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GB 976543
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(54) Freight Transporter with Load Shifting Mechanism

(57) A freight transporter is disclosed herein which includes a load support (18) which has a load support face (20) arranged to underlie and support load units during transportation thereof and a carrage (26) which has a load carrying face (38). An elevator mechanism is provided for adjusting the relative positions of the load carrying face 38 of the carriage and the load support face 18 of the load support so that the load units may be selectively supported by the load support means or the carriage. When the load units are supported by the carriage, they may be moved with the carriage along the freight transporter and when supported by the supports, they are suitably supported for transportation by the transporter.

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

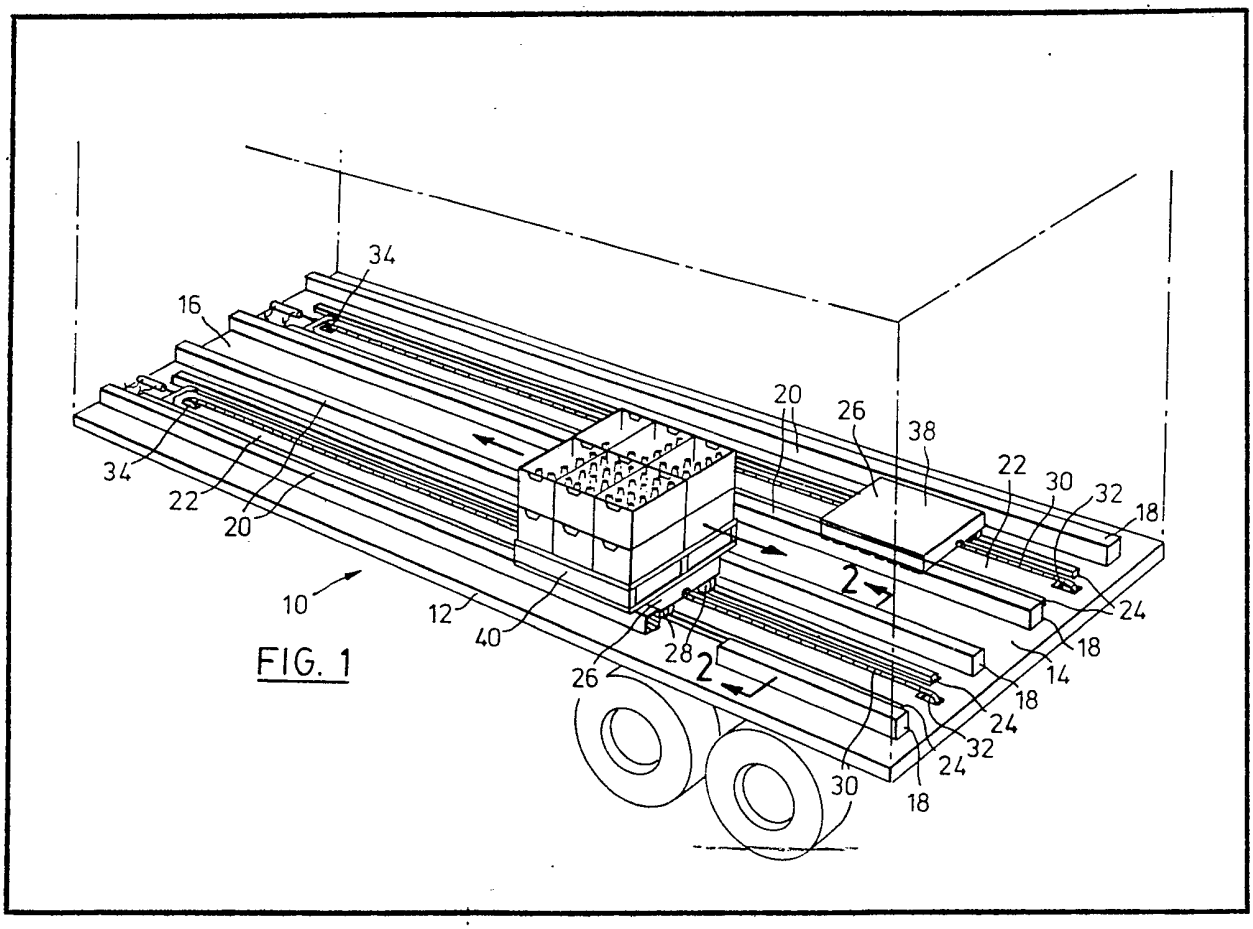

FIG. 1

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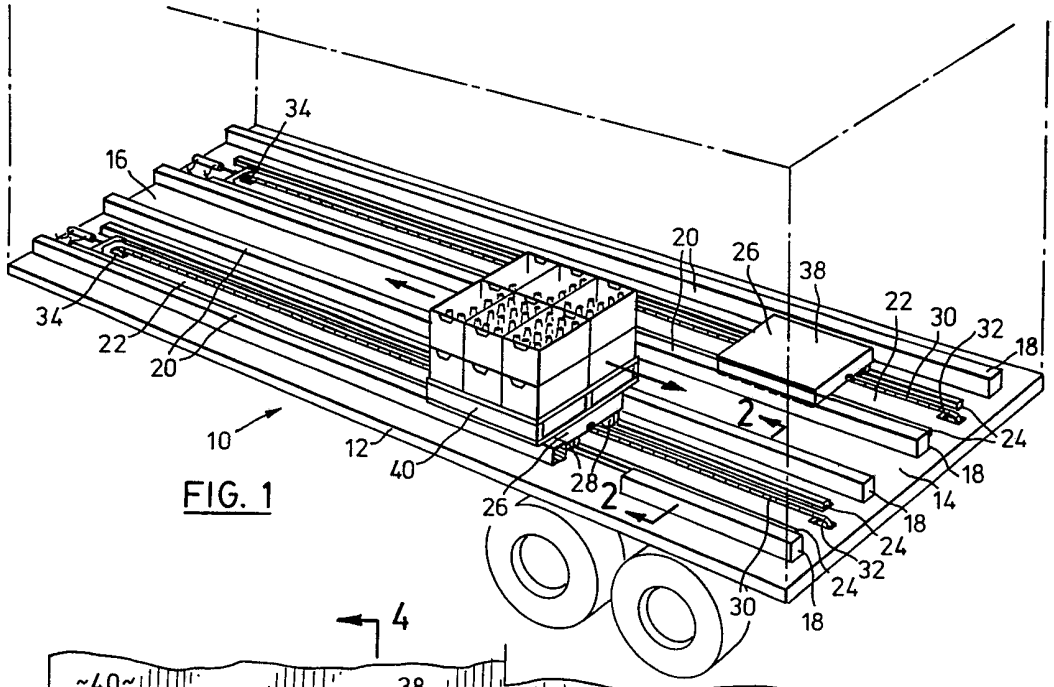

