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MULTICAR BULK TRANSPORTER AND METHOD

Filed Feb. 8, 1965

3 Sheets-Sheet 1

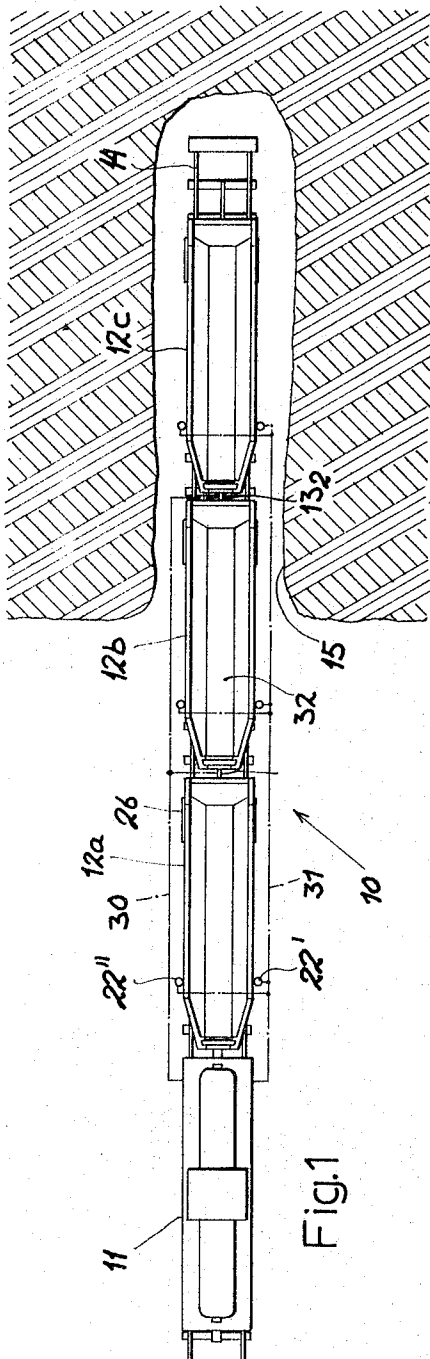


Fig. 1

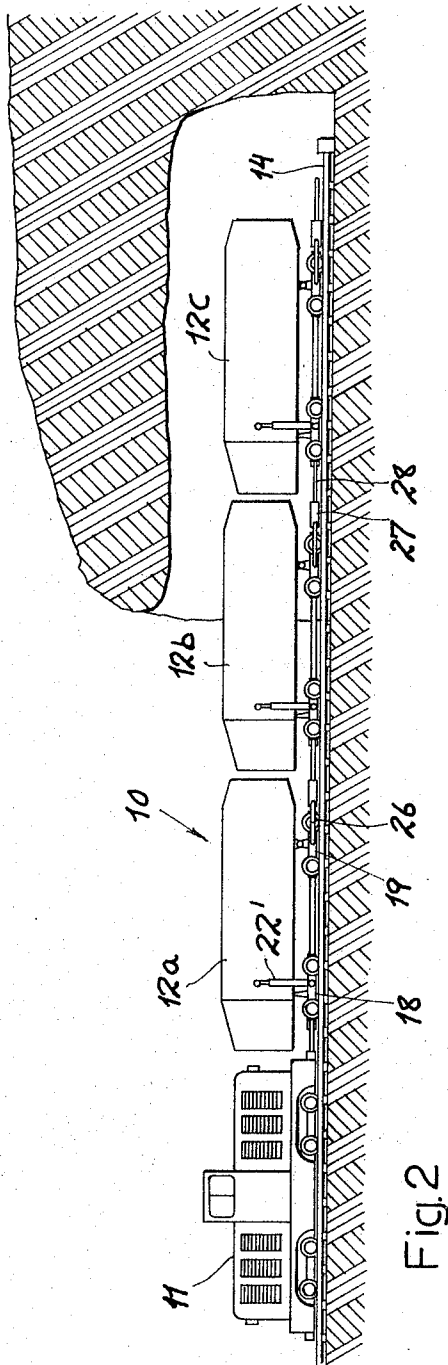


Fig. 2

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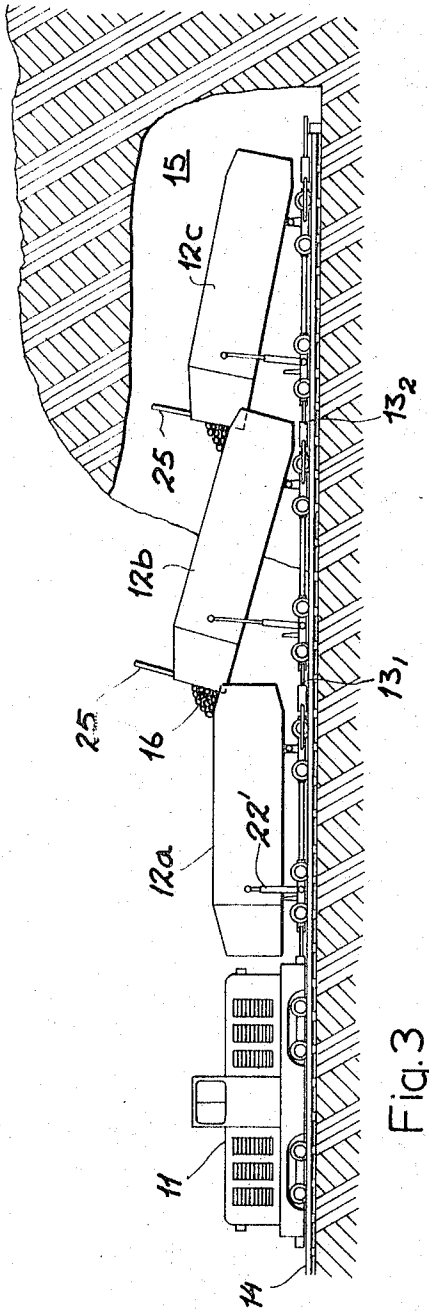


