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(54) Railway vehicle

(57) A load carrying vehicle (e.g. a railway wagon) has a top enclosure member 2 (e.g. a roof) and side enclosure members 5. At least one of the side enclosure members 5 is pivotal for upward and outward movement relative to the top enclosure member 2 which is itself vertically moveable. Means are provided to effect opening of the side enclosure member 5 as the top enclosure member 2 is raised. Such means may comprise, for example, arms 10 on the inner side of the side enclosure members which engage against rollers 12 as the top enclosure member 2 is raised.

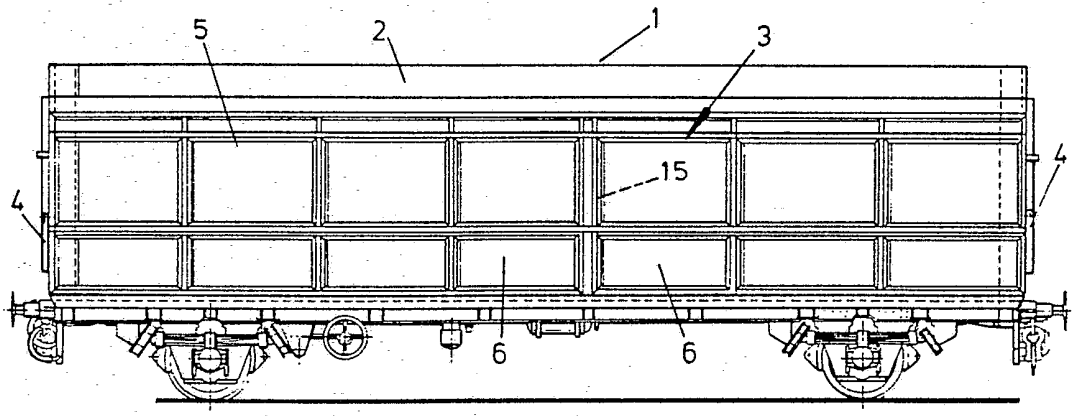

FIG 1

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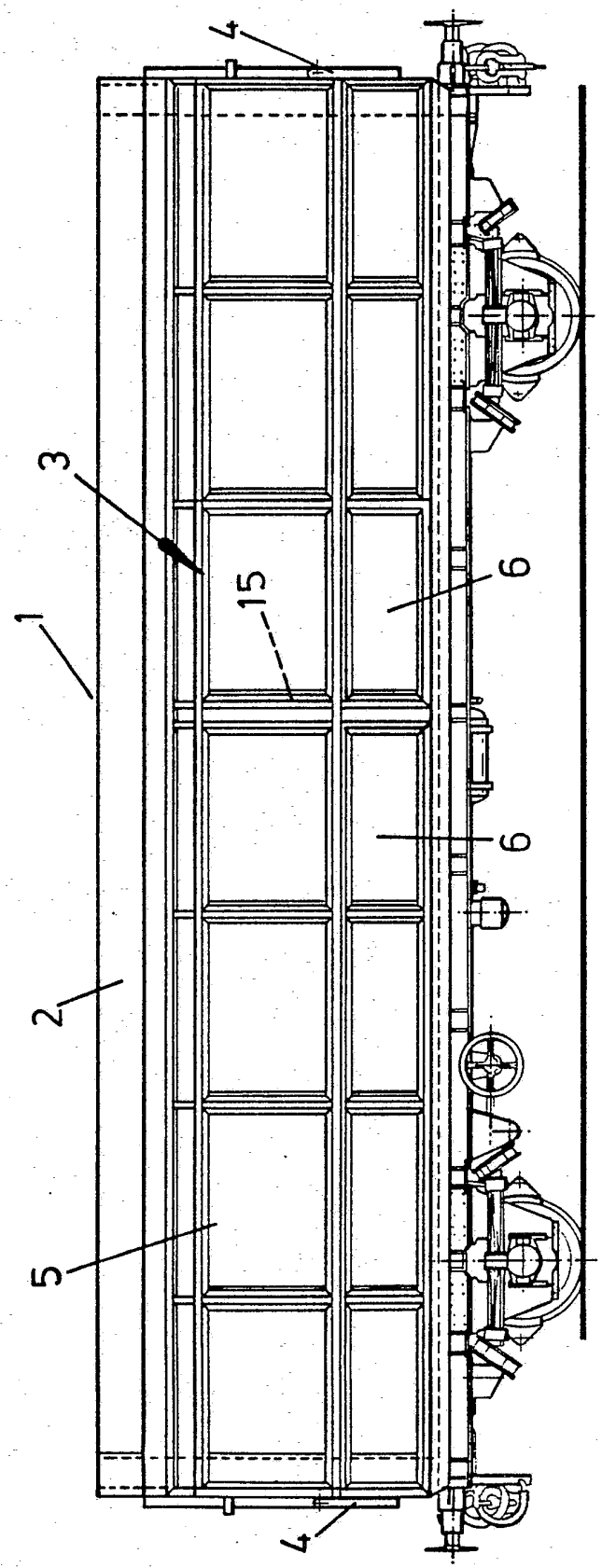

