United States Patent

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[54] **SHUTTLE TRAIN**
5 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **214/38,**
198/92, 214/83.36
[51] **Int. Cl.** **B65g 67/10,**
B65g 15/22
[50] **Field of Search** 214/38,
38.2, 83.36; 198/92

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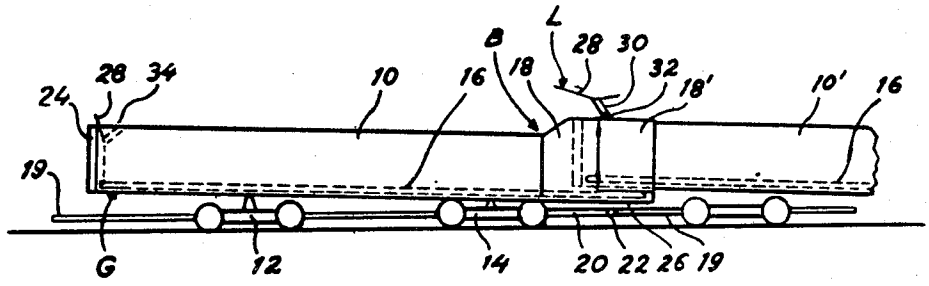
ABSTRACT: A shuttle train consists of a plurality of cars, each car having a conveyor extending along the entire length of the car and inclined toward its rear end, each car further having a widened rear end adapted to receive the front end of the following car, so that the cars can be telescoped one into the other, the conveyors partially overlapping each other and cooperating with separating walls having projections slidable along the upper edge of the car body.



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SHEET 1 OF 2

Fig. 1

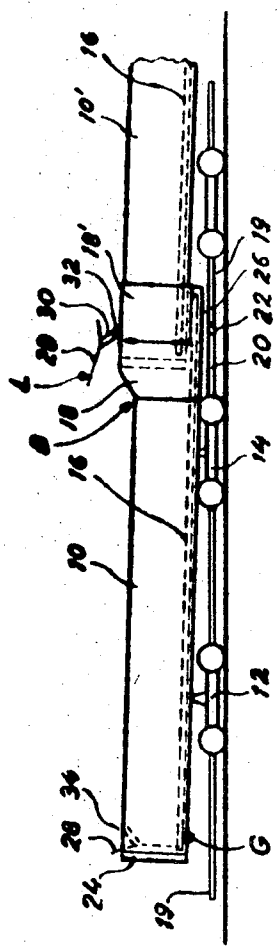


Fig. 2

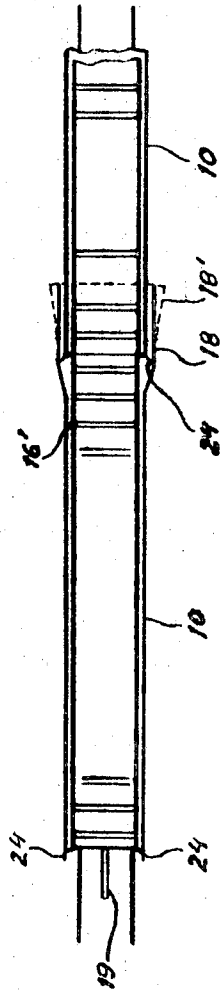
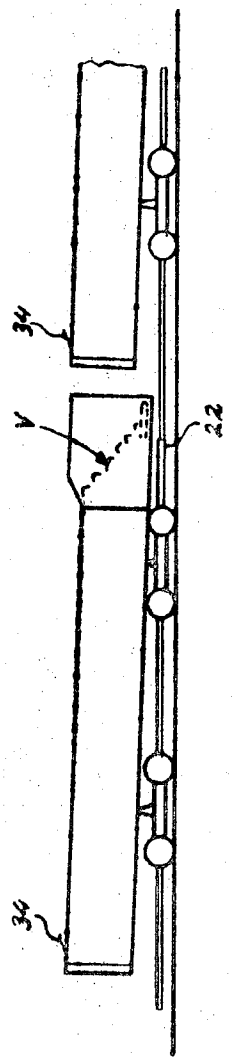


Fig. 3



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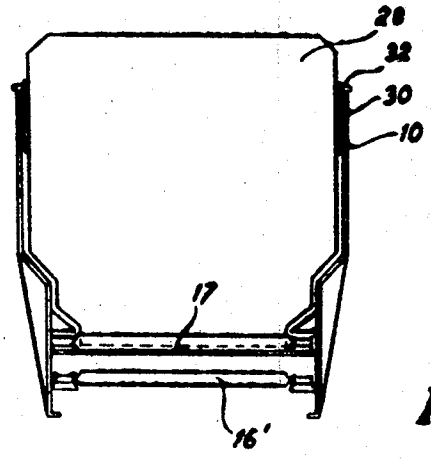