Fig. 3

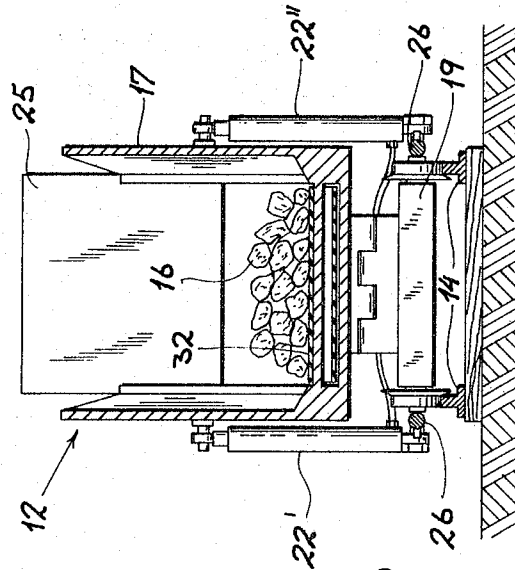


Fig. 5

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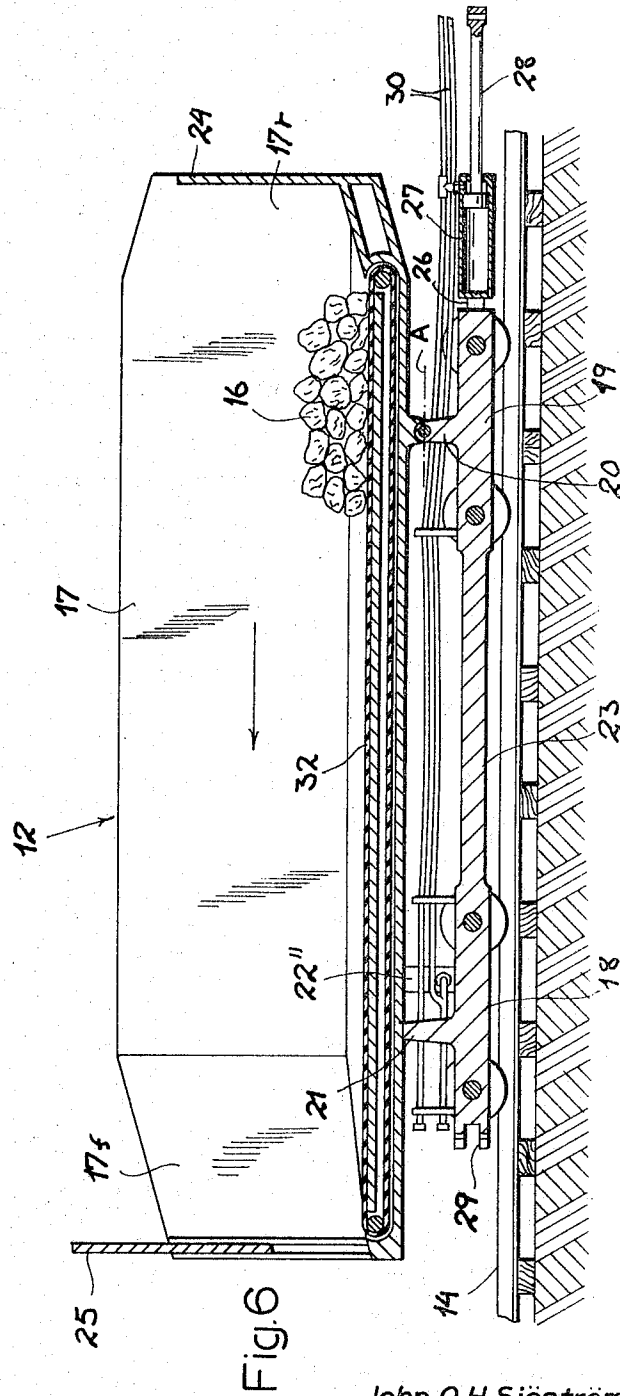
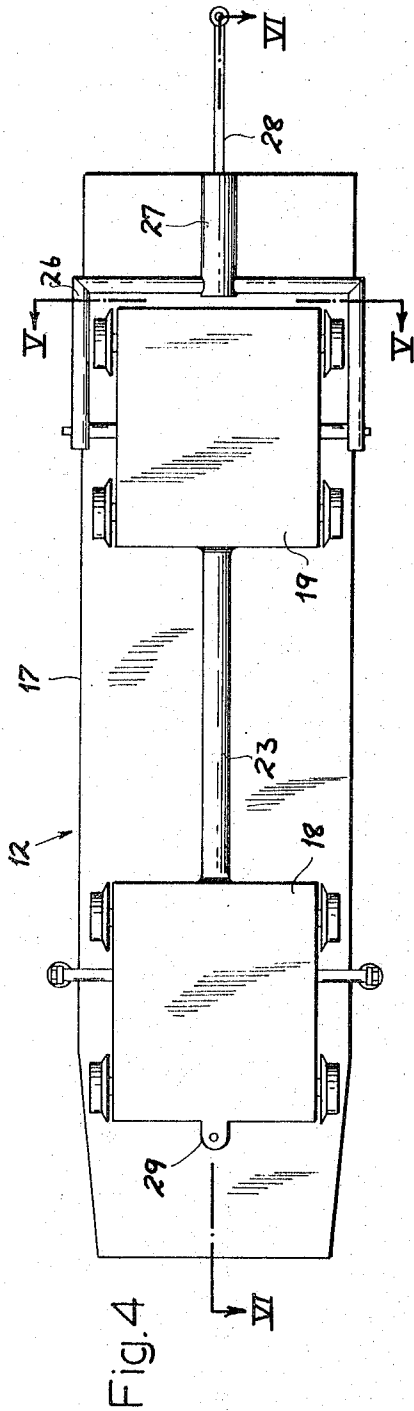
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MULTICAR BULK TRANSPORTER AND METHOD

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MULTICAR BULK TRANSPORTER AND METHOD

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11 Claims. (Cl. 214—38)

My present invention relates to a multicar train for use in hauling bulk loads.