FIG.1

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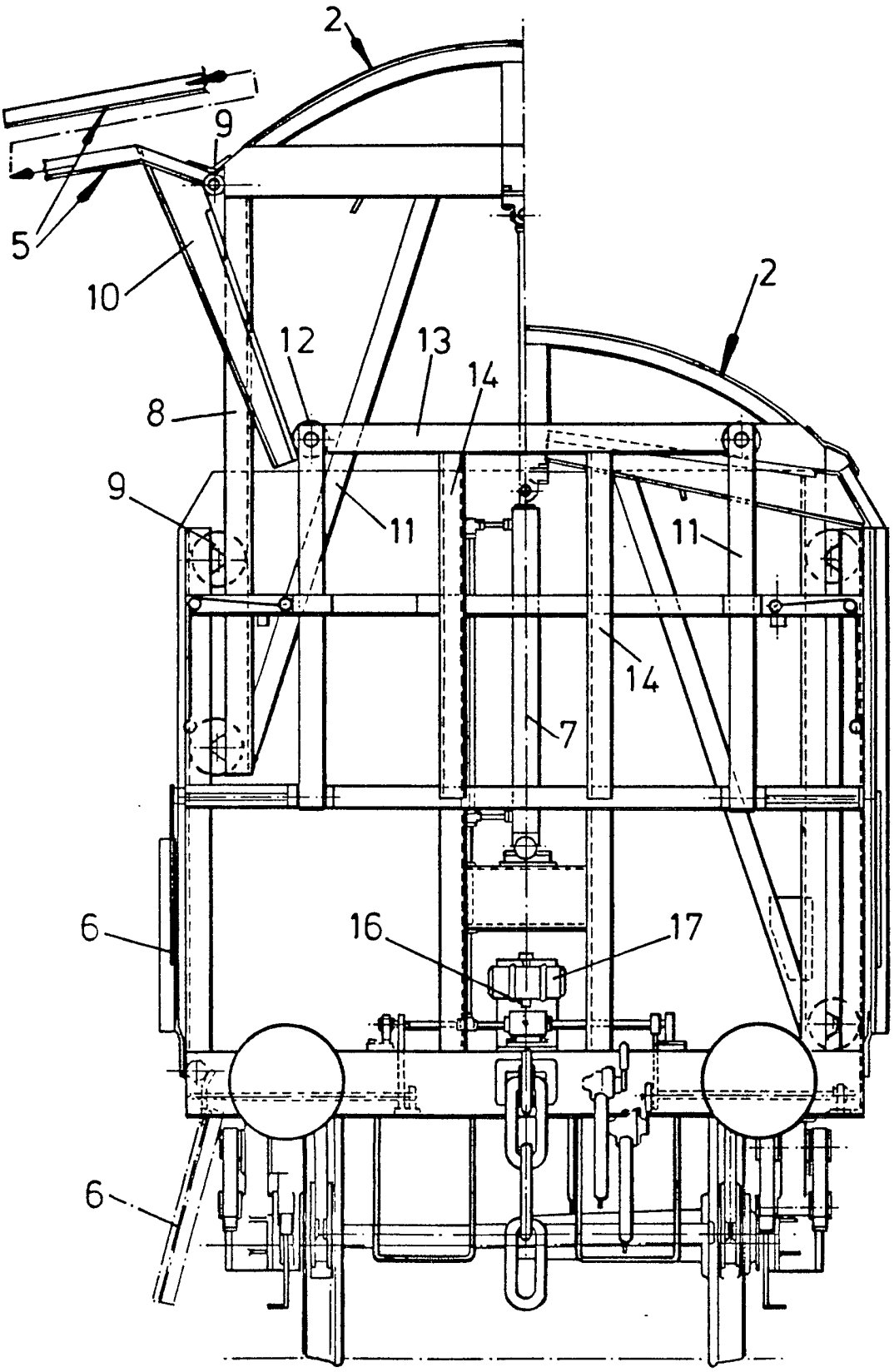

FIG. 2

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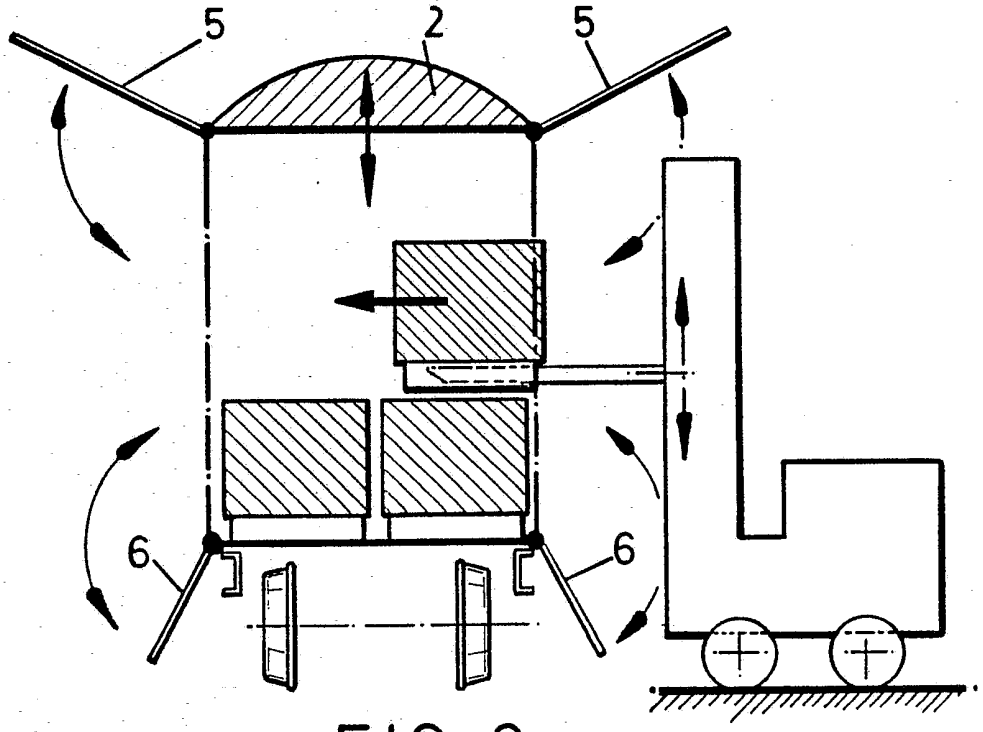

