

SPECIFICATION

Portals for vehicles

5 *Field of Invention*

The invention relates to portals for providing a passageway between end faces of two coupled vehicle boxes, especially railway cars.

Background of invention

- 10 In a known passageway system having separable portals for example that described in U.S. Patent 2,826,998, pivoted linkage supports are disposed above and below a passageway and the lower of the two pivoted linkage supports includes a lightly domed bridge member, in the form of a plate, which is pivotable around a transverse axis disposed at a face end of a vehicle box. Other members, on which the former bridge member lies in scale-like manner, are
- 15 supported on a threshold of a portal end frame either directly or by means of a support system which is itself supported by a vehicle box coupler lying below. A disadvantage of this construction is that the coupler must cooperate in the functioning of the passageway system and is thus loaded by the portal end frames. The construction cannot accommodate substantial differences in height between the two vehicle boxes such as may take place if the springs on
- 20 one of the vehicle boxes break.

- Further known is a passageway system as described in U.S. Patent 1,012,451, in which each of the separable portals is supported from below by a coupler and from above by a pivoted linkage connected to the vehicle box in the region of the roof. This pivoted linkage includes a telescoping device which may be pivoted around a vertical axis mounted on the vehicle box but
- 25 at some distance from the end face of the box and located inside the vehicle box. In the region lying outside the plane defining the end face of the box, a spring-tensioned telescoping device has mounted on it a lever arm which pivots around a vertical axis, the other end of the lever arm being fastened to an end frame of the associated portal. In this disposition, the portal is carried by one of the couplers and thus moves laterally with the coupler. The walkway which
- 30 passengers use in their passing from one box to the other includes a rigid plate extending from the end face of the box. On this rigid plate lies a bridge plate which can glide on the rigid plate in the manner of a fish scale and which is mounted for movement around a transverse axis at the threshold of the vestibule frame.

- It is an object of the present invention to provide a portal construction which permits to
- 35 connected portals to be held in a defined position.

Description of Invention

- The invention provides a portal on a vehicle box for forming, with another portal, a passageway between coupled vehicles which portal includes a first pivot linkage support at the
- 40 top of the portal interconnecting the vehicle box and a portal end member, said support having a first support arm pivotably mounted for movement about an upright axis on the vehicle, a slide on the support arm movable away from or towards the vehicle box, a second support arm pivotably mounted on the slide for movement about a transverse axis and connected to the top of the end member by a joint. This arrangement permits the passageway to be supported from
- 45 above and not by a coupler. However where appropriate the portal end member is pivotably connected to a coupler movably resiliently in a longitudinal vehicle direction and located and connected to the vehicle box for joining a pair of vehicles and the portal end member has a pin for engaging in a recess of the coupler to pivotably connect the portal end member and the coupler. The first pivot linkage system can, if necessary, also support the weight of any
- 50 passengers present on a walkway in the portal. The first pivot linkage thus not only guides the portal but can also completely support its weight including any load due to the presence of passengers if required. This may be required when the coupler cannot be loaded or is not intended to be loaded.

- The invention facilitates safe and comfortable use of the passageway by the passengers who
- 55 are reliably protected against any effects of the weather of the environment by the surrounding rubber membrane or skirt which also may surround the walkway because the membrane seals the passageway space against draft, water, snow, dust, sand, smoke and noise. This type of sealing is significant especially in air-conditioned vehicles due to the good thermal and acoustical insulation which it affords. Finally the effective seal makes it possible to dispense with
- 60 additional doors at the end of the vehicle box and/or compartment doors which is advantageous with respect to weight as well as to cost.