Such bulk transporters find application in restricted-access mine galleries and in tunneling operations where particulate bulk material from a working face of a mine is loaded into a train whose cars, when filled to capacity, are driven to an unloading station, being thereafter returned to the same loading site or moved to some other station for picking up a fresh load.

Heretofore, when such transporters were utilized in the hauling of ore or coal, it has been necessary to shunt each transporter car individually to the mining face when the latter lay at the inner terminus of a tunnel or was otherwise only limitedly accessible. After the car had been loaded, it was necessary to haul it to a discharge or transfer station, or to an assembly point, with the aid of an individual prime mover such as a shuttle locomotive. This method involved high operating costs and loss of time in mining or similar operations.

It is, therefore, the general object of my present invention to provide a multicar train for the purpose described whose individual cars may all be loaded substantially simultaneously even at locations where only a single car can reach the site of the goods to be transported.

A related object is to provide a multicar train whose individual cars, when used for the transportation of bulk goods, can be unloaded substantially simultaneously with delivery of the goods to a single chosen site.

It is also an object of my invention to provide a method of concurrently loading or unloading a series of cars in a multicar bulk transporter under the conditions outlined above.

The several cars constituting a train according to my invention each comprise a supporting structure, e.g. a plurality of wheeled bogies, having an elongated body tiltably mounted thereon advantageously in such manner that this body can swing about an axis closer to one end than the other whereby the first end is lowered and the second is raised when the body is tilted out of its normal horizontal position. One end of the body, i.e. the one nearer to its pivotal axis, is substantially closed whereas the opposite end is at least partly open or capable of being opened, the entire body being adapted to operate as an open-ended hopper or inverted chute through which rocks or other bulk goods can be passed from one end to the other end into an adjoining car. To this effect, I provide each car along the floor of its body with one or more conveyors such as endless belts or chains, the car body being open at the top (at least in the region of its closed end) to permit the funneling of goods from an adjoining car into its interior and further delivery of the goods by its own conveyor to the next-following car. Means are further provided, in accordance with other features of my invention, to elevate the open end of a car above the level of the closed end of an adjoining car and to reduce the spacing between these two cars with the aid of an adjustable coupling therebetween, so that the raised open end of one car overlies the closed end of the next car whereby operation of all the conveyors will move the goods successively to all the cars of the train. In this manner, if the first car is positioned at a loading site, goods deposited on the conveyor of that car will overflow into the immediately adjoining car whence an overflow will pass into the next-following car, and so on until

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the entire load has been distributed over all the cars of the train; conversely, after the train has arrived at an unloading station, the conveyors will discharge the goods through the open end of the last car, again with successive traverse of two or more cars by the goods carried on cars other than this last car. The latter car, incidentally, need not be tilted during either loading or unloading, except under special circumstances (e.g. when the goods are to be discharged across a wall).

The terms "first car" and "last car" do not necessarily indicate the lead car and the end car, respectively, of the train as seen in the direction of travel; in fact, it is frequently convenient to arrange the cars with their closed or receiving ends at the rear and with their open or delivery ends in front, it being then possible to back the train through a tunnel or other restricted passage up to the loading site where the goods are manually or mechanically charged into this end car from the rear and/or from the sides thereof.