FIG. 3

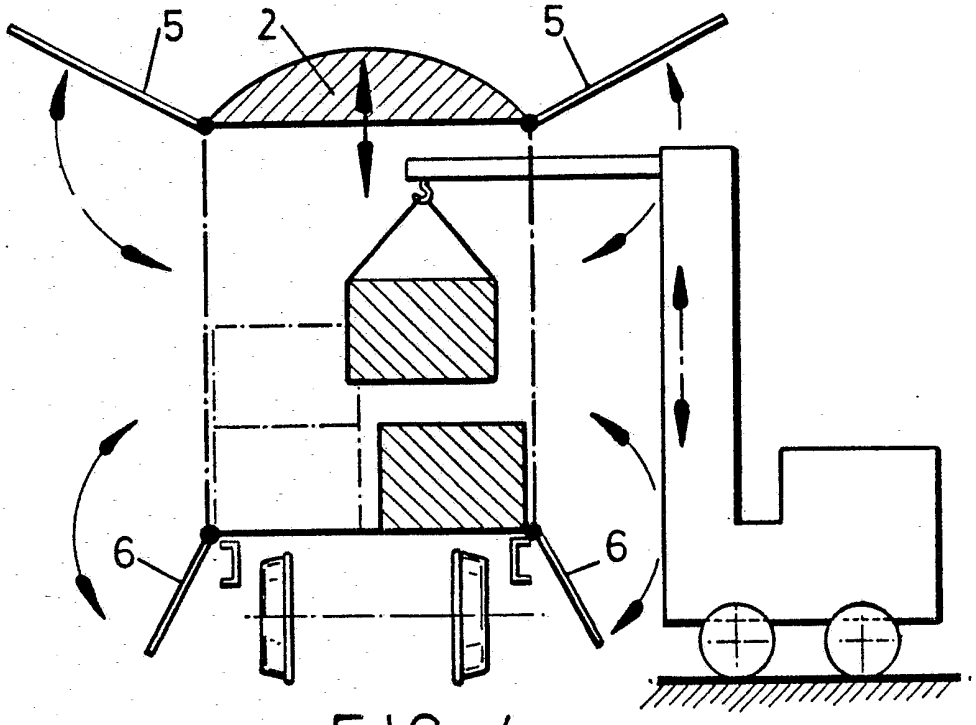

FIG. 4

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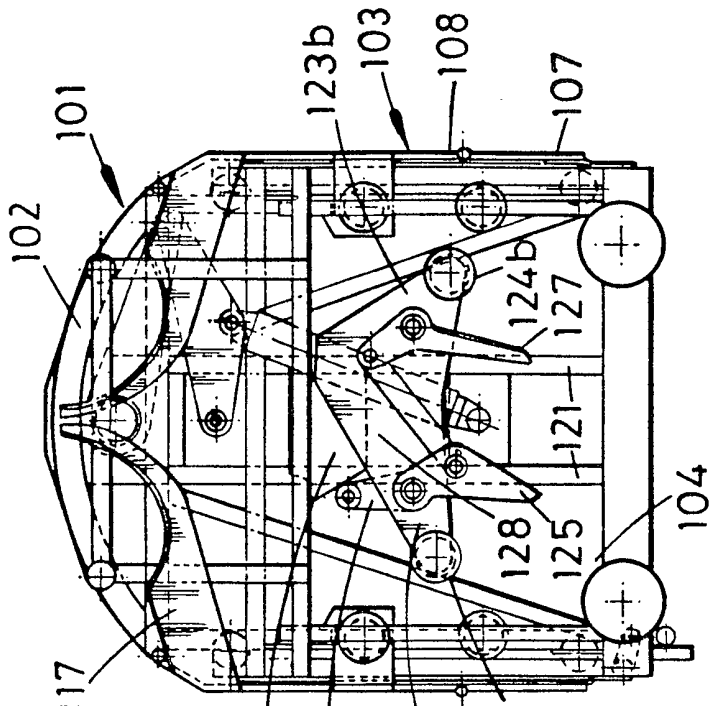