- An advantage of the passageway system using portals according to the invention is also the large usable interior cross section and the substantially continuous flat walkway floor without appreciable ramps of steps. Thus, the passageway can be used for the comfortable movement of
- 65 passengers during normal operation, for utilization as a standing room in heavy traffic and as an

escape route from one carriage to another. Finally, the passageway system using portals according to the invention permits sufficient mobility to accommodate any relative motions of the coupled vehicle boxes which occur in use. The system can accommodate very small track curvatures, as well as deliberately transversely inclined carriage boxes, large irregularities in the track and any motions due to vehicle suspension and vehicle coupling. A further advantage is the possibility of simple and reliable joining and separating of the portals forming the passageway when the railway cars are coupled or uncoupled. The couplers used may include automatic as well as manually actuated couplers and possibly permanent or semi-permanent couplers.

The passageway system using portals according to the invention accommodate any rotation or displacement which the two vehicle ends may perform relative to each other during a trip.

Preferably a first stop on the pivot linkage support is provided for limiting relative pivotal movement of the second support arm and the slide and to limit downward movement of the portal with respect to the vehicle box and a second step is provided for limiting relative pivotal movement of the second support arm with respect to another second support arm about a transverse axis provided by the joint.

In order to relieve the coupler of the vehicle from carrying the load of the portal, and to permit suspension of the portal end members on the carrier arms, the second support arms or guiding arms have a path-limiting stop located at their common joint. This causes both guiding arms to constitute a rigid suspension beam which is itself supported by the two slides. In this way, the load is distributed in approximately equal parts on the two guide arms on both vehicles boxes.

In order to permit a transfer of the entire weight of the passageway of coupled vehicle boxes in case the other of the two boxes experiences a failure of, say its pneumatic suspension, it is also possible to mount path-limiting stops between the guiding arms and the slide. The effect of these stops is to cause the weight of the passageway to be borne in such a case by the vehicle box whose suspension is intact.

Preferably resilient means urge the vehicle box and end members apart. Each portal may include a compression spring mounted between the vehicle box and the slide and acting in the longitudinal direction of the vehicle away from the vehicle box, the result of which is that, when uncoupled, the corresponding portal end member is pushed outwardly whereas in the coupled condition, the two joined portal end members are held approximately midway between the two ends of the carriages. The slide may be a roller slide.

In another preferred embodiment of the invention, there is provided a cover which includes two cover plates at each end of the vehicle, one of the cover plates being pivoted at the car box around a transverse and a longitudinal axis and the other being pivoted at the central part of the portal about a transverse and vertical axis. This covering results not only in an attractive appearance of the interior space of the passageway but also provides an additional feeling of security for the occupants. Finally, the covering hides the rubber membrane and thus protects it against deliberate damage. The cover plates are preferably provided as partially overlapping plates guided by a second pivot linkage support acting as telescopic guidance, one end of which is mounted at the vehicle box and the other at the portal end member. The two plates are preferably so embodied that they result in a gap-free covering. Suitably the first pivotal linkage support is located above the membrane and the second below. Advantageously an upper cover plate is provided above the second pivotal linkage support to support an upper portion of the membrane.

Preferably segment plates are mounted on at least one cover plate for pivoting about an upright axis to cover any gaps between the two cover plates and the segment plates are guided by springs and steps to cover the gaps.

In similar manner as in the ceiling region, a preferred exemplary embodiment of the invention provides internal shields at the sides of the passageway which cover the rubber membrane. These shields are mounted movably at the lateral box portal columns and pivot about the vertical axis.

Advantageously there is provided a third pivot linkage support for between the vehicle box and the portal end member at the bottom of the portal for supporting a walkway.

DRAWINGS

Figure 1 is a side view of two vehicles including a passageway of portals according to the invention;

Figure 2 is a schematic cross section through a portal according to Fig. 1 with passengers in the passageway between two vehicle boxes;

Figure 3 is a schematic longitudinal section through a pair of coupled portals of the invention with the constructional assemblies indicated;

Figure 4 is a schematic diagram in symbolic representation of a closed passageway of portals according to the invention to illustrate different freedoms of motion;

Figure 5 is a top view of a walkway with sectionally represented side membranes formed by a pair of interconnected portals according to the invention;

Figure 6 is a longitudinal section through the walkway of Fig. 5;

Figure 7 is a top view of a covering of the portals of Fig. 5 with lateral membranes shown in section;

Figure 8 is a longitudinal section through an upper pivotal linkage support and the covering of Fig. 7 for the portals of Fig. 5 and

Figure 9 illustrates different modes of use of portals according to the invention in schematic representations.

