected cars without interruption.

The conveyor means of the embodiment shown in FIG. 9 consists of three conveyor portions with common endless conveyor band 63 bridging the open top of storage bin 64 mounted on car 65. The endless conveyor band has stationary center portion 66 fixedly mounted on car 65 and two end conveyor portions 68, 69 which are independently pivotal about axes extending transversely and parallel to the track by means of hydraulic jacks 67, 67. Two drives 70 move the endless conveyor band in reversible conveying directions.

Since the three-part conveyor means of this embodiment is not displaceable in the direction of track elongation in respect of its car, two deflectors 71 are operable for loading the bin. When the conveyor means is to be used not to transfer material over the bin but to load it into the bin, the deflectors are successively moved from their rest position outside the conveying path of the material into this path. The deflectors may be movable vertically, laterally or pivotally between their rest and operating positions by servomotors 73.

Again, as schematically shown, drives 67, 70 and 73 are controlled through main lines 74, 75.

The conveyor means 13c has the advantage that it requires no guide rails means which makes the structure more economical in construction, operation and servicing.

The three-part conveyor means is substantially of the same length as the length L of car 65 although it will be effectively shortened when at least one of the end portions is pivoted upwardly, as shown in broken lines. The conveying position is shown in full lines in FIG. 9. Thus, no other means than the pivoting of the end portions is required to transfer material from one to the next adjacent car, and the end portions may be folded upwardly when the car is moved from one working site to another.

FIGS. 10 to 13 show various operating positions of conveyor means 13c. In the position of FIG. 10, material is simply conveyed in the direction of arrow 76 over the cars while this conveying direction is reversed in the direction of arrow 77 in FIG. 11. In the positions shown in FIGS. 12 and 13, on the other hand, the center car 65 is loaded by moving the deflectors 71 into their operating positions blocking the path of the material and thus forcing it by gravity into the bin, as shown by downwardly pointing arrows. During this loading operation, the deflectors associated with the conveyor means in the adjacent cars are in their rest position so as to permit free flow of the material to center car 65.

It will be clearly understood that the hereinabove described invention is not limited to use with ballast cleaning machines but may be used for the conveying and loading of any material to, into and from a succes-

sion of cars in a work train. The conveyor means may be mounted for lateral displacement transversely to the track so as to assure proper conveying and transfer of the material under all working conditions, including in track curves. It is also possible to couple together different embodiments of freight cars, such as shown in FIGS. 2, 8 and 9, to form a work train without in any way interfering with the effective operation. Obviously, any type of freight car may be used. The drive means may be powered and controlled electrically, hydraulically or pneumatically.

While the present invention has been described in connection with certain now preferred embodiments, it will be understood that many variations and modifications may occur to those skilled in the art, particularly after benefiting from this teaching, without departing from the spirit and scope of the invention as defined in the appended claims.

What we claim is:

1. A train of at least two like freight cars arranged in succession, each of the freight cars comprising a storage bin defining a top opening delimited by two end edges spaced apart in the direction of the elongation of a track whereon the train is adapted to move, a conveyor having two ends and means bridging the top opening in said direction, the conveyor means having a plurality of conveyor portions including an endless conveyor band mounted for traveling in a conveying path extending in said direction, means for driving the endless conveyor band in reversible directions in said path, at least some of the conveyor portions being mounted for movement so that a selected one of its ends projects beyond a respective one of the end edges of the top opening and into overlapping relationship with an adjacent end of the conveyor means of an adjacent one of the successively arranged freight cars, and drive means for so moving the conveyor portions.

2. The train of claim 1, wherein the conveyor portions are mounted for displacement in the direction of track elongation for said movement.

3. The train of claim 1, wherein the conveyor portions are mounted for pivoting the selected ends thereof for said movement.

4. The train of claim 1, wherein the conveyor means consists of two of said conveyor portions each including an endless conveyor band and arranged in overlapping relationship, and further comprising a guide rail for each of the conveyor portions, the conveyor portions being movably mounted on the guide rails, each of the guide rails bridging the top opening in the direction of track elongation, and each of the guide rails having two ends substantially at the level of the end edges of the top opening and a center portion at levels different from each other.

5. The train of claim 4, wherein the level of the center portion of one of the guide rails is above the level of the end edges and the level of the center portion of

the other guide rail is below the level of the end edges.

6. The train of claim 1, wherein the conveyor means consists of two of said conveyor portions each including an endless conveyor band, and further comprising a level guide rail means and a carriage for each conveyor portion movable on the guide rail means, each conveyor portion being pivotally mounted on its carriage intermediate the ends thereof.

7. The train of claim 6, wherein the guide rail means is a guide rail common to both carriages.

8. The train of claim 6, further comprising a drive for each of the carriages whereby the carriages are self-propelled.

9. The train of claim 1, wherein the conveyor means consists of two of said conveyor portions each including an endless conveyor band, the conveyor portions being of substantially the same length and the combined lengths of the conveyor portions corresponding substantially to the length of the freight car.

10. The train of claim 1, wherein the conveyor means consists of three of said conveyor portions with a common endless conveyor band, one of the conveyor portions being a stationary center portion and two of the conveyor portions being independently pivotal in respect of the center portion.

11. The train of claim 10, wherein the drive means for moving the two conveyor portions for pivoting about an axis transverse to the direction of track elongation is a hydraulic jack means associated with each of the two conveyor portions.

12. The train of claim 10, wherein the conveyor means is substantially of the same length as the freight car.

13. The train of claim 1, wherein the conveyor portions mounted for movement are each arranged for independent movement, each conveyor portion having a conveying plane and the independently movable conveyor portions being movable for positioning the conveying plane thereof to enclose an acute angle with the plane of the track.

14. The train of claim 1, wherein the drive means includes a cable winch.

15. The train of claim 1, wherein the drive means includes a rack-and-pinion drive.

16. The train of claim 1, wherein the drive means includes hydraulic jack means.

17. The train of claim 1, further comprising deflector means associated with the conveyor means, the deflector means being arranged to deflect material on the conveyor means to selected regions of the bin.

18. The train of claim 17, further comprising servomotor means for moving the deflector means.

19. The train of claim 18, further comprising remote control means for the drive means and the servomotor means.

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