FIG. 1

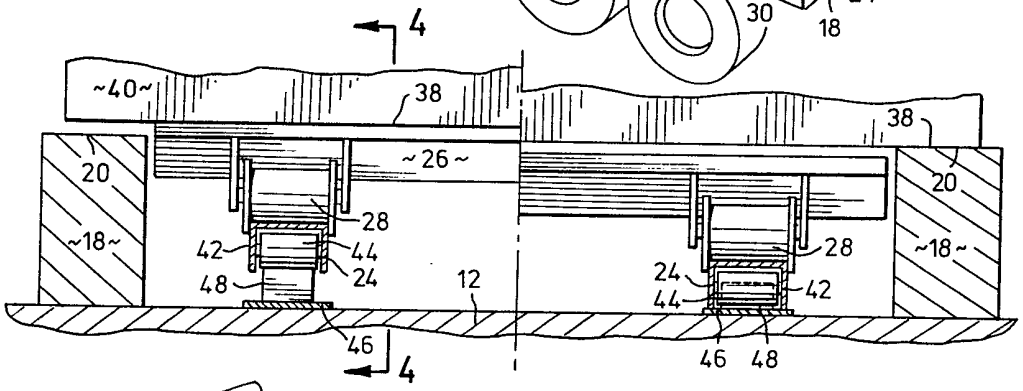

FIG. 2

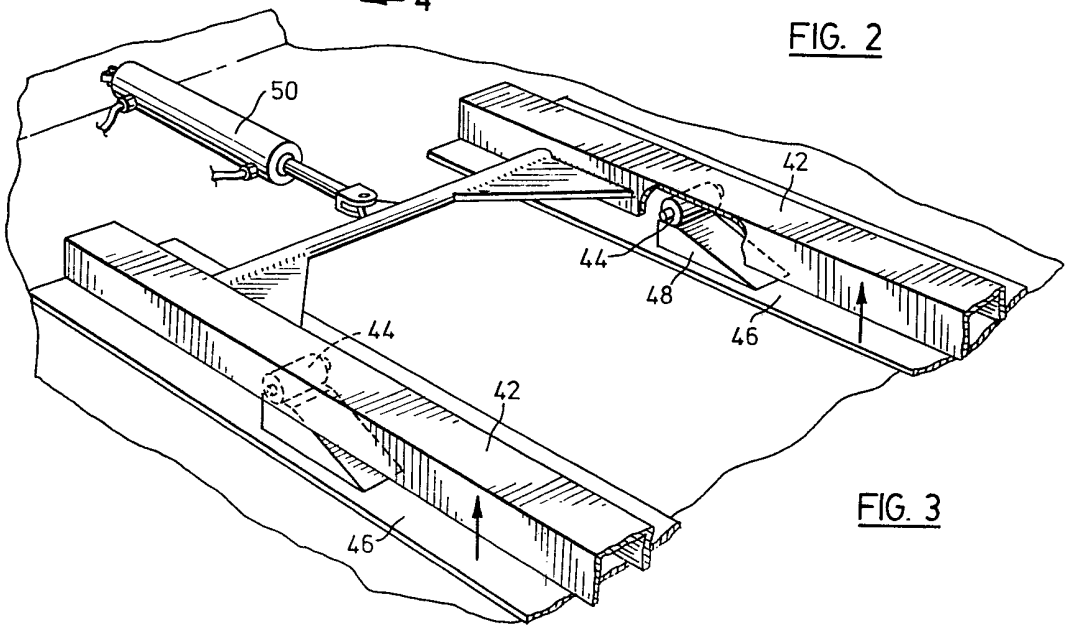

FIG. 3

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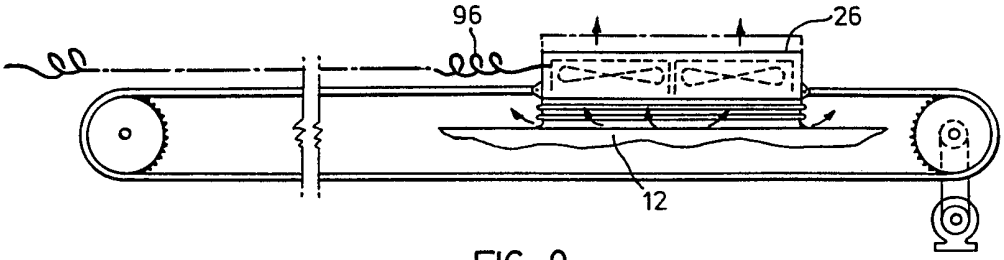

