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PIVOTABLE GUIDE BEAM SWITCH

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a switch for changing a guided vehicle path and, more particularly, to a pivotable guidebeam switch for switching a guided vehicle guidebeam.

2. Description of the Prior Art

10 Guided vehicles, such as people movers, typically travel on guideways. The guideway may include several guide paths, also known as turnouts. A guiderail or guidebeam is secured to the guideway to guide or steer the vehicle. Guided vehicles generally include a guideframe that follows the guidebeam. The guideframe includes a
15 plurality of downward depending guidewheel assemblies that provide the physical interface between the guidebeam and the guided vehicle.

It is known in the art to use a transfer table or guideway switch to switch the guided vehicle between
20 several guide paths. A typical rotary guideway switch is disclosed in U.S. Patent No. 4,970,962 to Burg et al. Transfer tables, in particular, are known to be large items that are time consuming and cumbersome to operate.

Switches for changing the guide path of railway
25 vehicles are well-known in the art. For example, U.S. Patent Nos. 943,810 to Carr and 3,785,294 to Omar disclose a switch for merging two tracks, each having two rails, into a single track using a central common rail. The central common rail is pivotable between the two tracks to
30 align one or the other of the tracks with the single track. U.S. Patent No. 1,286,042 to McClure et al. discloses a railroad track switch utilizing a ridged curved segment and a straight segment which move about an arc to connect a single rail with two or more turnout rails. Furthermore,
35 U.S. Patent No. 3,013,504 to Schütze teaches a switch for a monorail beam section. The switches disclosed by the prior art references discussed hereinabove typically fail to provide an adequate locking connection between the moving portion of the switch and the one or more turnouts



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exiting from the switch. Hence, it is the object of the present invention to overcome these and other deficiencies known in the prior art.

SUMMARY OF THE INVENTION

5 The above object is accomplished with a pivotable switch arrangement for switching a guided vehicle guidebeam made in accordance with the present invention. The pivotable switch arrangement includes a vehicle guideway. A main guidebeam is secured to the vehicle guideway. A
10 plurality of turnout guidebeams is secured to the vehicle guideway and spaced from the main guidebeam. Each of the turnout guidebeams may include an extendable locking pin at an end facing the main guidebeam. The pivotable switch arrangement further includes a pivotable guidebeam section
15 having a first end and a second end. The first end is pivotably connected to the guideway adjacent an end of the main guidebeam. The second end of the guidebeam section may define a cavity. A drive mechanism is connected to the guidebeam section and is configured to pivot the guidebeam
20 section between the plurality of turnout guidebeams and align the second end of the guidebeam section with one of the plurality of turnout guidebeams. The locking pin for each of the turnout guidebeams may be configured to removably engage the cavity when the second end of the
25 guidebeam section is aligned with the one of the plurality of turnout guidebeams. Preferably, the main guidebeam, the turnout guidebeams and the guidebeam section are at substantially the same elevation above the guideway.

 The pivotable switch arrangement may further
30 include a limit switch positioned in the cavity. The locking pin for each of the turnout guidebeams may be configured to engage the limit switch. The limit switch may be configured to generate a signal when the locking pin is extended into the cavity and engages the limit switch,
35 indicating that the guidebeam section is aligned and locked with the one of the plurality of turnout guidebeams. The drive mechanism may be a motor and a chain drive connected

to the guidebeam section. In addition, the drive mechanism may be a hydraulic cylinder and a piston connected to the guidebeam section. The guideway may include a plate and the guidebeam section may include a roller assembly configured to roll along the plate as the guidebeam section pivots between the plurality of turnout guidebeams.

The locations for the locking pin and the cavity may be reversed. Accordingly, the cavity may be defined at the second end of each of the turnout guidebeams. The locking pin may be located at the second end of the guidebeam section. The locking pin may be configured to removably engage the cavity when the second end of the guidebeam section is aligned with the one of the plurality of turnout guidebeams. A limit switch may be positioned in the cavity defined by the respective turnout guidebeams. The locking pin may be configured to engage the limit switch. The limit switch may be configured to generate a signal when the locking pin is extended into the cavity and engages the limit switch, indicating that the guidebeam section is aligned and locked with the one of the plurality of turnout guidebeams.