The adjustable coupling means between the cars and the associated tilting mechanism may be operated automatically or by hand. In a preferred embodiment, the tilting mechanism includes a pneumatic or hydraulic jack by which one end of the car body is braced against one of its supporting bogies (e.g. the front bogie) for swinging in a vertical plane about a pivotal axis on the remote (rear) bogie. Similarly, the adjustable coupling of the cars may also be effected by fluid-actuated means, the entire pneumatic or hydraulic system being advantageously powered from an associated prime mover such as a traction locomotive under the control of the engineer.

The invention will be described in greater detail with reference to the accompanying drawing in which:

FIG. 1 is a diagrammatic overall view of a multicar train embodying my invention;

FIG. 2 is a side-elevational view of the train of FIG. 1 in condition for travel;

FIG. 3 is a view similar to FIG. 2, showing the train in condition for loading or unloading;

FIG. 4 is a bottom view of one of the cars shown in FIGS. 2 or 3;

FIG. 5 is a cross-sectional view taken on the line V—V of FIG. 4; and

FIG. 6 is a longitudinal sectional view taken on the line VI—VI of FIG. 4.

In FIGS. 1 and 2 I have shown a mine train 10 with an engine 11 and several cars 12a, 12b, 12c; while only three cars have been illustrated to simplify the drawing, it will be understood that any reasonable number thereof may be used in practice. The cars 12a, 12b, 12c are interconnected by adjustable couplings 13₁, 13₂, described in detail hereafter, the lead car 12a being connected with the locomotive 11 by a conventional coupling 13₀. The train 10 travels on a track 14 which terminates in a mine tunnel 15, the end car 12c being shown backed into the tunnel to be loaded with mineral matter 16 (FIG. 5) mined therein.

As illustrated in greater detail in FIGS. 4-6, each car (generally designated 12 in these figures) comprises an upwardly open body 17 supported on a front bogie 18 and a rear bogie 19. Rear bogie 19 is formed with a boss 20 on which the rear end 17r of body 17 is pivotally supported so as to be tiltable about a horizontal axis A. Bogie 18 also has a boss 21 on which the front end 17f of body 17 rests freely so that it can be lifted off this boss under the control of a pair of pneumatic or hydraulic jacks 22', 22'' disposed on opposite sides of bogie 18 externally of the car body 17. The two bogies 18, 19 are interconnected at 23 to constitute a continuous support for the car body. The rear end 17r of this body, which overhangs the bogie 19, is closed at 24 whereas its front end 17f, similarly cantilevered to project beyond bogie

18, is shutterable by a retractable gate 25. This front end, moreover, converges slightly so as to fit between the side walls of the body of the next-preceding car above the end wall 24 thereof which extends only to about four-fifths of the height of these side walls.

The means for adjustably interconnecting adjoining cars, as illustrated at 13₁, 13₂ in FIGS. 1-3, include a swingable yoke 26 on the rear bogie 19 of each car, a pneumatic or hydraulic cylinder 27 centrally secured to the yoke 26, and a piston 28 projecting from cylinder 27 for attachment to a cooperating coupling part 29 on the front bogie 18 of the next-following car. As illustrated diagrammatically in FIG. 1, the supply of pneumatic or hydraulic fluid to the cylinders 27 and the jacks 22', 22'' is controlled from the engine 11 via fluid lines 30, 31.

Each car 13 further comprises an endless conveyor band 32 extending along the floor thereof, this band being driven by suitable (e.g. electric) means not further illustrated to advance the goods 16 from the rear to the front of the car, i.e. in the direction of the arrow in FIG. 6. When the jacks 22 of cars 12b, 12c are actuated to elevate their bodies into the tilted position shown in FIG. 3, and upon the admission of high-pressure fluid into the cylinders 27 of couplings 13₁, 13₂ in a sense reducing the spacing between the cars as likewise shown in FIG. 3, the funnel-shaped front end of each car 12b, 12c will overlie the substantially closed rear end of the next-preceding car 12a, 12b, respectively, so that goods charged into the end car 12c will successively traverse the two other cars 12b, 12a upon the opening of the gates 25 (by manual or automatic means not shown) and the actuation of the respective conveyors 32 thereof. In this manner the charge 16 will be progressively and substantially evenly distributed throughout all the cars of the train 10. When this train has been fully loaded, jacks 22', 22'' and piston cylinders 27 are reversed to restore the traveling position illustrated in FIGS. 1 and 2; the train 10 may then be hauled from the loading station 15 to an unloading station not shown.