Preliminary explanation of drawings

There are six possible components of motion which two coupled vehicle boxes may execute with respect to one another

Table 1

Motion	Symbol		
Displacement parallel to longitudinal axis	along x	$\dot{x}$	
Displacement parallel to transverse axis	along y	$\dot{y}$	
Displacement parallel to vertical axis	along z	$\dot{z}$	
Rotation about longitudinal axis	about x	$\ddot{x}$	(Roll)
Rotation about transverse axis	about y	$\ddot{y}$	(Pitch)
Rotation about vertical axis	about z	$\ddot{z}$	(Yaw)

When comparing different supports for portals forming walkways a characteristic role is played by the central transverse plane indicated as MQE in some of the drawings. This is the separation plane of a passageway formed by two separable portals. It is the plane of symmetry. The MQE can move with respect to the vehicle box motions in and about the Y and Z axes referred to in Table 1.

Fig. 1 of the drawing is a purely schematical representation of two vehicle boxes 1 and 2 belonging respectively to two railway vehicles or cars 3 and 4 shown in side view. The ends of the vehicles 3 and 4 are provided respectively with vehicle couplers 6 and 7. The end faces 12 and 16 of the vehicle boxes 1 and 2 are provided with portals or vestibules 9 and 10 which permit the walking passage of persons from one railway car to the other, as illustrated in the cross section of a portal 9 shown in Fig. 2. The separation plane is indicated at 14. Illustrated in Fig. 2 are two persons in the process of walking across a bridge member in the form of plate 18 in the portal 9. It will be seen that the persons are completely protected against external influences.

Illustrated in Figs. 1 and 2 are the three orthogonal axes X, Y, Z of a cartesian coordinate system to which further reference will be made.

The portals serve as passages and as shelter for railway passengers, although they may execute continuous motion corresponding to the relative motion of the railway cars during the trip. The portals also protect the passengers against external influences and furthermore protect the passageway itself externally and internally. The portal has to accommodate a number of functions for providing mobility and further protective functions. The attached flow diagram illustrates the inter-relationship between the various functions.