The present invention is also a locking mechanism for connecting adjacent guidebeam sections in a pivotable guidebeam switch. The locking assembly includes a first guidebeam section having an extendable locking pin at one end, and a second guidebeam section defining a cavity at an end facing the locking pin. The locking pin is configured to removably engage the cavity when the first and second guidebeam sections are aligned. The locking mechanism may further include a limit switch positioned in the cavity and the locking pin may be configured to engage the limit switch. The limit switch may be configured to generate a signal when the locking pin engages the limit switch, indicating that first and second guidebeam sections are aligned and locked together.

Furthermore, the present invention is a pivotable switch arrangement for switching a guided vehicle guidebeam

that generally includes a vehicle guideway, a main guidebeam, a plurality of turnout guidebeams, a plurality of guidebeam sections and a drive mechanism. The main guidebeam is secured to the vehicle guideway and may include an extendable locking pin at one end. The plurality of turnout guidebeams is secured to the vehicle guideway and spaced from the main guidebeam. The plurality of guidebeam sections each has a first end and a second end. The first end of each of the guidebeam sections is pivotably connected to the guideway adjacent to the plurality of turnout guidebeams, respectively. The second end of each of the guidebeam sections may define a cavity. The drive mechanism is connected to each of the guidebeam sections and is configured to pivot the respective guidebeam sections such that the second end of one of the guidebeam sections aligns with the main guidebeam. The locking pin may be configured to removably engage the cavity in the second end of the one of the guidebeam sections when the one of the guidebeam sections is aligned with the main guidebeam.

A limit switch may be positioned in the cavity defined by the respective guidebeam sections. The locking pin may be configured to engage the limit switch. The limit switch may be configured to generate a signal when the locking pin is extended into the cavity and engages the limit switch, indicating that the one of the guidebeam sections is aligned and locked with the main guidebeam. The drive mechanism may be a motor and a chain drive connected to the guidebeam sections. The drive mechanism may also be a hydraulic cylinder and pistons connected to the guidebeam sections. The guideway may include a plate and the guidebeam sections may each include a roller assembly configured to roll along the plate as the respective guidebeam sections pivot into and out of alignment with the main guidebeam.

The locations for the locking pin and cavity may be reversed. Accordingly, the cavity may be defined at an

end of the main guidebeam. The arrangement may further include a plurality of the extendable locking pins located at the second end of the guidebeam sections, respectively. The locking pin for each of the guidebeam sections may be configured to engage the cavity defined in the main guidebeam when the one of the guidebeam sections is aligned with the main guidebeam. A limit switch may be positioned in the cavity. The locking pin for each of the guidebeam sections may be configured to engage the limit switch. The limit switch may be configured to generate a signal when the locking pin is extended into the cavity and engages the limit switch, indicating that the one of the guidebeam sections is aligned and locked with the main guidebeam.

While the guidebeam sections are automatically-controlled and hydraulically, or motor and chain-drive, operated, they also have semi-automatic and manual control capabilities. The time for one complete automatic operation cycle, including train control events, is approximately six seconds. No personnel intervention is required for control or operation of the guidebeam switch of the arrangement in the automatic mode.

A switch logic control cabinet (not shown) located in the guidebeam switch area of the arrangement performs all the vital checks involved with the operation of the guidebeam switch of the arrangement. The vital checks include the guidebeam switch position command logic, which is used to move the guidebeam switch from one position to another; the switch correspondence logic, which vitally detects the position and mechanical locking of the guidebeam switch; and the logic, which is needed to drive traffic lights in the area of the guidebeam switch of the arrangement.

To accomplish these tasks the guidebeam switch logic control unit interfaces with an electro-mechanical drive and the automatic train control system. The guidebeam switch logic control unit may be located next to the drive mechanism. Housed inside each guidebeam switch

logic control unit are the vital relays which are used to perform the vital checks. Also included in the unit are various circuit breakers, power transformers and lightning arrestors which make up the control circuits.

5 Further details and advantages of the present invention will become apparent in the following detailed description, in conjunction with the drawings wherein similar parts are identified by primed reference numerals.