At the unloading station, the same procedure of tilting at least the cars 12b and 12c, reducing the spacing between the cars and driving the conveyors 32 thereof can be used to discharge the goods 16 from all the cars by way of front car 12a; naturally, in this case, the locomotive 11 should be uncoupled before the conveyors are set in motion.

While the invention has been described with reference to a specific embodiment, it will be understood that various details shown by way of example may be modified or even omitted. Thus, the front gate 25 could be omitted in certain instances (as where the track 14 slopes continually upwardly from the loading to the unloading station), or the car bodies 17 could be partly closed at the top. These and other variations, readily apparent to persons skilled in the art, are therefore intended to be embraced within the spirit and scope of my invention except as otherwise limited in the appended claims.

I claim:

1. A train for the transportation of bulk goods, comprising a plurality of aligned cars each with support means and an elongated upwardly open body pivotably mounted on said frame for swinging about a horizontal axis, said body having a substantially closed first end and an at least partly open second end; adjustable coupling means between said cars interconnecting the respective support means thereof with variable spacing of their adjoining ends; conveyor means extending longitudinally along the floor of said body; drive means for operating said conveyor means for transportation of a load from said first end to said second end; and mechanism operable to tilt said body about said axis to an extent sufficient to lift said second end above the level of the proximal end of an immediately adjoining car whereby said load can be transferred to said adjoining car by said conveyor means upon an adjustment of said coupling means to reduce the

spacing between said body and the body of said adjoining car sufficiently to have said second end overlie said proximal end.

2. A train for the transportation of bulk goods, comprising a plurality of aligned cars each with support means and an elongated upwardly open body pivotably mounted on said support means for swinging about a horizontal axis, said body having a substantially closed rear end and an at least partly open front end; adjustable coupling means between said cars interconnecting the respective support means thereof with variable spacing of their adjoining ends; conveyor means extending longitudinally along the floor of said body; drive means for operating said conveyor means for transportation of a load from said rear end to said front end; and mechanism operable to tilt said body about said axis to an extent sufficient to lift said front end above the level of the rear end of an immediately preceding car whereby said load can be transferred to said preceding car by said conveyor means upon an adjustment of said coupling means to reduce the spacing between said body and the body of said preceding car sufficient to have said front end overlie the rear end of said preceding car.

3. A train for the transportation of bulk goods, comprising a plurality of aligned cars each with support means and an elongated upwardly open body pivotably mounted on said support means for swinging about a horizontal axis, said body having a substantially closed rear end relatively close to said axis and an at least partly open front end relatively remote from said axis; adjustable coupling means between said cars interconnecting the respective support means thereof with variable spacing of their adjoining ends; conveyor means extending longitudinally along the floor of said body; drive means for operating said conveyor means for transportation of a load from said rear end to said front end; and mechanism operable to tilt said body about said axis to an extent sufficient to lift said front end above the level of the rear end of an immediately preceding car whereby said load can be transferred to said preceding car by said conveyor means upon an adjustment of said coupling means to reduce the spacing between said body and the body of said preceding car sufficient to have said front end overlie the rear end of said preceding car.

4. A train for the transporting of bulk goods, comprising a plurality of aligned cars each with a front bogie, a rear bogie and an elongated upwardly open body pivotably mounted on said rear bogie for swinging about a horizontal axis, said front bogie having a substantially closed rear end and an at least partially open front end; bracing means adjustably supporting said body of said front bogie for varying the elevation of said front end whereby said body is tiltable about said axis; conveyor means extending longitudinally along the floor of said body; drive means for operating said conveyor means for transportation of a load from said rear end to said front end; and adjustable coupling means connecting said front bogie with the rear bogie of an immediately preceding car, said bracing means and said coupling means being operable to elevate the said front end above the rear end of said preceding car and to reduce the spacing between the cars sufficiently to have said front end overlie the rear end of said preceding car whereby upon operation of said drive means said load is transferred to said preceding car by said conveyor means.