Table II

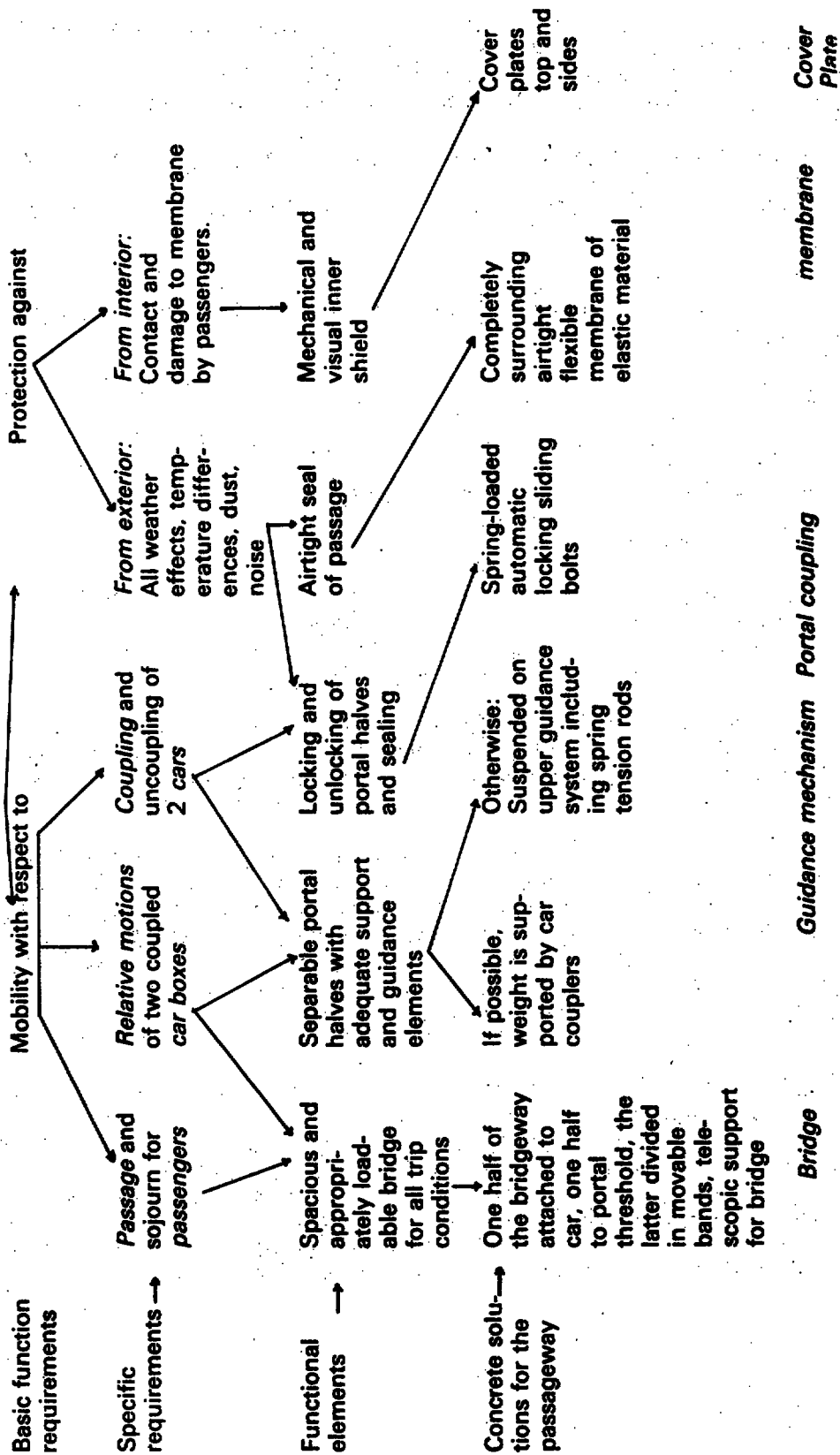


Fig. 3 is a schematic representation of a longitudinal cross section through a passageway formed by two portals between two vehicle bodies and shows the following constructional groups for portals of the invention at the following levels:

- A. The vehicle coupler
- 5 B. An elastic membrane or bellows 5
- C. A walkway
- D. A passageway, lateral covering and linkages
- E. An upper covering
- F. An upper pivotal linkage system
- 10 The conditions and possibilities relative to the vertical support of the portals are summarized in Table IV. 10

Fig. 4 represents a pivotal linkage network or a mobility plan. This plan includes rectangular bands which represent rigid elements, bands with rounded ends which represent elastic members and circles which represent elastic members and circles which represent pivots.

- 15 Furthermore, the pivotal symbols are provided with the symbol representing the possibilities of motion as set out in Table III with respect to the six components of motion. This symbolic representation helps to ascertain the functioning of the parts shown in other drawings. The exact construction of the individual pivots and links in the drawings may be varied but the functioning will not be affected as long as the components of movement of Fig. 4 are adhered to. 15

20 20

TABLE III

The pivot linkage network is shown in a side view in Fig. 4

The four main symbols are:

25 25

 = rigid links

 = pivots (joints)

30 30

 = elastic links

 = two links can be coupled rigidly or completely separated

The mobility symbols in a joint symbol have the meaning:

35 35

u	rotatable about	$\left\{ \begin{array}{l} z \text{ axis; vertical axis in} \\ y \text{ axis; transverse to} \end{array} \right\}$	$\left\{ \begin{array}{l} \text{plane of} \\ \text{drawing} \end{array} \right\}$
	displaceable in		
		$\left\{ \begin{array}{l} x \text{ axis; longitudinal axis in} \end{array} \right\}$	