BRIEF DESCRIPTION OF THE DRAWINGS

10 Fig. 1 is a top plan view of a first embodiment of a pivotable switch arrangement made in accordance with the present invention;

15 Fig. 2 is a second embodiment of the pivotable switch arrangement made in accordance with the present invention;

20 Fig. 3 is a partially cut-away side elevational view of a locking assembly made in accordance with the present invention and used to join adjacent guidebeam sections in the pivotable switch arrangements of Figs. 1 and 2;

Fig. 4 is an end view of an intermediate support used in the arrangement of Fig. 2;

Fig. 5 is a cross-sectional view along lines A-A in Fig. 4;

25 Fig. 6 is a perspective view of a first portion of the intermediate support of Fig. 4; and

Fig. 7 is a perspective view of a second portion of the intermediate support of Fig. 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 Fig. 1 shows a first embodiment of a pivotable switch arrangement 10 made in accordance with the present invention. The pivotable switch arrangement 10 includes a vehicle guideway 12 made of a plurality of concrete slabs adapted to have a guided vehicle (not shown) travel
35 thereon, and sharing a common surface, (i.e., lie in a common plane). The guided vehicle, such as a people mover, includes a body and a plurality of drive wheels that are

adapted to coact with the guideway 12. The guided vehicle may include a guideframe with a plurality of depending guidewheels configured to coact with a guiderail or a guidebeam secured to the guideway 12.

5 The pivotable switch arrangement 10 generally includes a main guidebeam 14, a plurality of turnout guidebeams 16 spaced from the main guidebeam 14 and a pivotable guidebeam switch 18 configured to connect the
10 main guidebeam 14 with one of the turnout guidebeams 16 at any given time. The main guidebeam 14 is secured to the guideway 12 adjacent a point end 20 of the guidebeam switch 18. The turnout guidebeams 16 are secured to the guideway 12 at a frog end 22 of the guidebeam switch 18. The turnout guidebeams 16 are spaced from the main guidebeam
15 14. The turnout guidebeams 16 each include an extendable locking pin 17 located at an end of each of the turnout guidebeams 16 facing the main guidebeam 14. In Fig. 1, two turnout guidebeams 16 are shown but it will be appreciated by those skilled in the art that additional turnout
20 guidebeams 16 may be provided in accordance with the present invention. In Fig. 1, the main guidebeam 14 may be defined as the inbound direction to the guidebeam switch 18 and the turnout guidebeams 16 may be defined as the outbound direction from the guidebeam switch 18 from the
25 point of view of a guided vehicle entering and exiting the guidebeam switch 18. It should be understood that the guidebeam directions are not limited to "inbound" and "outbound" directions. Hence, the turnout guidebeams 16 may be defined as the inbound direction to the guidebeam
30 switch 18 and the main guidebeam 14 may be defined as the outbound direction from the guidebeam switch 18.

 The guidebeam switch 18 includes a pivotable guidebeam section 24 that connects the main guidebeam 14 with the turnout guidebeams 16 and, more particularly,
35 connects the point end 20 of the guidebeam switch 18 with the frog end 22 of the guidebeam switch 18. The guidebeam switch 18 may be positioned in a switching pit 23 formed in

the guideway 12. However, in the preferred embodiment, the main guidebeam 14, the turnout guidebeams 16 and the pivotable guidebeam section 24 are at substantially the same elevation above the guideway 12. The guidebeam section 24 has a first end 26 and a second end 28. The first end 26 is pivotably connected by a pivot pin 30 to the guideway 12 adjacent to an end 32 of the main guidebeam 14. The second end 28 of the guidebeam section 24 defines a cavity 34. The guidebeam section 24 preferably includes a roller assembly 36 attached to an underside of the guidebeam section 24. A plate 38 is preferably attached to the guideway 12 below the roller assembly 36. The plate 38 is generally oriented along the direction of travel of the guidebeam section 24, as the guidebeam section 24 pivots about the pivot pin 30. The roller assembly 36 includes a plurality of rollers 37 configured to roll along the plate 38 as the guidebeam section 24 pivots between the turnout guidebeams 16. The plate 38 is preferably embedded in the guideway 12.