Fig.4

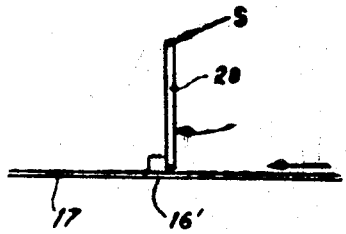

Fig.5

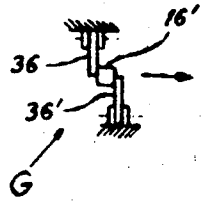

Fig.6

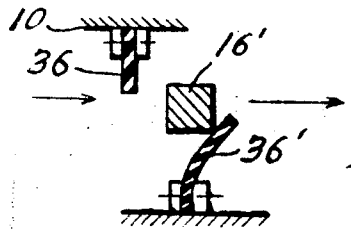

Fig.6a

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SHUTTLE TRAIN

This invention refers to a shuttle train. The invention is particularly concerned with a shuttle train having a plurality of cars each of which is provided with a conveyor extending the entire length of the car. The cars can be spaced one from the other or they can be moved into a position in which they are telescoped one into the other.

Cars of this type are known in prior art. However, known cars have the drawback that the front ends of the cars must be raised before loading and unloading and that the cars must be lowered after the loading and unloading have been completed. Practical experience has shown that these raising and lowering operations increase the manufacturing costs to a substantial extent and that they consume a substantial amount of time, so that the speed of operation of a train is greatly lowered.

An object of the present invention is to eliminate these drawbacks of existing constructions through the provision of a shuttle train which does not require the raising and lowering operations.

Other objects will become apparent in the course of the following specification.

In the accomplishment of the objectives of the present invention it was found desirable to provide a conveyor extending with a constant inclination from the front end of a car to the rear end thereof, the car body having a widened portion at its rear end which can telescope with the front end of the following car, so that the material from the rear car can be forwarded to the front car. The conveyors partially overlap each other and are adapted to cooperate with separating walls which at their upper ends are provided with projections slidable along the upper edge of the car body. The lower ends of the separating walls abut against driving pins provided in the conveyor.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings, showing, by way of example only, a preferred embodiment of the inventive idea.

In the drawings:

FIG. 1 shows diagrammatically in side view a portion of a shuttle train of the present invention in a loading position;

FIG. 2 is a top view of the train shown in FIG. 1;

FIG. 3 shows the same train in the driving position;

FIG. 4 is a transverse section through the middle of a car body on an enlarged scale;

FIG. 5 is a diagrammatic partial side view showing the separating wall of a car body; and

FIG. 6 is a diagrammatic partial section showing driving pins engaged by rubber strips.

FIG. 6*a* is similar to FIG. 6 but shows the parts in a different position.

The drawings show a car body **10** constituting a part of a shuttle train and having a front and a rear bogie **12, 14**. Each car body has a belt conveyor **16** arranged in a slightly inclined position so that the front end of the belt conveyor of each car in the loading or unloading position of the train can be guided over the rear end of the belt conveyor of the preceding car as shown in FIG. 1. For example, the angle of inclination may be about 1.5° while the length of the upper conveyor belt may be about 11 meters. The upper part of the conveyor belt slides along the bottom **17** of the car body, as shown in FIG. 4.

In order to provide telescoping of the car bodies into and out of each other the rear end **18** of each car body is somewhat wider than the remaining part of car body and also to a small degree higher, so that a jut will result. Thus there is the advantage that the entire width of the car essentially remains unchanged along the entire train and that there is the possibility to telescope the cars without raising them. The conveyor belts **16** are driven each by itself by means of compressed air motors, electromotors or hydraulic motors (not shown). In order to move the cars from the driving position to the loading and unloading position respectively, namely to telescope the car bodies, one bogie, for example, the front bogie **12** is provided with a coupling rod **19** while the other

bogie **14** is provided with a coupling sleeve **20** so that the coupling rod **19** can be introduced into the sleeve **20** and locked in either loading and unloading position respectively, in which the rod **19** is set far into the sleeve **20**. However, in the driving position shown in FIG. 3, the rod **19** is inserted into the sleeve **20** only by a length which is sufficient for locking the coupling by means of a crossbar **22** which extends through both the sleeve and the rod. Obviously, the coupling rod **19** can be shaped as a tube.