40 40

The number of mobility symbols yields the types of joints:

- | | | | |
|-------|--|------------------|----|
| u | pivotal, transmits rotation about the two other axes | } pivots | 45 |
| 45 uu | two-axis pivot (universal joint) transmits rotation about third axis | | |
| uuu | three axis pivot, transmits no torques | | |
| 50 | linear freedom of motion, straight line guidance, transmits forces in two other directions | } sliding joints | 50 |
| 55 .. | area freedom of motion, transmits forces in third direction, | | |
| ... | spatial freedom of motion, transmits no translation forces | | |

Table IV

Operative during	Type of construction and load	Support of the passageway on the vehicle coupler 6, 7 is			
		permissible		not permissible	
		net weight only	w/payload	net weight only	with payload
during installation or delivery	uncoupled	Rigid rod (pendulum) mounted only for installation aid removed for normal operation	—	Spring tension rod 28 (elastic pendulum) as construction element; supports approximately net weight of passageway	X
		All vertical forces are applied to coupler 6, 7 via elastic intermediate element and distributed over both car boxes			
Normal operation		Vertical forces are distributed over both car boxes by central stop 18 and upper guidance			
Extreme height difference, e.g. suspension breakage		As at left, except net weight of passageway supported by spring tension rods 18 from undamaged car			
	coupled	Entire passageway suspended from upper guidance by box-side stop 62 of the car with damaged suspension			

the drawings may be varied but the functioning will not be affected as long as the components of movement of Fig. 4 are adhered to.

Exemplary embodiments of construction of passageways between vehicle boxes will be described with reference to Figs. 5 to 8 showing a corresponding embodiment in side view and longitudinal sections. In Fig. 4, all the pivots are provided with the mobility symbols according to Table III but only the most important reference numerals used in Figs. 8 to 11 are included for the purpose of clarity. Figs. 4-8 are described together and detail the general arrangement of Figs. 1-3.

Shown are part of two coupled vehicle boxes 1 and 2 belonging to the two cars 3, 4 and two separable portals 9, 10. The function of the parts of both portals are the same and they are arranged symmetrically on either side of the separation plane 14. Only the left half of Figs. 4-8 will be described below. The portal 9 has a bridge plate 18 which is pivotably attached in the manner of a hinge at one threshold 20 of an end face opening of the vehicle box where it pivots about a transverse axis 23. Rotatably disposed about a transverse axis 26 are bridge members 25 attached to a threshold 21 of a portal end frame 24 and the bridge members 25 glidingly lie on the bridge plate 18 attached to the vehicle box to form a walkway. The bridge members 25 consist of individual adjacent elements 50-54 which are capable of close adhesion even when the bridge plate 18 on the box side undergoes rotation about the longitudinal axis. Disposed below the passage walkway 18, 25 is a pivotal linkage support or guidance system. This system consists of a bridge support 29 attached to the box 1 by means of a two-axis pivot. Its purpose is to support and guide the bridge plate 18 attached to the car box as well as to be connected to a bridge support attached to the portal end frame by means of a longitudinally displaceable telescope mechanism. The bridge support 30 attached to the portal end frame is connected to the portal half 24 by means of a two-axis (cardan) pivot 31.

The portal halves 24 are held in the central position between the two end faces 12, 16 of the vehicle boxes with respect to distance and angular position. The passageway formed by the coupled portals can be sealed by a completely closed surrounding rubber membrane 42. Lateral cover plates 44 may be attached so as to provide lateral shielding between the rubber membrane 42 and the passenger space 43 (Fig. 2). The lateral cover plates 44 may, for example, be pivotably attached to the box 1 by a hinge 46 extending in the vertical direction and may be glidingly supported on the central portion of the portal half 24. Spring tension rods 28 are also illustrated (See Fig. 7).