A drive mechanism 39 is attached to the guidebeam section 24 at about a midpoint of the guidebeam section 24. The drive mechanism 39 is preferably attached to the guideway 12 and is generally configured to pivot the guidebeam section 24 between the plurality of turnout guidebeams 16 such that the second end 28 of the guidebeam section 24 aligns with one of the plurality of turnout guidebeams 16. A gap is defined between the second end 28 of the guidebeam section 24 and the respective turnout guidebeams 16 to permit the pivotable movement of the guidebeam section 24 into and out of alignment with the respective turnout guidebeams 16. The drive mechanism 39 may be an electro-mechanical drive (not shown), a hydraulic cylinder and a piston connected to the guidebeam section 24, as shown in Fig. 1, or a motor and chain drive as shown in Fig. 2 discussed hereinafter.

In operation, the drive mechanism 39 is activated to either extend or retract, for example, the piston

connected to the guidebeam section 24 to pivot the guidebeam section 24 such that the second end 28 of the guidebeam section 24 is aligned with one of the turnout guidebeams 16. When the guidebeam section 24 is aligned with the selected turnout guidebeam 16, the locking pin 17 located at the end of the selected turnout guidebeam 16 engages the cavity 34 defined in the second end 28 of the guidebeam section 24 to lock the guidebeam section 24 in alignment with the selected turnout guidebeam 16. The operation of the extendable locking pin 17 will be discussed more fully herein in connection with Fig. 3.

It will be apparent to those skilled in the art that the locations for the locking pin 17 and the cavity 34 may be reversed. In particular, the cavity 34 may be defined at the end of each of the turnout guidebeams 16 facing the main guidebeam. Hence, each of the turnout guidebeams 16 defines a cavity facing the main guidebeam 14. The locking pin 17 will now be located at the second end 28 of the guidebeam section 24. The locking pin 17 cooperates with the respective cavities 34 as discussed previously. Thus, when the guidebeam section 24 is aligned with one of the turnout guidebeams 16 the locking pin 17 may extend from the guidebeam section 24 and engage the cavity 34 in the selected turnout guidebeam 16.

Fig. 2 shows a second embodiment of the pivotable switch arrangement for switching a guided vehicle guidebeam made in accordance with the present invention. The pivotable switch arrangement in Fig. 2 is designated with reference numeral 10'. The pivotable switch arrangement 10' also includes a vehicle guideway 12', a main guidebeam 14' secured to the guideway 12', and a plurality of turnout guidebeams 16' secured to the guideway 12'. The turnout guidebeams 16' are spaced from the main guidebeam 14'. The main guidebeam 14' preferably has an extendable locking pin 17' at an end 32' of the main guidebeam 14'. A pivotable guidebeam switch 18' is positioned between the main guidebeam 14' and the turnout guidebeams 16' and is

configured to connect the main guidebeam 14' with the turnout guidebeams 16'. A principle difference between the guidebeam switch 18 discussed previously and the guidebeam switch 18' is that the guidebeam switch 18' includes a plurality of guidebeam sections 24'. The arrangement 10' typically includes at least one curved guidebeam section, which is identified with reference numeral 24a' in Fig. 2, for a branching turnout from the arrangement 10'. A straight guidebeam section of the plurality of guidebeam sections 24' is identified with reference numeral 24b' in Fig. 2. However, it will be apparent to the those skilled in the art that the guidebeam sections in Fig. 2 may include any combination of curved and straight guidebeam sections. The following discussion will be with reference to a curved guidebeam section 24a' and a straight guidebeam section 24b' as an example.

The guidebeam sections 24a', 24b' each have a first end 26' and a second end 28'. The first end 26' of each of the guidebeam sections 24a', 24b' is pivotably connected to the guideway 12' adjacent to the turnout guidebeams 16', respectively. Respective pivot pins 30' are preferably used to pivotably connect the guidebeam sections 24a', 24b' to the guideway 12'. The second end 28' of each of the guidebeam sections 24a', 24b' defines a cavity 34'. The locking pin 17' at the end 32' of the main guidebeam 14' is configured to removably engage the cavity 34' defined in the second end 28' of each of the guidebeam sections 24a', 24b' when the respective guidebeam sections 24a', 24b' are aligned with the main guidebeam 14'. The pivotable guidebeam switch 18' may be located in a switching pit (not shown). However, in the preferred embodiment, the main guidebeam 14', the turnout guidebeam 16' and the guidebeam sections 24a', 24b' are at the same elevation above the guideway 12'. In addition, as shown in Fig. 2, the guidebeam sections 24a', 24b' may be curved or straight guidebeam sections, as stated previously.