FIG. 6

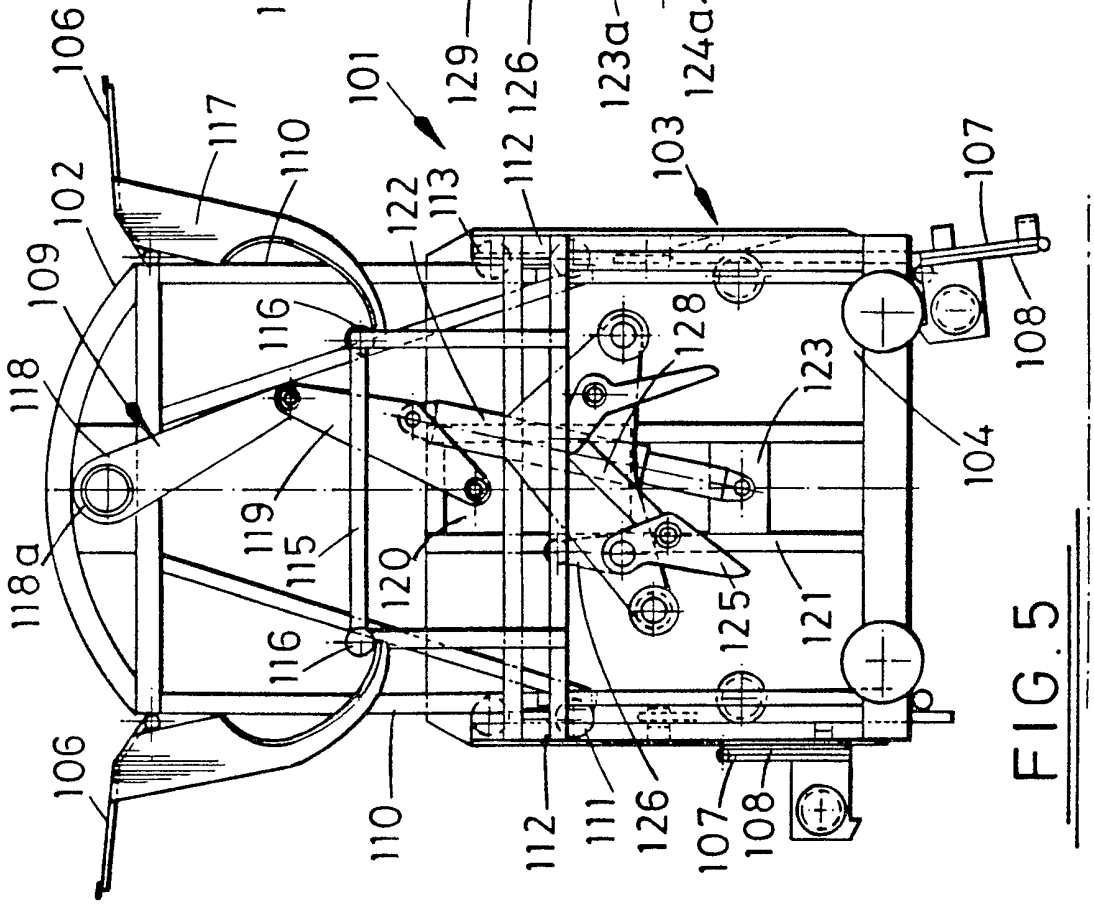

FIG. 5

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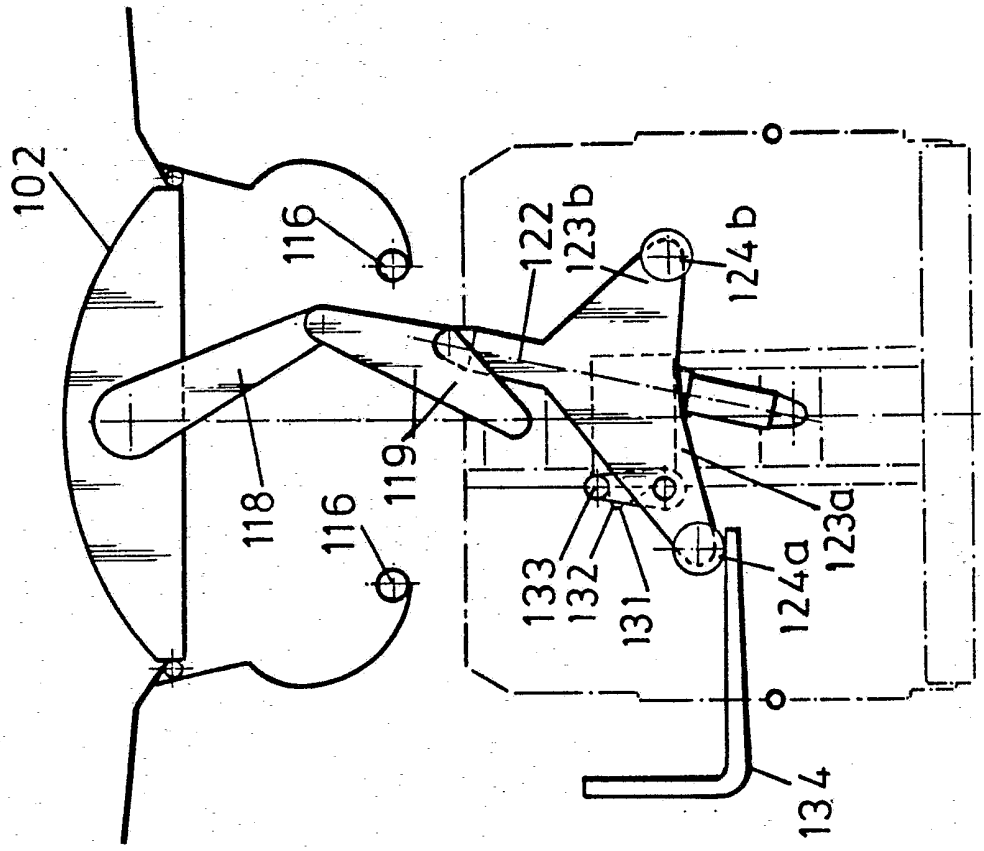

FIG.8

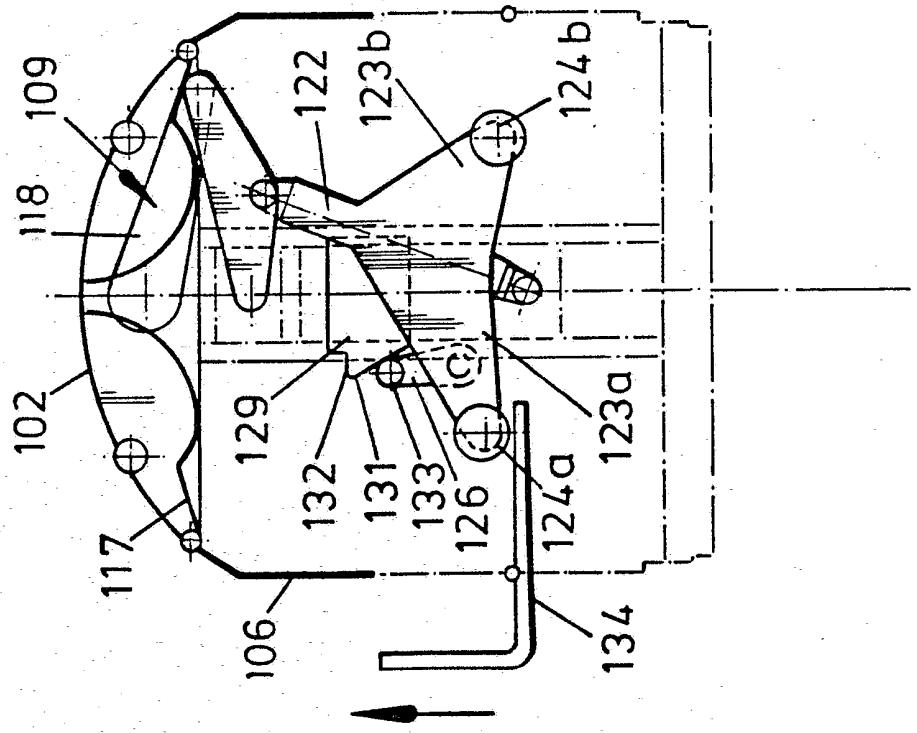

FIG.7

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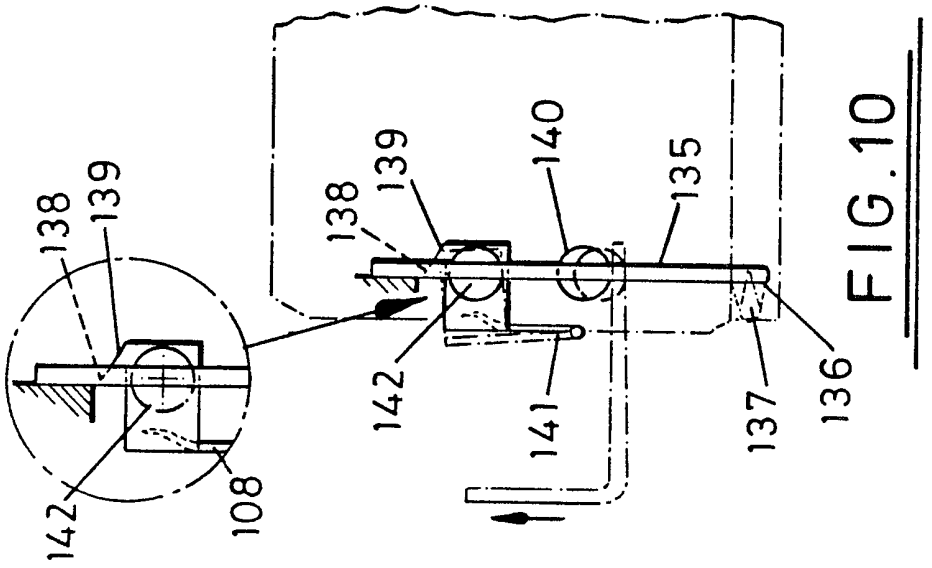