The passenger space 42 is covered at the top by means of a movable covering. This consists of horizontal plates or sheets 66, 67, 68 which are mutually displaceable in the longitudinal direction by being connected to telescoping parts 75 and 76 and which are supported pivotably at the box 1 or the portal end frame 24. The type of pivots at connection chosen for the exemplary embodiment can be derived from Fig. 4.

The vehicles 3, 4 may be coupled by the manual or automatic vehicle couplers 6, 7. The weight of the portals when the cars are coupled is normally supported by an upper pivot linkage support and guidance including elements 57-64. However, if the vehicle coupler 6, 7 is suitably constructed, it may support the portal partially or completely.

The upper portal pivotal linkage support, shown enlarged in Fig. 8, consists of a mechanical pivotal linkage between the vehicle box and the associated portal end frame. A pivotal arm 58 which pivots about a vertical axis 57 is attached to the vehicle box 1. The pivotal arm 58 carries a slide 59 which is slidable in the longitudinal direction. Rotatably attached to the slide 59 about a transverse axis 61 is a single or double support arm 60 which is pivotably and separably attached to the upper end of the portal end frame 24 at a joint 63. The slide 59 is urged outwardly by a system of springs 64 so that when the vehicles are uncoupled, the portal halves 24 assume their outermost position whereas, when coupled, the two joined portal end frames 24 are held approximately in the middle between the two vehicles 3, 4. Further provided between the support arm 60 and the slide 59 are path-limiting stops 62 which limit the extent of the downward motion of the portal end frames 24.

Depending on whether the vehicle couplers 6, 7 (Fig. 6) can be loaded with the weight of the portals or not two variants of construction result. In a first case, the upper pivotal linkage support will be loaded with the weight of the portal only under special conditions, namely when extreme differences occur in the vertical position of the two boxes 1 and 2. Normally however, the portal is supported by the vehicle coupler 6, 7. In a second case if the vehicle coupler 6, 7 cannot be loaded with the weight of the portal, the upper pivotal linkage support supports the weight of the passageway. In that case, there is provided a further stop 78 which limits the relative motion of the two support arms 60. As a result, the two support arms 60 form a rigid support yoke whose two ends are suspended from the two slides 58 and the centre of which is loaded by the portals.

The associated pivotal linkage chain may be deducted from Fig. 4. The walkway, which is seen in detail in Figs. 8 and 9, is disposed between the vehicle boxes 1 or 2 and the associated respective portal end frames 24 at the height of the floor of the vehicles 3 or 4. On the side of

the vehicle box, the approximately half-rounded plate 18 is pivotable attached to the transverse axis 23. The counter plate 25 is pivotably attached to the transverse axis 26 at the portal half 24 and is glidingly supported on the plate 18 attached to the box. One of the two plates, in this case the plate 25, is subdivided into individually movable strips 50-54 so as to permit improved adaptation to motions in use. Disposed underneath the bridge plates 18, 25 is the telescopic carrier assembly of parts 29, 30 connected between the vehicle box 1 and the portal frame 24. This assembly acts to support the walkway. In the exemplary embodiment shown, the bridge support 29 is a telescopic tube attached by the two-axis pivot 23, 31 beneath the bridge plate 18 on the vehicle box side. The cooperating telescopic rod 30 which is guided by the telescopic tube 29 is attached below the pivot of the bridge plate 25 at the portal frame side to rotate about a transverse axis 31. The bridge plate 18 is glidingly supported on the telescopic tube 29.

The upper covering of the interior of a passageway between two railway vehicles which may be separated in a central transverse plane 14 and which is completely surrounded by, for example, a rubber membrane 42 is illustrated in Figs. 10 and 11. The covering is composed of the cover plates or sheets 66, 67 and 68. One of the end plates 66 is attached to the portal end frame 24 and pivots about the vertical axis of a joint 73 and about the transverse axis of a pivot 72. The other end plate 68 is attached by means of a two-axis joint 71 to the vehicle box 1. The partially overlapping plates 66 and 68 can be augmented as is clearly shown in Figs. 10 and 11 by segment plates 67 for the purpose of completing the covering. The segment plates are pivotable about a vertical axis 79 at one or other of the end plates 66 or 68. The entire assembly of plates is guided by the telescoping parts 75 and 76 where, in the case shown, the piston part 75 of the telescope is attached to the box and the cylinder part 76 is attached to the end frame.