The guidebeam sections 24a', 24b' preferably each include a roller assembly 36' attached to an underside of the respective guidebeam sections 24a', 24b'. A plate 38' is preferably attached to the guideway 12' and aligned with the direction of travel of the guidebeam sections 24a', 24b' as the guidebeam sections 24a', 24b' pivot into and out of alignment with the main guidebeam 14'. The roller assemblies 36' coast with the plate 38' to allow the guidebeam sections 24a', 24b' to pivot smoothly into alignment with the main guidebeam 14'. The plate 38' is preferably embedded in the guideway 12'.

A drive mechanism 39' is connected to each of the guidebeam sections 24a', 24b'. The drive mechanism 39' is configured to pivot the respective guidebeam sections 24a', 24b' into and out of alignment with the main guidebeam 14'. In Fig. 2, two guidebeam sections 24a', 24b' are provided in the guidebeam switch 18', but additional guidebeam sections (curved or straight) may be provided in accordance with the present invention, as stated previously. The drive mechanism 39' is generally configured to pivot one or the other of the guidebeam sections 24a', 24b' shown in Fig. 2 into alignment with the main guidebeam 14'. The "non-selected" guidebeam sections 24a', 24b', as shown in Fig. 2, remains out of alignment with main guidebeam 14' when the "selected" guidebeam section 24a', 24b', as shown in Fig. 2, is aligned with the main guidebeam 14'. However, at any given time one of the guidebeam sections 24a', 24b' is aligned or pivoting into alignment, with the main guidebeam 14' as a safety feature to prevent a guided vehicle from entering an open guidebeam switch. The other guidebeam section 24a', as shown in Fig. 2, is thus positioned out of alignment with the main guidebeam 14'. The drive mechanism 39' is preferably an electro-mechanical drive, a motor and a chain drive connected to the guidebeam sections 24a', 24b'. In addition, the drive mechanism 39' may be a hydraulic cylinder and pistons connected to the guidebeam sections 24a', 24b' in the manner discussed

previously in connection with the guidebeam switch 18 shown in Fig. 1.

Referring now to Figs. 2 and 4-7, in a preferred embodiment of the arrangement 10', the arrangement 10' includes a passive intermediate support 40 for the curved guidebeam section 24a'. The passive intermediate support 40 is configured to support the curved guidebeam section 24a' as a guided vehicle (not shown) passes over the curved guidebeam section 24a'. A similar passive intermediate support 40 may be provided for the straight guidebeam 24b' in Fig. 2 but is not generally necessary. The passive intermediate support 40 is provided for the curved guidebeam section 24a' because as the guided vehicle passes over the curved guidebeam section 24a' centrifugal forces act outward on the guidebeam section 24a'. The passive intermediate support 40 of the present invention acts to restrain the outward directed centrifugal forces acting on the curved guidebeam section 24a'.

The intermediate support 40 includes a first portion 42 which is configured to be secured to the guideway 12'. As shown in Fig. 4, the first portion 42 of the intermediate support may be positioned in a switching pit 23' defined below the surface of the guideway 12'. The intermediate support 40 further includes a second portion 44 attached to the curved guidebeam section 24a'. The curved guidebeam section 24a' is illustrated in Fig. 4 as an H-beam. The second portion 44 of the intermediate support includes two spaced apart leg portions 46. The first portion 42 of the intermediate support 40 defines lateral recess 48. The leg portions 46 are configured to cooperate with the lateral recesses 48. The first portion 42 may be secured to the guideway 12' with fasteners, such as bolts and associated hardware. Similarly, the second portion 44 may be secured to the curved guidebeam section 24a' with fasteners, such as nuts, bolts and associated hardware.

In operation, as the curved guidebeam section 24a' rotates fully into alignment with the main guidebeam 14', the second portion 44 attached to the curved guidebeam section 24a' engages the first portion 42 of the intermediate support 40. The leg portions 46 attached to the second portion 44 of the intermediate support 40 slide into engagement with the lateral recesses 48 defined by the first portion 42 of the intermediate support 40, as illustrated in Fig. 5. The first portion 42 of the intermediate support 40 is adapted to transmit the outward directed centrifugal forces acting on the curved guidebeam section 24a' to the guideway 12', as will be appreciated by those skilled in the art. Since outward directed forces on the straight guidebeam section 24b' in Fig. 2 are typically much lower, the intermediate support 40 may be omitted from the straight guidebeam section 24b'.