FIG.10

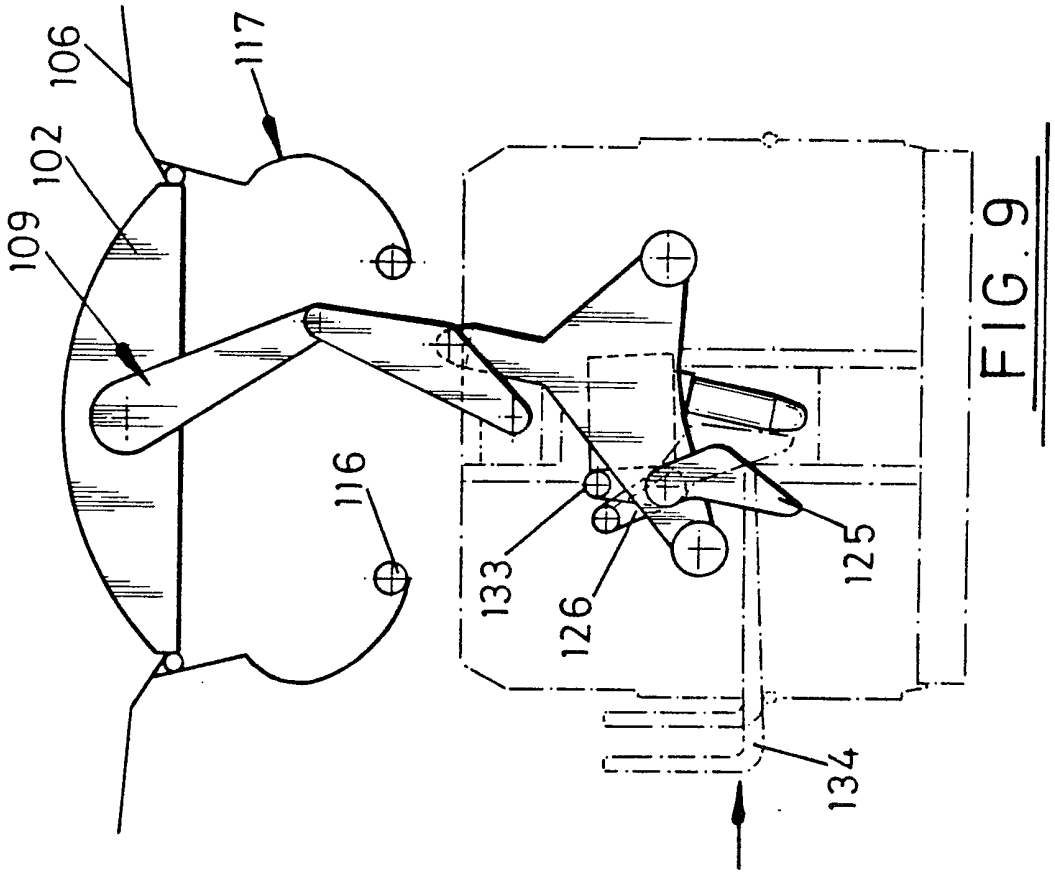

FIG.9

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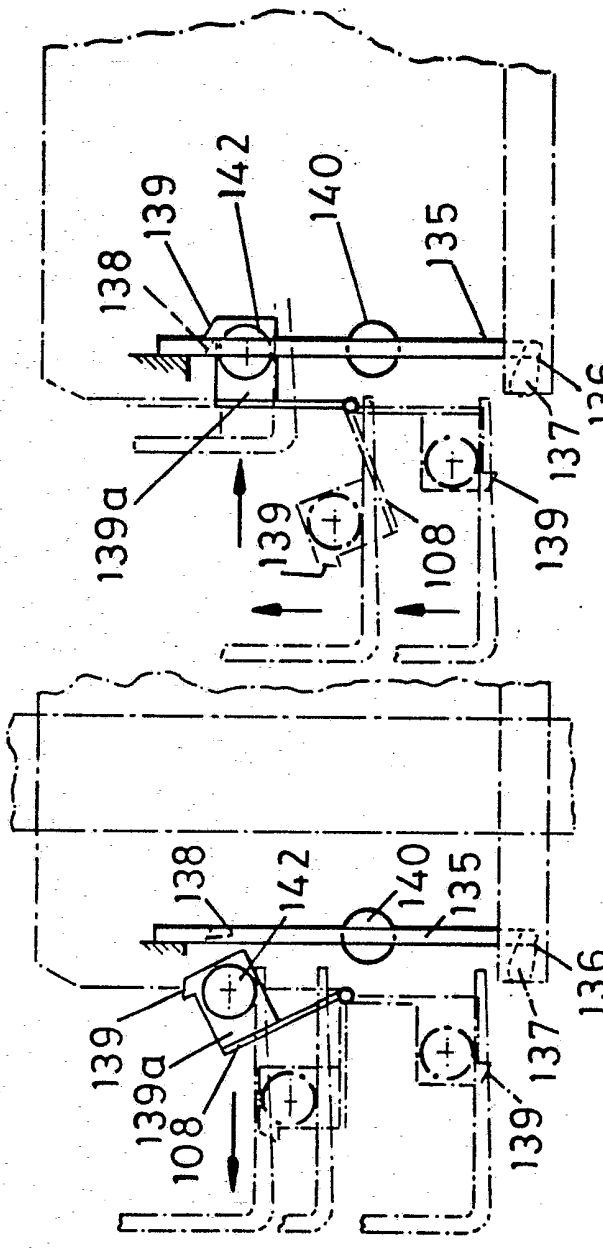

FIG.12

FIG.11

RAILWAY VEHICLE

The present invention relates to a railway vehicle.

There are various cargos carried by railway vehicles which are preferably carried in enclosed wagons so as to protect the cargo from, for example, the weather. Such cargos may, for example, be bags or sacks of powder (or granular) material which may or may not be supported by pallets when loaded in the wagon. However, not all of the load carrying space of the vehicle may be readily accessible to conventional load handling equipment so that the automatic loading equipment is hampered and manual effort is required to distribute the load throughout the wagon.

It is therefore an object of the present invention to obviate or mitigate the above mentioned disadvantage.

According to the present invention there is provided a load carrying vehicle (e.g. a railway wagon) having top and side enclosure members wherein at least one of the side enclosure members is pivotal for upwardly and outwardly swinging movement relative to the top enclosure member, the top enclosure member is vertically moveable, and means are provided to effect said swinging movement of the side enclosure member as the roof is raised.

Preferably the pivotal side enclosure member extends along substantially the length of the vehicle and preferably also over at least a substantial portion of the depth of the load carrying space.

The use of the pivotal side enclosure member may thus allow ready access to the load carrying space and load handling equipment, e.g. fork lift trucks.

Preferably also each side of the vehicle has a side enclosure member pivotal as described above upon vertical movement of the top member. Preferably means are also provided so as to allow the pivotal movement of the two side enclosure members to be effected either simultaneously or singly as desired.

Preferably the or each of the pivotal side enclosure members is pivotally mounted along a side edge of the top enclosure member and preferably also has at least one inwardly extending upper arm which engages a guide member within the vehicle whereby as the top member is raised the guide member causes the arm to effect said outward swinging movement of the side enclosure member.

The invention will be described by way of example only with reference to the accompanying drawings, in which;

Fig. 1 is a side view of one embodiment of railway wagon in accordance with the invention;

Fig. 2 is an end view of the wagon showing various internal features thereof and also illustrating the upper and lower positions of the roof;

Fig. 3 diagrammatically illustrates the loading of the wagon with palleted loads by means of a fork lift truck;

Fig. 4 schematically illustrates loading of the wagon with bags, sacks or the like.