Advantageously, the segment plates 67 are so guided by means of compression springs 69 and stops 70 that, when the end plates 66 and 68 are widely separated, the segment plates cover the lateral gaps between them, whereas, when the plates 66 and 68 are close together, the segment plates 67 are pushed between them. This construction prevents an uncontrolled to and fro motion when accelerating.

As shown in Fig. 8, the end plate 66 is pocket-shaped and its lower surface, as explained, serves as the end plate 66 whereas the upper surface 74 supports the rubber membrane 42.

The following remarks may be made with respect to the function of the motion-limiting stops 62 and 78 of the support arm 60. Fig. 9 is a set of schematic illustrations distributed over four rows a, b, c, d and three columns A, B, C in which various conditions of use of the portals are shown. The rows a and b illustrate a portal which is normally supported by the vehicle couplers 6, 7 but is always guided thereby. The rows c and d illustrate a portal which is guided by the couplers 6 and 7 only in the horizontal direction but is not supported thereby. In rows a, c, the portal is shown unoccupied whereas in rows b, c, it is shown loaded by the presence of passengers.

Column A illustrates the vehicles in the coupled state and in normal operation, column B illustrates the vehicles in the coupled state but with an extreme vertical distance between the two vehicle boxes 1 and 2 and column C shows one of the vehicles uncoupled and thus unloaded.

The illustrations of Fig. 9 shown the function of the upper motion limiting stops at both the box side and the portal frame side. In the drawing, those elements such as support arms, spring tension rods or vehicle couplers which carry the load are shown shaded. The stop at the portal frame side which causes the upper support arms to be joined into a single continuous beam, becomes operative in the illustrated cases Ac and Ad in Fig. 9, whereas the stops at the carriage box come into play in the case Ba, Bb, Bc, Bd and Cc.

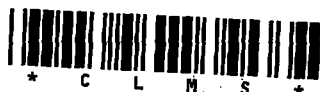
CLAIMS

1. A portal on a vehicle box for forming, with another portal, a passageway between coupled vehicles which portal includes a first pivot linkage support at the top of the portal interconnecting the vehicle box and a portal end member, said support having a first support arm pivotably mounted for movement about an upright axis on the vehicle, a slide on the support arm movable away from or towards the vehicle box, a second support arm pivotably mounted on the slide for movement about a transverse axis and connected to the top of the end member by a joint.

2. A portal according to claim 1 in which a first stop on the pivot linkage support is provided for limiting relative pivotal movement of the second support arm and the slide and to limit downward movement of the portal with respect to the vehicle box.

3. A portal according to claim 1 or claim 2 in which a second stop is provided for limiting relative pivotal movement of the second support arm with respect to another second support arm about a transverse axis provided by the joint.

4. A portal according to claim 3 in which the arrangement is such that when the vehicle is



the vehicle box, the approximately half-rounded plate 18 is pivotable attached to the transverse axis 23. The counter plate 25 is pivotably attached to the transverse axis 26 at the portal half 24 and is glidingly supported on the plate 18 attached to the box. One of the two plates, in this case the plate 25, is subdivided into individually movable strips 50-54 so as to permit improved adaptation to motions in use. Disposed underneath the bridge plates 18, 25 is the telescopic carrier assembly of parts 29, 30 connected between the vehicle box 1 and the portal frame 24. This assembly acts to support the walkway. In the exemplary embodiment shown, the bridge support 29 is a telescopic tube attached by the two-axis pivot 23, 31 beneath the bridge plate 18 on the vehicle box side. The cooperating telescopic rod 30 which is guided by the telescopic tube 29 is attached below the pivot of the bridge plate 25 at the portal frame side to rotate about a transverse axis 31. The bridge plate 18 is glidingly supported on the telescopic tube 29.