FIG. 9

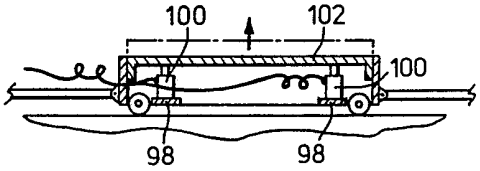

FIG. 10

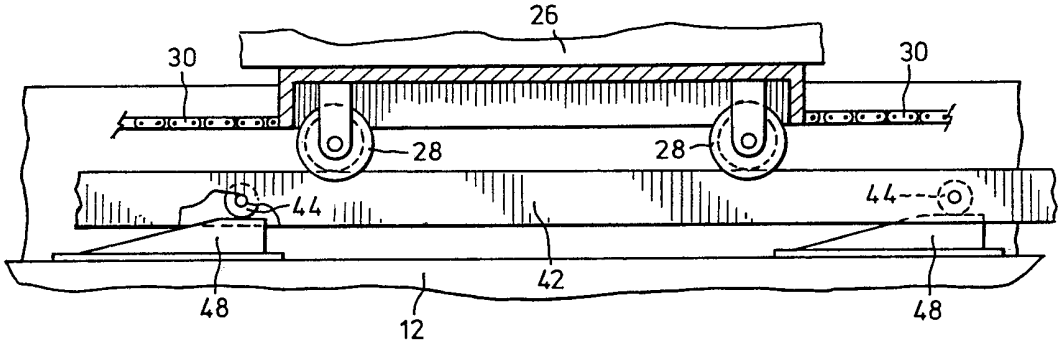

FIG. 4

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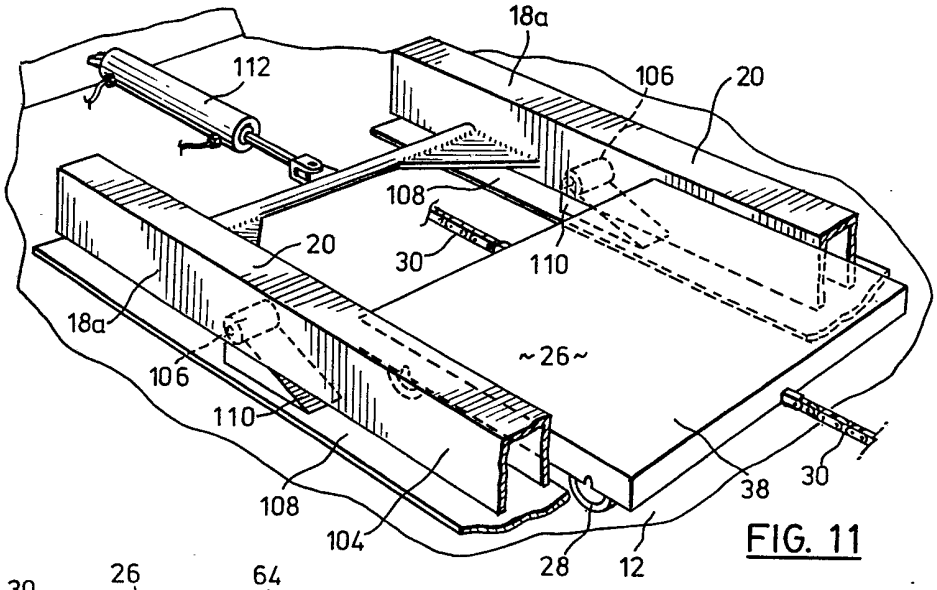