Fig. 5 is a view of one end of a further embodiment of railway wagon in accordance with the invention and showing the roof in the raised position;

Fig. 6 is similar to Fig. 1 but showing the roof in the lowered position;

Figs. 7 and 8 are diagrammatic illustrations showing the manner in which the roof of the wagon of

Figs. 5 and 6 is raised;

Fig. 9 diagrammatically illustrates how the roof is lowered; and

Figs. 10 - 12 diagrammatically illustrate how a side door of the wagon is opened.

The railway wagon 1 shown in Fig. 1 comprises a body having a roof 2, side walls 3 and end walls 4. The side walls at each side of the vehicle each comprise an upper transome door 5 and two lower doors 6. Transome door 5 extends along the length of the body and over a substantial portion of the height thereof. The upper edge of door 5 is pivotal relative to roof 2 to allow pivotal movement of door 5 upwardly and outwardly of the vehicle (as described more fully below). The doors 6 are of comparatively low height as compared to door 5 and each extend over one half of the body length. Each door 6 is pivotal along its lower edge for pivotal movement downwardly and outwardly of the vehicle.

In the vehicle as shown in Fig. 1, roof 2 is in its "travelling" position and this is also shown in the right hand half of Fig. 2. Roof 2 may however be raised by two double acting rams 7 (only one shown) provided one at each end of the wagon to the position shown at the left hand side of Fig. 2. Roof 2 has at each end a frame 8 which co-operates with rollers 9 to guide the vertical movement of roof 2.

As shown in Fig. 2, the upper edge of door 6 is pivoted (as at 9) to the side edge of roof 2. At each of its upper inner corner, each of doors 5 has an arm (or end wing) 10 which extends, in the closed position of the door, inwardly of the wagon.

At each end of the wagon are two laterally spaced vertically extending beams 11 at the top of each of which is a respective roller 12. Each of

beams 11 is pivotal at its lower end about an axis extending laterally of the vehicle whereby each beam may be moved between a first position in which its roller 12 is co-operable with wing 10 (as later described) and a second position in which there is no co-operation.

Extending horizontally between the top ends of the two roller beams 11 at each end of the wagon is a reaction beam 13 mounted on supports 14. Reaction beam 13 is separate from roller beam 11 and roller 13 but its ends are in close proximity therewith.

Consider now that all roller beams 11 are in their first position. As the roof 2 is raised by rams 7, the upper surfaces of end wings 10 engage under the respective rollers 12. Upon continued upward movement of roof 2, the engagement of wings 10 by rollers 12 ensures that the doors 5 at each side of the vehicle open upwardly and outwardly from the position shown at the right hand side of Fig. 2 to that shown at the left hand side. It should be appreciated that there is a play in roller beams 11 allowing their top ends to move (as viewed is Fig. 2) inwardly of the vehicle as a result of the forces generated in opening doors 5. There is thus engagement with the ends of reaction beam 13 which provides a 'reaction' to allow continued door opening.

Lower doors 6 may be opened and moved to the position shown in dotted lines in Fig. 2 and it will be appreciated that there is ready access to the load carrying space of the vehicle.

If it is not wanted pivotally to open the two doors 5 simulataneously, (e.g. because of a railway vehicle on adjacent tracks) then the two roller beams 11 at one side of the wagon may be moved about their lower pivots from their first to second portions.

Straps or the like may be provided to ensure sufficient but not excessive movement to prevent co-operation between the rollers 12 and the end wings 10. Lifting of the roof 2 now only causes opening of the door at that side of the wagon at which the roller beams are in their first position.

Having thus described the general operation of the wagon, more specific features will now be described.

At each side of the wagon is a central pillar 15 over which doors 5 and 6 close. A spring-loaded interlock mechanism (operated by hydraulic rams in pillars 15) serves to maintain the doors in the closed position.

When it is desired to raise the roof 2, an air motor may be attached to a coupling at the side of the wagon. Shafts driven by the motor connect to a pump 16 and a reservoir 17. A valve (not shown) is operated to release the interlock mechanism in pillar 15 and a further valve (or second position of the first mentioned valve) is selected to release pressure into rams 7.

After a short distance of the lift (e.g. 30mm) sufficient for door 5 to clear the interlock mechanism, the wings 10 engage rollers 12 to effect pivotal door opening, as described previously.

The rams 7 are trickle fed through individually set valves to ensure slow measured lift which is equivalent at both ends of the roof. Since the valves are trickle controlled, the operator has time to switch off the control valve if it is clear that the two ends of the roof are not lifting equally e.g. due to unforseen damage or jamming.

Proximity switches automatically cut off the oil supply to the rams 7 when the roof is fully lifted

and the pressure is locked in.

For a ram stroke of, say, 1.05m (i.e. relatively small) the whole of the load space is accessible with a headroom of at least 4335mm. This allows lifting equipment to reach right into the load space.

When the wagon has been loaded, the roof is lowered by the rams 7 and this obviously results in pivotal closing of doors 5. However, a short distance (e.g. 30mm) from their fully lowered position, the free ends of wings 10 engage in slides (not shown) which initially follow the arc of movement of the ends of the wings and then allow vertical movement to allow final door closure. Additionally, tapered pegs (not shown) on the bottom of doors 5 engage apertures in lower doors 6 for final centring.

It should be noted that the wings 10 are forced sufficiently by the initial portion of the slides in which their ends locate during closure to overcome resistance from mis-placed loads so that the doors centre the load and squash them if necessary.

The interlocks are homed automatically as the doors complete closure.

Proximity switches signal completion of interlocking.

Additionally, provision may be made to prevent disconnection of the air motor until interlocking is complete.

Referring now to Fig. 3, the wagon is schematically shown in a condition in which all doors 5 and 6 are open. The case with which palleted loads may be loaded by means of a fork lift truck will be readily appreciated from this drawing.

Fig. 4 schematically shows the wagon in a condition in which the lower doors 6 are maintained

in their 'closed' position whilst doors 5 are open. In this condition, loads (e.g. in sacks or large bags) may be lowered onto the wagon by conventional lifting apparatus.

Figs. 5-12 illustrate a modified construction of wagon and its operation.

The wagon 101 of Figs. 5-12 has a roof 102 raised and lowered by the mechanism illustrated in detail in Figs. 5 and 6. The illustrated mechanism is provided at one end of the wagon (i.e. that end illustrated in Figs. 5 and 6) externally of the load carrying space and only certain components of this mechanism (as detailed below) are also included at the other end of the wagon.