In operation, when the drive mechanism 39' is activated, the guidebeam section, 24a' for example, which is initially aligned with the main guidebeam 14' begins to move out of alignment with the main guidebeam 14', while the "selected" guidebeam section 24b' begins to pivot into alignment with the main guidebeam 14'. When the "selected" guidebeam section 24b' is aligned with the main guidebeam 14', the locking pin 17' extends from the end 32' of the main guidebeam 14' and engages the cavity 34' in the second end 28' of the "selected" guidebeam section 24b'. In this manner, the main guidebeam 14' and the "selected" guidebeam section 24b' are locked in engagement. As with the guidebeam switch 18 discussed previously, the locations for the locking pin 17' and the cavity 34' may be reversed. In particular, the main guidebeam 14' may define the cavity 34' at end 32', while a plurality of extendable locking pins 17' is located at the second end of the guidebeam sections 24a', 24b', respectively. Hence, in this configuration, when the selected guidebeam section 24b' is aligned with the main guidebeam 14', the locking pin 17' attached to the "selected" guidebeam section 24b' may

engage the cavity 34' defined in the main guidebeam 14' thereby locking the main guidebeam 14' and the "selected" guidebeam section 24b' together.

Fig. 3 shows a locking assembly 50, also referred to as a locking mechanism, for connecting adjacent guidebeam portions in the guidebeam switches 18, 18' discussed hereinabove. The locking assembly 50 will be discussed in connection with the guidebeam switch 18' shown in Fig. 2. However, the same principle of operation of the locking assembly 50 may be applied in the guidebeam switch 18 shown in Fig. 1. The locking assembly 50 includes the locking pin 17' located at the end 32' of the main guidebeam 14'. One of the turnout guidebeams 24b' is shown in Fig. 3 and defines the cavity 34'. When the "selected" guidebeam section 24b' shown in Fig. 3 is aligned with the main guidebeam 14' the locking pin 17' is activated and extends into the cavity 34' in the second end 28' of the selected guidebeam section 24b'. A limit switch 52 positioned in the cavity 34' is engaged by the locking pin 17'. The locking pin 17', after engaging the limit switch 52, remains positioned in the cavity 34' to lock the main guidebeam 14' and the selected guidebeam section 24b' together. The limit switch 52 then generates a signal indicating that the selected guidebeam section 24b' is aligned and locked with the main guidebeam 14'. Once the limit switch 52 is activated, the generated signal is sent to a system computer (not shown) or a signal light (not shown) indicating that the selected guidebeam section 24b' is properly aligned with the main guidebeam 14' and the guided vehicle can travel through the guidebeam switch 18' (shown in Fig. 2). When another guidebeam section 24a' for example, is to be moved into alignment with the main guidebeam 14', the locking pin 17' is retracted from the cavity 34', and the drive mechanism 39' activated to simultaneously move the "first" guidebeam section 24b', for example, out of alignment while the "newly selected" guidebeam section 24a', for example, is pivoted into

alignment with the main guidebeam 14'. The newly aligned guidebeam section 24a' and main guidebeam 14' are locked together as described previously. The extendable locking pin arrangement of the present invention provides the advantage that the locking pin 17', when extended, provides stability in the vertical and lateral directions for the aligned guidebeam portions, such as the main guidebeam 14' and the guidebeam section 24b' shown in Fig. 3. A similar advantage is afforded to the arrangement 10 shown in Fig. 1 as well. The vertical and lateral directions may be defined with respect to a central or longitudinal axis L' of the main guidebeam 14' in Fig. 2, and a central or longitudinal axis L₁, L₂ of the turnout guidebeam 16 in Fig. 1.

Referring briefly to Fig. 1, when the guidebeam section 24 is to be moved into alignment with another of the turnout guidebeams 16 shown in Fig. 1, the locking pin 17 is retracted from the guidebeam section 24 and the drive mechanism 39 activated to pivot the guidebeam section 24 to the next selected turnout guidebeam 16. The locking pin 17 is again activated to engage the cavity 34 defined in the guidebeam section 24, thereby locking the selected turnout guidebeam 16 and the guidebeam section 24 together.