FIG. 11

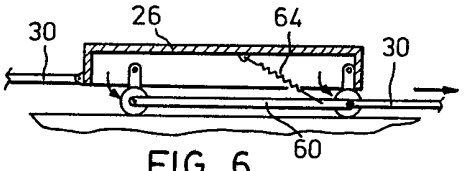

FIG. 6

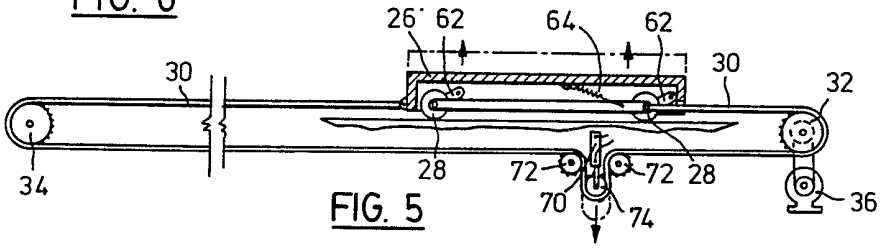

FIG. 5

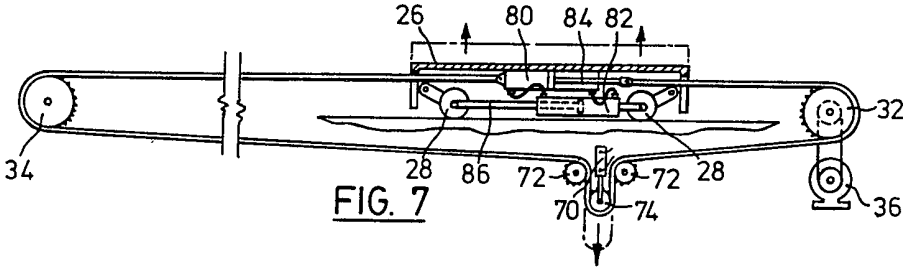

FIG. 7

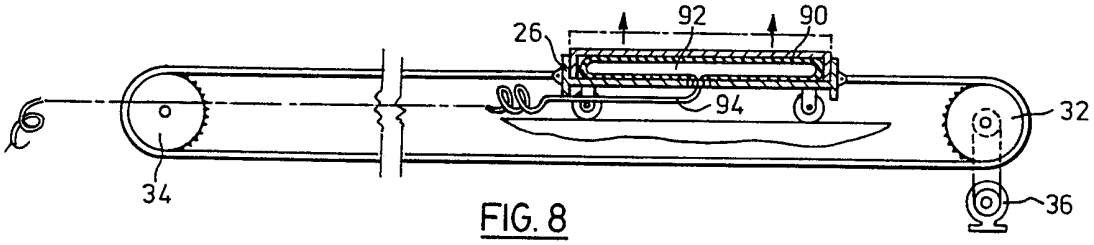

FIG. 8

SPECIFICATION

Freight Transporter with Load Shifting Mechanism

This invention relates to freight transporters. In particular, this invention relates to load shifting mechanism incorporated in a freight transporter.

In the transportation of freight on trucks, trains, aircraft and ships, considerable difficulty has long been experienced in moving load units toward and away from the loading end.

In transport trucks, it has been common practice to provide a roller conveyor extending along the bed of the truck along which load units may be rolled so as to be moved toward and away from the loading end. Such conveyors do, however, permit the load to shift during transportation and this can create a serious hazard during acceleration and deceleration of the transporter.

The present invention overcomes the difficulties of the prior art and provides a simple and efficient mechanism which enables load units to be moved toward and away from the loading end of the transporter.

To achieve the required movement of load units, a carriage is provided which can be driven along a loading path extending inwardly from the loading end of the transporter and elevator means is provided which permits adjustment of the height of the carriage relative to the load supporting face of the transporter so that loads may be selectively supported by the load supporting face of the transporter or the carriage. The elevator means may be such that the relative movement is achieved in a number of different ways. One such way is to provide a mechanism which will permit adjustment of the height of the carriage so that by adjusting the height of the carriage the load carrying face thereof may be raised or lowered.

In an alternative construction, the carriage may ride on support rails, the support rails being height-adjustable so as to raise and lower the carriage. In yet another alternative, the load support means of the freight transporter may be height-adjustable so as to raise and lower load units out of and into engagement with the carriage.

According to one aspect of the present invention, a freight transporter for use in transporting load units comprises a load support means on the transporter, said load support means having a loading end for receiving load units and a load support face extending inwardly from said loading end in a loading path, said load support face being disposed in a substantially horizontal plane to underlie and support load units during transportation thereof, a carriage located on said transporter proximate said load support means for movement relative to said load support means in said loading path, said carriage having a load carrying face, elevator means for adjusting the relative positions of the load carrying face of said carriage and said load support face between a first position and a second position, in said first position of said elevator means the carriage may be moved along the loading path below and out of engagement with load units mounted on said load support means in use, and, in response to movement to said second position, a load unit initially supported by said load support means will be transferred to the carriage to be supported thereby for movement with said carriage along said loading path.

The invention will be more clearly understood after reference to the following detailed specification read in conjunction with the drawings wherein:—

Fig. 1 is a pictorial view of the interior of a freight transporter constructed in accordance with an embodiment of the present invention;

Fig. 2 is a sectional view along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged pictorial view of a portion of the elevator mechanism of Fig. 2;

Fig. 4 is a side view in the direction of the arrows 4—4 of Fig. 2;

Fig. 5 is a side view of a carriage and its elevator and drive mechanism;

Fig. 6 is a side view of the carriage of Fig. 5 in the elevated position;

Fig. 7 is a side view of a carriage and its drive mechanism illustrating an alternative elevator mechanism;

Fig. 8 is a view similar to Fig. 7 illustrating a further alternative elevator mechanism;

Fig. 9 is a view similar to Fig. 8 illustrating yet another elevator mechanism;

Fig. 10 is a side view of a carriage illustrating a still further elevator mechanism; and

Fig. 11 is a pictorial illustration of a portion of a height adjustable support rail.