The body of the wagon 101 comprises in addition to the roof 102, side walls 103 and end walls 104. Side walls 103 are themselves comprised of upper transome doors 106 (which are pivotally mounted along their upper edges on the longitudinal edges of the roof 102) and lower and upper side doors 107 and 108. These side doors open and close independently of the transome doors 106.

Roof 102 is raised and lowered by means of a scissor mechanism 109 described in more detail below. For the purpose of its guidance during the vertical movement, the roof 102 has at each of its ends (which ends overhang the end walls 104) two depending channel members 110 each with a lower roller 111. Adjacent each channel member 110, and fixed relative to the chassis of the wagon, is a respective upstanding channel member 112 with an upper roller 113. Each roller 113 locates in the associated channel member 110 and each roller 111 locates in the associated channel member 112.

Provided at each end of the wagon (externally of

the load carrying space) is a frame 114 with an upper cross-member 115. This frame 114 is fixed relative to the wagon chassis and each end of the cross-member 115 carries a respective roller 116. One of these rollers 116 is provided on the side of cross-member 115 adjacent the end wall 104 and the other is provided on the side remote therefrom.

At each of their ends the transome doors 106 have a wing 117 with a concave upper surface. The two wings at any one end of the wagon locate on opposite sides of the frame 114 so as to avoid interference with each other during the raising and lowering of the roof. In the lowered position of the roof, the concave surface of each wing 117 is a short distance vertically below a roller 116. As the roof 102 is raised a short distance, the doors 106 (with attached wings 117) are also raised but there is no opening of the transome doors 106 until the concave surface of the wing engages against the associated roller 116 at which point further lifting of the roof causes the doors 106 to swing outwardly. The concave sections of the wings 117 are designed such that there are equal angles of rotation for equal lifts.

The mechanism used for raising and lowering the roof 102 will now be described in more detail.

At each end of the wagon is a scissor mechanism 109 which comprises links 118 and 119, the former of which is pivotally connected, at one end, to the roof 102 via a torque tube 118a running the full length of the roof to an identical scissor mechanism at the other end of the wagon and, at the other end, to the link 119. Link 119 is pivotally mounted (at its end remote from link 118) on support plates 120 welded on vertical girders 121. Link 119 is of generally triangular configuration and at an apex is pivotally

connected to a spring loaded damper device 122 (function described below) the lower end of which is pivotally mounted on a plate 123 welded to girders 121. The damper device is urged to an extended position by the spring (not shown) and the internal damping arrangement resists compression of the device. The arrangement of scissors mechanism 109 and spring loaded damper device 122 is provided for each end of the wagon. At one end of the wagon (i.e. that end illustrated in Figs. 5 and 6) the damper device has a pair of wings 123a and 123b the tips of which have respective rollers 124a and 124b projecting from the faces of the wings remote from end wall 104.

Pivotally mounted on wing 123a (on the face remote from end wall 104) is a depending lever 125 which is rotationally connected through wing 123a with an arm 126. A further lever 127 is pivotally mounted on wing 123b. This lever 127 depends frrom wing 123b and, in its upper region, is connected by a link 128 to lever 125.

Mounted on the girders 121 at that end of the wagon at which the wings 123a and 123b are provided is a lock plate 129 with a sloping face 131 and a shoulder 132. Upper end of arm 126 has a roller 132 which, in the lowered position of roof 102, engages against the sloping face 131 of plate 129. Although not shown in the drawings, spring means are provided for biasing arm 126 towards plate 129.

The method by which the roof 102 is raised will now be described with reference to Figs. 7 and 8 of the drawings.

Manually operable catches (not shown) may be provided on the wagon to ensure that the roof stays in the lowered position for wagon travel and these

catches are released prior to lifting of the roof.

A fork-lift truck (not shown) approaches from the side of the wagon and positions its tine 134 under a roller 124a or 124b (depending on the side from which the track has approached the wagon). The tine 134 is then raised by the truck and causes the wings 123a and 123b to be raised thus extending the damper device 122 (Fig. 8).

The extension of the damper device is also facilitated by the spring means (mentioned above) which acts to extend the damper device. These spring means are not sufficiently powerful to raise the roof 102 of themselves but do reduce the effort required by the fork lift truck as compared to what would be required without the spring assistance.

As will be appreciated from Fig. 8, extension of the damper device 122 opens the scissor mechanism 109 to raise roof 102. The transome doors 106 open outwardly as a result of engagement of the rollers 116 with wings 117. The torsion tube 118a extends along the roof to connect links 118 to prevent crabbing or roof sagging.

During extension of damper device 122, roller 133 rides upwardly along surface 131 of plate 129. The roof 102 is raised to an "overlift" position at which arm 126 has been biased to a position such that roller 133 is above shoulder 132. Stops (not shown) prevent the roof being raised beyong the "overlift" position. From the "overlift" position, the roof is allowed to descend slightly so that roller 132 seats on shoulder 132 to hold the roof 102 in the raised position (Fig. 8).

The manner in which the roof is lowered is illustrated in Fig. 9. The tine 134 of the fork lift truck seen (in Fig. 9) approaching the wagon from the

left is moved forwardly to engage against lever 125 which thus moves anti-clockwise (as viewed in Fig. 9) about its pivot point so as to cause arm 126 to move to the position in dotted line thereby disengaging roller 133 from shoulder 132. Roof 102 is now free to descend under its own weight to its closed position. The downward movement of roof 102 is slowed by the damping device 122. During this downward movement, transome doors 106 move back under their own weight to their closed position, this movement being guided by engagement of the wings 117 against rollers 116.

If the fork lift truck approaches from the right of the wagon to lower the roof, its tine 134 engages against lever 127 which transmits its movement to arm 126 via link 128 and lever 125 so as to disengage roller 133 from shoulder 132 so that the roof 102 may then be lowered.

It will have been noted that no provision is made in this embodiment of the wagon for selectively opening only one of the transome doors, as was the case with the wagon of Fig. 1. This is because, in the embodiment of Figs. 5-12, the transome doors 116 are of significantly lesser depth than the doors 6 of Fig. 1 so that their simultaneous opening is unlikely ever to pose problems.

The reason for the comparatively small depth of doors 106 is due to the provision of the lower and upper side doors 107 and 108. The lower edge of upper door 108 is pivotally mounted on the upper edge of lower door 7 so as to be openable independently of the lower door. In its fully open position, upper door 108 has pivotted 180° so as to be in face-to-face contact with lower door 107 (see left hand side of Fig. 5). The lower door 107 may, when

desired, be moved pivotally downards so that the doors 107 and 108 together fall below the floor level of the load carrying space of the wagon (see right hand side of Fig. 5).