At its front end the edge of each car body is provided with two vertical swingable flaps **24**, the purpose of which is to close the space between the two car bodies **10** and **10'** when they are telescoped into each other, as shown in FIGS. 1 and 2, so that the material to be transported is prevented from falling into this space and being squeezed therein. When the material is moved by means of the conveyor belt from one of the cars over to the preceding car, the flaps **24** are swung by the action of the material to abut against the inside of the end walls **18** of the preceding car. The flaps **24** are spring-biassed so that they are returned automatically to the driving position (left side of FIG. 2) when the cars are moved apart from the position of FIG. 1 to the position of FIG. 3.

Furthermore, the wider portion **18** at the rear side of the car body is provided with a swinging flap **18'** which can be moved outwardly to a slight extent to the position shown by broken lines in FIG. 2, in order to enable loading and unloading when the cars stand in a curve. The flaps **18'** may be actuated manually by means of a mechanism **26** comprising a screw spindle provided with a hand wheel placed under the flap and the jut. However, the flaps **18'** may be also operated by means of a hydraulic or air cylinder or by some other suitable means.

As the cars are being drawn apart after the loading operation, a device must be provided for preventing the material from falling out of the front end of the rear car at the passage between the two coupled cars. For this purpose there is arranged a follower plate **28** which, according to FIG. 4, forms a separating wall within the load space of the car body and which at its two side edges has arms **30** provided at their outer ends with projecting pivots **32** resting on and slidable along the upper edges of the car body. At the front end of the cars and on the upper edge of the car body there are arranged clawlike stop pieces **34** for cooperation with the pivots **32** when the separating wall **28** is in its front end position.

The operation of the separating wall **28** is as follows:

Let it be assumed that the train consists of the two cars **10** and **10'** shown in FIG. 1. Before the starting of the loading operation at the rear end of the rear car **10'**, the separating wall **28** of the preceding car is moved to the right to the point B, the lower end of the separating wall **28** according to FIG. 5 abutting from the right against driving pins of the conveyor belt (position S) so that the separating wall cannot swing clockwise. The separating wall **28** of the rear car **10'** is also moved to point B where it assumes the position S. The material to be transported now is loaded on the rear end of the rear car **10'** against the separating wall and is gradually moved to the left by means of the conveyor belt **16**. When the pivots of the separating wall are caught by the stop pieces **34**, the separating walls are swung clockwise by the action of the material into the position L, whereby the wall **28** in raised position will not hinder the movement of the passing material. The material now is piled behind the separating wall **28** of the front car **10** which is in the position B. When the loading operation continues, the separating wall **28** of the front car will be moved to the position shown in FIG. 1. After having finished the loading operation, the cars are drawn apart to the driving position. Then the separating wall **28** of the rear car **10'** will swing down to close the front end of this car while a declining slip angle V (FIG. 3) is formed at the rear end of the front car **10**. After this the train leaves for the discharge station. Naturally, the number of cars can be more than two shown in the example.

When the material to be transported has particles of small size, for example sand, there is the danger that this material

will be drawn back by the driving pins 16' of the conveyor belt at the front end of the car, so that the space between the cars can be packed and the material can fall down on the rails. In order to prevent this, stationary rubber strips 36, 36' (FIG. 6) are provided for the driving pins 16' of the lower part of the conveyor belt behind the front end thereof at such a level that the driving pins 16' bend away the rubber strips 36, 36' to be able to pass; thus the material is stopped and will fall down on the conveyor belt of the front car which will move this material forward in the correct direction. It is thus apparent that a rubber strip 36 is secured to the bottom of the car body 10, while the other rubber strip 36' is secured to the under edge of the car body 10. The conveyor pins 16' moves from the front end of the car body 10 to the rear end thereof as indicated by the arrow. All particles remaining on the pin 16' when it has reached the strips 36, 36' are removed by the action of these strips and will drop upon the conveyor of the car in front.

I claim:

1. A shuttle train having a plurality of cars, each of said cars comprising a car body having a front end and a rear end, a conveyor extending between said ends and being inclined downwardly toward the rear end, said rear end having a widened portion adapted to receive the front end of another car, the conveyors of two adjacent cars having overlapping end portions, separating walls swingably mounted upon said car body adjacent the ends thereof, arms carried by said walls, pivots carried by said arms and slidable along the upper edges of said car body, and pins carried by said conveyor and adapted to engage the lower portions of said walls.

2. A shuttle train in accordance with claim 1, wherein the wall located adjacent the front end of the car is swingable to a substantially horizontal plane.

3. A shuttle train in accordance with claim 1, comprising vertical flaps swingably mounted adjacent the front end of the car body.

4. A shuttle train in accordance with claim 1, comprising flaps mounted upon the widened rear end portion of the car body and swingable outwardly relatively to the car body.

5. A shuttle train in accordance with claim 1, comprising rubber strips connected to said car body and adapted to engage said pins.