With reference to Fig. 1 of the drawings, the reference numeral 10 refers generally to the container body portion of a road-going freight transporter vehicle. The body includes a bed 12 which has a loading end 14 at one end thereof and an inner end 16 at the other end thereof. Four load support beams 18 extend inwardly from the loading end 14 of the bed to the inner end 16 in a spaced parallel relationship. The beams 18 are arranged in pairs and have load support faces 20 directed upwardly therefrom. The load support faces 20 serve to support the load units during transportation thereof by the freight transporter. The beams 18 may be made from any suitable material with wood being a particularly suitable material because it will resist tendencies for the load to shift during transportation as a result of acceleration and deceleration of the transporter.

A channel 22 is formed between each pair of beams 18. A pair of height adjustable support rails 24 are located in each channel 22 and arranged one adjacent each beam 18. The height adjustable rails 24 extend over substantially the full length of the bed 12 from the loading end 14 to the inner end 16.

A carriage 26 is positioned to run in each channel 22 and has support wheels 28 mounted

for rotation thereon. The wheels 28 are arranged to run on the height adjustable rails 24. An endless drive chain 30 is provided for driving each carriage 26. The drive chain 30 has one end connected to the back end of its associated carriage 26 and the other end connected to the front end thereof. The chain 30 extends around sprockets 32 located at the loading end 14 of the transporter and sprocket 34 located at the inner end 16. The sprockets 32 are driven by a suitable drive motor 36 (Fig. 5) so as to selectively drive the carriages 26 along their respective height adjustable support rails 24 between the loading end and the inner end of the transporter.

Each carriage 26 has a load carrying face 38 which may be moved relative to the load support faces 20 of its associated load support beams 18 by activating the height adjustable rails 24. By activating the height adjustable rails 24 so that the carriage 26 is lowered, the carriage 26 may be driven along the channel 22 which forms a guide path which extends below load units 40 mounted on the beams 18. By activating the height adjustable support rails 24 to raise the carriage 26, the carriage 26 may raise any overlying load unit 40 to a level above the load supporting faces 20 so that the load unit may be transported by the carriage along the guide rail by powering the drive chain 30.

The structure of the height adjustable support rail 24 is best seen with reference to Figs. 2, 3 and 4 of the drawings to which reference is now made. Each height adjustable support rail 24 consists of an inverted channelshaped rail 42 which has a plurality of rollers 44 mounted for rotation therein at spaced intervals along the length thereof. A base plate 46 is mounted on the bed 12 directly below each channel member 42 and has a plurality of wedge shaped ramps 48 located thereon at spaced intervals along the length thereof. One such ramp 48 is arranged to be associated with each roller 44.

An expandable hydraulic cylinder 50 is located at the inner end of each rail 42. One end of the hydraulic cylinder unit 50 is mounted on the inner end of the rail 42 and the other end is secured with respect to the bed of the transporter. By activating the hydraulic cylinder 50, the rail 42 can be moved longitudinally to cause the wheels 44 to ramp up and down the ramps 48 to raise and lower the rail 42 as required in use.

In use, the carriage 26 may be initially located inwardly from the loading end of the freight transporter. A load unit 40 may be positioned by means of conventional fork-lift truck or the like resting on the load support faces 20 of a pair of beams 18 at the loading end. In order to transfer this load unit 40 inwardly, the height adjustable rails 24 are positioned in the lowered configuration and the carriage drive mechanism is activated to cause the carriage to move to the loading end and, in so doing, to pass under the load unit. When the carriage is located in the required location below the load unit, the height adjustable rails 24 are activated to be raised to raise the carriage 26 upwardly into engagement with the load unit 40 to an extent sufficient to raise the load unit 40 upwardly from the load supporting surface 20. The carriage drive mechanism is then activated to move the carriage 26, with the load 40 mounted thereon, inwardly away from the loading end to the required storage location. When the load has been transported to the required storage location, the height adjustable rails 24 are lowered causing the carriage 26 to be lowered and thereby lower the load unit 40 onto the load supporting faces 20 of the beams 18 at the required location. The carriage 26 is now free of engagement with the load unit 40 and may be returned to the loading end to receive a further load unit as required in use. The unloading operation is the reverse described above.

From the foregoing it will be apparent that the mechanism described above provides a simple and efficient mechanism for effecting relative movement between the load support face 20 of the beams 18 and the load carrying face 38 of the carriage 26. The provision of a mechanism for achieving this relative movement permits load units to be selectively supported by the load supporting means of the transporter or the carriages 26. When the load is carried by the carriages 26, it may be moved freely along the length of the transporter and when it is lowered onto the load supporting beams, it is restrained against longitudinal movement by frictional engagement with the beams.