Referring briefly to Fig. 2, the arrangement 10' preferably includes limit switches 54, 55 secured to the guideway 12' at respective lateral storage locations for the guidebeam sections 24a', 24b'. The respective limit switches 54, 55 are adapted to generate a signal indicating when the "non-selected" guidebeam section, either the curved guidebeam section 24a' or the straight guidebeam section 24b' in Fig. 2, is clear of the guided vehicle's clearance envelope, and located at its storage position. A guided vehicle (not shown) may then pass without obstruction through the guidebeam switch 18'. The "non-selected" guidebeam section in Fig. 2 is the curved guidebeam section 24a' and is illustrated at its storage position and engaging limit switch 54. The straight

guidebeam section 24b' is fully aligned with the main guidebeam section 14'. Limit switch 54 actuated by the curved guidebeam section 24a' sends a signal to the system computer (not shown) or a signal light (not shown),
5 indicating that the "non-selected" curved guidebeam section 24a' is properly stored in its storage position located outside of the clearance envelope for the guided vehicle. The vehicle clearance envelope may be defined as the lateral distance from the centerline L' of the main
10 guidebeam 14' in Fig. 2 necessary for the guided vehicle to pass without obstruction by the "non-selected" guidebeam section (24a' in Fig. 2) through the guidebeam switch 18'. The guided vehicle clearance envelope thus generally dictates how far the respective guidebeam sections 24a',
15 24b' must pivot away from the main guidebeam 14' to provide the necessary clearance for the guided vehicle to pass through the guidebeam switch 18' and, in particular, to pass over the "selected" guidebeam section (24b' in Fig. 2). The limit switch 55 actuated by the straight guidebeam
20 section 24b' operates in a similar manner. As stated previously, the arrangement 10' in Fig. 2 may include any combination of curved and straight guidebeam sections, each of which will preferably include a "storage position" limit switch as discussed hereinabove. The guidebeam section 24
25 in Fig. 1 may also include a similar storage position limit switch (not shown).

The present invention was described with reference to preferred embodiments which are merely illustrative of the present invention and not restrictive
30 thereof. Obvious modifications and alterations of the present invention may be made without departing from the spirit and scope of the present invention. The scope of the present invention is defined by the appended claims and equivalents thereto.

WE CLAIM:

1. A pivotable switch arrangement for switching a guided vehicle guidebeam, comprising:
 - a vehicle guideway;
 - a main guidebeam secured to the vehicle
 - 5 guideway;
 - a plurality of turnout guidebeams secured to the vehicle guideway and spaced from the main guidebeam;
 - a pivotable guidebeam section having a first end and a second end, with the first end pivotably
 - 10 connected to the guideway adjacent an end of the main guidebeam;
 - a drive mechanism connected to the guidebeam section and configured to pivot the guidebeam section between the plurality of turnout guidebeams and align the
 - 15 second end of the guidebeam section with one of the plurality of turnout guidebeams; and
 - a locking mechanism configured to connect the guidebeam section with the one of the plurality of turnout guidebeams,
 - 20 wherein the main guidebeam, the turnout guidebeams and the guidebeam section are at substantially the same elevation above the guideway such that the pivotable guidebeam section does not lie in a switching pit.
2. The pivotable switch arrangement of claim 1, wherein the locking mechanism includes an extendable locking pin located at an end of each of the turnout guidebeams substantially facing the main guidebeam,
- 5 wherein the second end of the guidebeam section defines a cavity, and wherein the locking pin for each of the turnout guidebeams is configured to engage the cavity

when the second end of the guidebeam section is aligned with the one of the plurality of turnout guidebeams.

3. The pivotable switch arrangement of claim 2, wherein the locking mechanism further includes a limit switch positioned in the cavity, and wherein the locking pin for each of the turnout guidebeams is configured to
5 engage the limit switch.

4. The pivotable switch arrangement of claim 3, wherein the limit switch is configured to generate a signal when the locking pin is extended into the cavity and engages the limit switch, indicating that the
5 guidebeam section is aligned and locked with the one of the plurality of turnout guidebeams.

5. The pivotable switch arrangement of claim 1, wherein the drive mechanism is a motor and a chain drive connected to the guidebeam section.

6. The pivotable switch arrangement of claim 1, wherein the drive mechanism is a hydraulic cylinder and a piston connected to the guidebeam section.