5. A train for the transporting of bulk goods, comprising a plurality of aligned cars each with a front bogie, a rear bogie and an elongated upwardly open body pivotably mounted on said rear bogie for swinging about a horizontal axis, said front bogie having a substantially closed rear end projecting rearwardly beyond said rear bogie and an at least partially open front end projecting forwardly beyond said front bogie; bracing means adjustably supporting body of said front bogie for varying the elevation of said front end whereby said body is tilt-

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able about said axis; conveyor means extending longitudinally along the floor of said body; drive means for operating said conveyor means for transportation of a load from said rear end to said front end; and adjustable coupling means connecting said front bogie with the rear bogie of an immediately preceding car, said bracing means and said coupling means being operable to elevate the said front end above the rear end of said preceding car and to reduce the spacing between the cars sufficiently to have said front end overlie the rear end of said preceding car whereby upon operation of said drive means said load is transferred to said preceding car by said conveyor means.

6. A train as defined in claim 5 wherein said conveyor means comprises an endless band.

7. A train as defined in claim 5 wherein said bracing means comprises a fluid-operated jack.

8. A train for the transportation of bulk goods, comprising a prime mover and a plurality of aligned cars linked with said prime mover, each of said cars being provided with supporting means and an elongated upwardly open body pivotably mounted on said frame for swinging about a horizontal axis, said body having a substantially closed first end and an at least partly open second end; adjustable coupling means between said cars interconnecting the respective support means thereof with variable spacing of their adjoining ends; conveyor means extending longitudinally along the floor of said body; drive means for operating said conveyor means for transportation of a load from said first end to said second end; mechanism operable to tilt said body about said axis to an extent sufficient to lift said second end above the level of the proximal end of an immediately adjoining car whereby said load can be transferred to said adjoining car by said conveyor means upon an adjustment of said coupling means to reduce the spacing between said body and the body of said adjoining car sufficiently to have said second end overlie said proximal end; and control means on said prime mover for so operating said mechanism and adjusting said coupling means.

9. A train as defined in claim 8 wherein said control means includes a source of high-pressure fluid.

10. A method of loading a train of cars with elongated and upwardly open bodies, said bodies being provided with conveyor means for the transportation of goods from said closed to said open end, the bodies of said cars being spaced apart during travel between stations,

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comprising the following steps upon arrival of the train at a loading station:

- (a) tilting each car except, at most, the last car at one end of the train into a position in which an open end of the car body, facing said one end of the train, is elevated above a closed end of the body of an immediately adjoining car;
- (b) reducing the spacing between cars until the elevated open ends of all cars other than said last car overlie the closed ends of the respectively adjoining cars;
- (c) operating the conveyor means of all said cars; and
- (d) charging the first car of the train with goods to be loaded onto the train whereby said goods are successively transported by said conveyor means up to said last car with distribution of the goods over all the cars of the train.

11. A method of unloading a train of cars with elongated and upwardly open bodies, said bodies being provided with conveyor means for the transportation of goods from said closed to said open end, the bodies of said cars being spaced apart during travel between stations comprising the following steps upon arrival of the train at an unloading station:

- (a) tilting each car except, at most, the last car at one end of the train into a position in which an open end of the car body, facing said one end of the train, is elevated above a closed end of the body of an immediately adjoining car;
- (b) reducing the spacing between cars until the elevated open ends of all cars other than said last car overlie the closed ends of the respectively adjoining cars; and
- (c) operating the conveyor means of all said cars whereby goods carried on all said cars are successively discharged from the train by way of said last car.

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