The height adjustable support rails described in the preceding embodiment provide a particularly attractive mechanism for achieving the relative movement between the carriage and the stationary supports because the mechanism required for adjusting the height of the rails is inexpensive, simple and easy to maintain in good working order. Various other mechanisms may, however, be provided for effecting the required height adjustment between the load carrying face 38 of the carriage 26 and the load supporting face 20 of the beams 18. In one such alternative, the carriage 26 may be made height adjustable and in another alternative the support beams 18 may be made height adjustable.

Examples of height adjustable carriage are illustrated in Figs. 5 to 10 of the drawings.

As shown in Figs. 5 and 6 of the drawings, the carriage 26 has an undercarriage which includes a tie bar 60 extending between each set of wheels 28 and link arms 62 pivotally connected to the carriage frame. The link arms 62 extend parallel to one another so that the undercarriage is in the form of a parallelogram linkage. A tension spring 64 connects the undercarriage to the frame of the carriage. One end of the drive chain 30 is connected to the undercarriage and the other end thereof is connected to the frame of the carriage. A tensioning mechanism 70 is provided for applying varying tension to the drive chain 30. The tension mechanism includes a pair of fixed sprockets 72 and a moving sprocket 74. The

moving sprocket 74 is mounted on the end of a ram 76 of an hydraulic cylinder 78. By activating the hydraulic cylinder 78, the sprocket 74 may be moved between the position shown in solid lines in Fig. 5 and the position shown in broken lines in Fig. 5. To adjust the height of the carriage 26 between the position shown in Figs. 5 and 6 of the drawings, the hydraulic cylinder 78 is activated to move the sprocket 74 to the extended position shown in broken lines in Fig. 5. In so doing, increased tension is applied to the chain 30 which causes the parallelogram linkage of the undercarriage to pivot to the position shown in Fig. 6 of the drawings, thereby raising the carriage 26. The carriage 26 can be lowered simply by activating the hydraulic cylinder 78 to return to the retracted position, the tensioning spring 64 serving to cause the undercarriage 60 to pivot with respect to the carriage 26.

An alternative mechanism for raising and lowering the carriage 26 is illustrated in Fig. 7 of the drawings wherein a pair of hydraulic cylinders 80 and 82 are coupled so as to be slaves of one another. The hydraulic cylinder 80 is fixed with respect to the carriage and has a ram 84 slidable therein. The hydraulic cylinder 82 has one end connected to one of the wheel sets 28 and a ram connected to the other wheel set 28. By activating the hydraulic cylinder 78 as previously described and the embodiments illustrated in Fig. 5, the chain 30 may be extended to cause the ram 84 to move with respect to the cylinder 80 to eject hydraulic fluid into the cylinder 82 which in turn causes the cylinder 82 and its associated ram 86 to expand, thereby to move the wheel sets 28 away from one another to pivot about their pivotal connection with the carriage and thereby raise the carriage to the position shown in broken lines in Fig. 7.

Yet another mechanism for providing a height adjustable carriage is illustrated in Fig. 8 of the drawings wherein the carriage 26 has a movable platform 90 and an air bag 92 is located between the platform 90 and the frame of the carriage 26. By inflating the air bag 92 through a flexible conduit 94 from a suitable source of pressurised air, the platform 90 may be raised or lowered as required.

In a further embodiment illustrated in Fig. 9 of the drawings, the carriage 26 may be wheelless and may be in the form of a ground effect device to which air is supplied under pressure through conduit 96 to be discharged downwardly against the bed 12 of the vehicle to raise the carriage as required, the air supply being cut off or substantially reduced to permit the ground effect carriage to be lowered as required in use.

In yet another embodiment of a height adjustable carriage as illustrated in Fig. 10, the carriage includes a frame 98 upon which plurality of hydraulic jacks 100 are mounted. A platform 102 is mounted on the jacks 100 and may be raised and lowered by the jacks 100 as required in use.

As previously indicated in an alternative construction, the height of the support beams 18 may be adjusted while the height of the carriage 26 remains constant. A support beam suitable for providing height adjustment is illustrated in Fig. 11 of the drawings and is identified generally by the reference numeral 18a.