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Advantageously, the segment plates 67 are so guided by means of compression springs 69 and stops 70 that, when the end plates 66 and 68 are widely separated, the segment plates cover the lateral gaps between them, whereas, when the plates 66 and 68 are close together, the segment plates 67 are pushed between them. This construction prevents an uncontrolled to and fro motion when accelerating.

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The illustrations of Fig. 9 show the function of the upper motion limiting stops at both the box side and the portal frame side. In the drawing, those elements such as support arms, spring tension rods or vehicle couplers which carry the load are shown shaded. The stop at the portal frame side which causes the upper support arms to be joined into a single continuous beam, becomes operative in the illustrated cases Ac and Ad in Fig. 9, whereas the stops at the carriage box come into play in the case Ba, Bb, Bc, Bd and Cc.

CLAIMS

1. A portal on a vehicle box for forming, with another portal, a passageway between coupled vehicles which portal includes a first pivot linkage support at the top of the portal interconnecting the vehicle box and a portal end member, said support having a first support arm pivotably mounted for movement about an upright axis on the vehicle, a slide on the support arm movable away from or towards the vehicle box, a second support arm pivotably mounted on the slide for movement about a transverse axis and connected to the top of the end member by a joint.

2. A portal according to claim 1 in which a first stop on the pivot linkage support is provided for limiting relative pivotal movement of the second support arm and the slide and to limit downward movement of the portal with respect to the vehicle box.

3. A portal according to claim 1 or claim 2 in which a second stop is provided for limiting relative pivotal movement of the second support arm with respect to another second support arm about a transverse axis provided by the joint.

4. A portal according to claim 3 in which the arrangement is such that when the vehicle is



coupled the respective second support arm forms a support yoke carrying adjacent portal end members by means of the joint.

5. A portal according to any of the preceding claims in which resilient means urge the vehicle box and end member apart.

5 6. A portal according to claim 5 in which the resilient member is a compression spring arranged between the vehicle box and the slide. 5

7. A portal according to any of the preceding claims in which the slide is a roller slide.

8. A portal according to any of the preceding claims further including a pair of cover plates to form a ceiling surface inside a membrane of the portal, one cover plate being pivotably 10 connected to the vehicle box for movement about a transverse and longitudinal axis and the 10 other cover plate being pivotably connected to the portal end member for movement about a transverse and longitudinal axis.

9. A portal according to claim 8 in which the coverplates overlap partially and a second pivotal linkage support connected at one end to the vehicle box and at the other end to the end 15 member and extensible in a longitudinal vehicle box direction is provided to guide the 15 coverplates.

10. A portal according to claims 8 and 9 in which the first pivotal linkage support is located above the membrane and the second below.

11. A portal according to any of claims 8 to 10 in which segment plates are mounted on at 20 least one coverplate for pivoting about an upright axis to cover any gaps between the two 20 coverplates.

12. A portal according to claim 11 in which the segment plates are guided by springs and steps to cover the gaps.

13. A portal according to any of claims 9 to 12 in which an upper coverplate is provided 25 above the second pivotal linkage support to support an upper portion of the membrane. 25

14. A portal according to any of the preceding claims in which the portal end member is pivotably connected to a coupler movable resiliently in a longitudinal vehicle direction and located below the portal and connected to the vehicle box for joining a pair of vehicles.

15. A portal according to claim 14 in which the portal end member has a pin for engaging 30 in a recess of the coupler to pivotably connect the portal end member and the coupler. 30

16. A portal according to any of the preceding claims in which resilient tension rods are disposed between the vehicle box and the portal end member for helping to support the portal weight.

17. A portal according to any of the preceding claims which further includes shields 35 pivotable about an upright axis between the passageway and the inside of the membrane. 35

18. A portal according to any of the preceding claims in which there is provided a third pivot linkage support between the vehicle box and the portal end member at the bottom of the portal for supporting a walkway.