7. The pivotable switch arrangement of claim 1, wherein the guideway includes a plate and the guidebeam section includes a roller assembly configured to roll along the plate as the guidebeam section pivots
5 between the plurality of turnout guidebeams.

8. The pivotable switch arrangement of claim 2, wherein the cavity is defined at the end of each of the turnout guidebeams, wherein the locking pin is

located at the second end of the guidebeam section, and
5 wherein the locking pin is configured to removably engage
the cavity when the second end of the guidebeam section
is aligned with the one of the plurality of turnout
guidebeams.

9. A locking mechanism for connecting
adjacent guidebeam sections in a pivotable guidebeam
switch, comprising:

a first guidebeam section having an extendable
5 locking pin at one end;

a second guidebeam section defining a cavity at
an end facing the locking pin; and

a limit switch positioned in the cavity,

wherein the locking pin is configured to
10 removably engage the limit switch in the cavity when the
first and second guidebeam sections are aligned, and

wherein the limit switch is configured to
generate a signal when the locking pin engages the limit
switch, indicating that the first and second guidebeam
15 sections are aligned and locked together.

10. A pivotable switch arrangement for
switching a guided vehicle guidebeam, comprising:

a vehicle guideway;

a main guidebeam secured to the vehicle
5 guideway;

a plurality of turnout guidebeams secured to
the vehicle guideway and spaced from the main guidebeam;

a plurality of guidebeam sections each having a
first end and a second end, with the first end of each of
10 the guidebeam sections pivotally connected to the

guideway adjacent to the plurality of turnout guidebeams, respectively;

15 a drive mechanism connected to each of the guidebeam sections and configured to pivot the respective guidebeam sections such that the second end of one of the guidebeam sections aligns with the main guidebeam; and

20 a locking mechanism configured to connect the one of the guidebeam sections with the main guidebeam when the one of the guidebeam sections is aligned with the main guidebeam, .

25 wherein the main guidebeam, the turnout guidebeams and the guidebeam sections are at substantially the same elevation above the guideway such that the pivotable guidebeam sections do not lie in a switching pit.

5 11. The pivotable switch arrangement of claim 10, wherein the locking mechanism includes an extendable locking pin at an end of the main guidebeam substantially facing the turnout guidebeams, wherein the second end of each of the guidebeam sections defines a cavity, and wherein the locking pin is configured to removably engage the cavity in the second end of the one of the guidebeam sections when the one of the guidebeam sections is aligned with the main guidebeam.

5 12. The pivotable switch arrangement of claim 11, wherein the locking mechanism further includes a limit switch positioned in the cavity defined by the respective guidebeam sections, wherein the locking pin is configured to engage the limit switch.

13. The pivotable switch arrangement of claim 12, wherein the limit switch is configured to generate a signal when the locking pin is extended into the cavity and engages the limit switch, indicating that the one of
5 the guidebeam sections is aligned and locked with the main guidebeam.

14. The pivotable switch arrangement of claim 10, wherein the drive mechanism is a motor and a chain drive connected to the guidebeam sections.

15. The pivotable switch arrangement of claim 10, wherein the guideway includes a plate, and the guidebeam sections each include a roller assembly configured to roll along the plate as the respective
5 guidebeam sections pivot into and out of alignment with the main guidebeam.

16. The pivotable switch arrangement of claim 11, wherein the cavity is defined at the end of the main guidebeam, and further including a plurality of the extendable locking pins located at the second end of the
5 guidebeam sections, respectively, and wherein the locking pin for each of the guidebeam sections is configured to engage the cavity defined in the main guidebeam when the one of the guidebeam sections is aligned with the main guidebeam.

17. The pivotable switch arrangement of claim 10, wherein the guidebeam sections include a curved guidebeam section, and the arrangement includes an intermediate support configured to support the curved

5 guidebeam section when the curved guidebeam section is aligned with the main guidebeam.

18. The pivotable switch arrangement of claim 10, further including a storage position limit switch located at the second end of each of the guidebeam sections, connected to the guideway at a storage position
5 of the respective guidebeam sections, and wherein the storage position limit switch for each of the guidebeam sections is configured to generate a signal when the respective guidebeam sections are located in the storage position and actuates the limit switch.