The support beam 18a includes a U-shaped channel member 104 which has a plurality of rollers 106 located at spaced intervals along the length thereof. A support plate 108 is disposed below the rail 104 and extends longitudinally thereof. A plurality of wedge shaped ramps 110 are located at spaced intervals along the length of the support plate 108 so as to underlie each roller 106. An hydraulic cylinder 112 has one end connected to the rail 104 and its other end secured with respect to the bed 12. By activating the hydraulic cylinder 112, the rail 104 may be driven longitudinally with respect to the ramps 110 causing the rollers 106 to ride up and down the ramps 110 to raise and lower the load support face 20 of the rail 104 as required in use. This mechanism is substantially the same as that described above with respect to the height adjustable support rails 24. It will be seen that by activating the hydraulic cylinder 112, the height of the load support face 20 may be adjusted with respect to the height of the load carrying face 38 of the carriage 26.

It will be apparent that the carriage 26 may be moved longitudinally of the transporter to effect movement of a load therealong regardless of the mechanism used for raising and lowering the relative positions of the surfaces 20 and 28. By the simple expedient of providing a carriage for transporting the load and a mechanism for adjusting the relative height of the position of the carriage and the load supporting surface of the transporter, it becomes a simple matter to effect movement of a load unit with respect to the transporter.

It will be apparent that the freight transporter in which the load transfer mechanism is incorporated may be any one of a number of different types of transporters including road-going trucks, air planes, railroad cars and ships.

A road-going truck is, however, a particularly convenient transporter in which to incorporate a load moving mechanism because these vehicles tend to be used for transporting load units to and from a plurality of job sites which cannot justify the expense involved in providing elaborate loading mechanisms.

Various modifications of the present invention will be apparent to those skilled in the art. For example, while in the preferred embodiment a drive mechanism is provided for driving the carriage along the loading path, the carriage might also be manually pushed. There is, however, considerable advantage to the provision of the drive mechanism in that it permits the load to be moved while the operator is out of the path of travel and not, therefore, likely to be injured by the moving load.

A further important, although not essential,

feature of the present invention is in the provision of two load transporting mechanisms arranged side by side on the transporter. The provision of the two units permits two sides of the transporter to be loaded independently and at the same time with palletised load units or the like. It will be noted, however, that the two carriages may be operated in unison in order to move full width loads along the bed of the transporter. These and other aspects of the present invention will be apparent to those skilled in the art.

The transporter may have a second load transporting mechanism located above the first mechanism illustrated in Fig. 1 such that load units may be loaded into the transporter at two levels, one above the other. The second load transporting mechanism being used to load a second load supporting platform arranged above the load of the transporter so that the full height of the container space may be utilised.

Claims

1. A freight transporter for use in transporting load units comprising:—

(a) load support means on the transporter, said load support means having a loading end for receiving load units and a load support face extending inwardly from said loading end in a loading path, said load support face being disposed in a substantially horizontal plane to underlie and support load units during transportation thereof,

(b) a carriage located on said transporter proximate said load support means for movement relative to said load support means in said loading path, said carriage having a load carrying face,

(c) elevator means for adjusting the relative positions of the load carrying face of said carriage and said load support face between a first position and a second position, in said first position of said elevator means the carriage may be moved along the loading path below and out of engagement with load units mounted on said load support means in use, and, in response to movement to said second position, a load unit initially supported by said load support means will be transferred to the carriage to be supported thereby for movement with said carriage along said loading path.

2. A freight transporter as claimed in claim 1 wherein the load support face of said load support means is disposed at a fixed height with respect to said transporter and said elevator means is in the form of means for adjusting the height of said carriage.

3. A freight transporter as claimed in claim 1 wherein said elevator means comprises height adjustable rail means mounted on said transporter and extending along said loading path, said carriage having support rails riding on said rail means such that by adjusting the height of the support rail the height of the load carrying face of the carriage may be adjusted.

4. A freight transporter as claimed in claim 1 wherein said load support means comprises height adjustable load support members for raising and lowering load units with respect to said carriage.

5. A freight transporter as claimed in claim 1, 2 or 3 including drive means for driving said carriage relative to said load support means in the direction of the loading path.

6. A freight transporter substantially as described herein with reference to and as illustrated by the figures of the accompanying drawings.

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