The upper side doors 108 are each associated with a locking mechanism which comprises for, each door 108, two vertically moveable bars 135 provided one at each end of the wagon (see Fig. 10). The two bars 135 associated with any one door 108, are each mounted on links 136 which are connected by a torque tube 137 extending the length of the wagon. The bars 135 have a catch formation 138 engaging with a complimentary catch formation 139 (see Fig. 11) on a bracket 139a on the associated door 108 when the latter is closed. Upward vertical movement of bars 135 causes the complimentary catch formations to be disengaged permitting opening of the upper door. To facilitate disengagement of the catch formations, one of the two bars 135 associated with a door 108 has a roller 140 under which the tine 134 of a fork lift truck may be positioned to effect raising of that bar 135, which vertical movement is transmitted to the other bar 135 by torque tube 137. The catch formations at each end of the door 108 are thus disengaged. A spring 141 serves to move the door 108 slightly outwardly (without falling down) so that bars 135 may be lowered (by removing the tine 134) without re-engagement of the catch formations. A roller 142 at the end of door 108 may now be engaged by the tine 134 which is used to pull the roller 142 slightly outwards so that door 108 begins to fall. Downward movement of tine 134 allows roller 142 to be lowered gently and thus permitting slow opening of door 108 (Fig. 11). Closure of door 108 is generally the reverse of the above procedure save that there is

no need positively to lift bars 135 with the tine 134 as the catch formations re-engage automatically.

If lower door 107 is also to be opened, then doors 107 and 108 should be fastened together by catches (not shown) before door 107 is lowered.

The above described arrangement of lower and upper doors 107 and 108 allows the wagon to be loaded easily with either pallets or sacks (or bags) as desired. In both cases, of course, roof 102 will be raised. For pallets, both doors 107 and 108 are open so that the pallets may be loaded easily straight onto the floor of the wagon. If bags or sacks are to be loaded, then lower door 107 is closed whilst door 108 is initially open. Bags or sacks are lowered from above the upper level of door 107 onto the floor of the wagon thus forming a first layer supported at the sides by the door 107 which aids positioning of the bags or sacks. Subsequently, doors 108 are closed and a second layer of bags or sacks loaded from above the level of door 108. The sides of this layer are, of course, supported by the doors 108, which also aids positioning of the bags or sacks.

CLAIMS

1. A load carrying vehicle having top and side enclosure members wherein at least one of the side enclosure members is pivotal for upward and outward movement relative to the top enclosure member, the top enclosure member is vertically moveable, and means are provided to effect said movement of the side enclosure member as the top enclosure member is raised.

2. A vehicle as claimed in claim 1, wherein the pivotal side enclosure member extends along substantially the length of the vehicle.

3. A vehicle as claimed in claim 1 or 2, wherein each side of the vehicle has a side enclosure member pivotally openable upon vertical movement of the top enclosure member.

4. A vehicle as claimed in any one of claims 1 to 3, wherein the or each pivotal side enclosure members are pivotally mounted along a respective side edge of the top enclosure member and each of said side pivotal enclosure members has at least one inwardly extending upper arm which engages a guide member within the vehicle whereby as the top member is raised the guide member causes the arm to effect said outward swinging movement of the side enclosure member.

5. A vehicle as claimed in claim 4, wherein each guide member is a roller.

6. A vehicle as claimed in any one of claims 1 to 5 wherein, for the guidance during its vertical movement, the roof has at each end a pair of laterally spaced depending first channel members each with a lower roller locating in an associated upstanding second channel member having an upper

roller locating in the associated first channel member.

7. A vehicle as claimed in any one of claims 1 to 6, wherein the means for raising the top enclosure member are located externally of the load carrying space of the vehicle.

8. A vehicle as claimed in any one of claims 1 to 6, wherein the roof is raised and lowered by means of rams.

9. A vehicle as claimed in any one of claims 1 to 7, wherein the means for raising the top enclosure member comprise scissor mechanisms provided one at each end of the vehicle.

10. A vehicle as claimed in claim 9, wherein the scissor mechanisms at each end of the wagon comprise two links pivotally connected to each other, a first one of said links also being pivotally mounted on the roof of the vehicle and the second one of said links being pivotally mounted about a point which is fixed relative to the chassis of the vehicle.

11. A vehicle as claimed in claim 10, wherein a torsion tube or the like connects the two first links through the top enclosure member to ensure uniform lifting of the top enclosure member at both ends of the vehicle.

12. A vehicle as claimed in any one of claims 9 to 11, wherein spring loaded means are provided at both ends of the vehicle to assist opening of the scissor mechanism at both ends of the vehicle.

13. A vehicle as claimed in claim 12, wherein said spring loaded means is extendable and has a first end pivotally mounted about a point fixed relative to the chassis of the vehicle and a second end pivotally mounted on the second link.

14. A vehicle as claimed in claim 13, wherein

one of the said spring loaded means has a pair of wings projecting one towards each side of the vehicle, and each of said wings is provided with a roller for engagement by a fork lift truck or the like to raise the top enclosure member.

15. A vehicle as claimed in claim 14, wherein an upwardly extending arm is pivotally mounted on one of said wings, the free end of said arm has stop means for engaging on a fixed seat when the roof is in the raised position so as to prevent unwanted lowering of the roof, a guide surface is provided along which the stop means travels during raising of the roof to a predetermined position beyond which the arm is biassed to a position at which the stop means is above the seat so that lowering the roof slightly causes the stop means to locate on the seat.

16. A vehicle as claimed in claim 15, wherein a pair of depending levers are provided one on each of said wings and said levers are linked to said arm such that operation of either lever causes the stop means to be removed from its seat allowing the roof to descend.

17. A vehicle as claimed in any one of claims 12 to 16 wherein damping means are provided to slow the descent of the roof.

18. A vehicle as claimed in claim 17, when dependent from claim 12, wherein the damping means are provided as part of the extendable spring loaded means.

19. A vehicle as claimed in any one of claims 1 to 18, wherein the sides of the vehicle comprise the pivotal side enclosure members as upper closure members for the side of the vehicle, and lower side closure members.

20. A vehicle as claimed in claim 19, wherein

the lower side closure members comprise first and second doors which are openable downardly and outwardly of the vehicle, said first doors being pivotally mounted along their lower edges on the vehicle and said second doors being mounted along their lower edges on the upper edges of the first doors such that the second doors may be opened into face-to-face relationship with the first doors.

21. A vehicle as claimed in any one of claims 1 to 20 which is a railway wagon.

22. A vehicle substantially as hereinbefore described with reference to Figs. 1 and 2 or Figs. 3 and 4 or Figs. 5 to 12 of the accompanying drawings.

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