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TRAVELING VEHICLE SYSTEM

Abstract

A traveling vehicle system includes a track of, traveling vehicles, and a controller configured or programmed to control each of the traveling vehicles. A portion of a traveling area for the traveling vehicles is shut off by a shutter activatable upon detection of an anomaly by a detector. The controller is configured or programmed to permit the traveling vehicles to enter an interference section without checking the presence or absence of the traveling vehicles in the interference section upon determining that a number of the traveling vehicles present in a lock section has not reached a specified number of two or more, and prohibits the traveling vehicles from entering the interference section upon determining that the specified number has been reached.

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Background/Summary

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to traveling vehicle systems.

2. Description of the Related Art

[0002] A traveling vehicle system is known in which a traveling vehicle to transport a container such as a front opening unified pod (FOUP) or a reticle pod in which objects to be stored such as semiconductor wafers or glass substrates are stored travels along a track. A building in which such a traveling vehicle system is disposed may be provided with shutters to operate to partition spaces in the building in an emergency to prevent a fire from entering and spreading. In this case, the track is disposed to straddle an area shielded by the shutters.

[0003] In such a traveling vehicle system, if an activated shutter catches a traveling vehicle, the space in the building cannot be partitioned and the shutter cannot function properly. In view of this, for example, an area where a traveling vehicle may be caught when the shutter is activated is set as a blocking area, and blocking control is performed to reduce the number of traveling vehicles present in the blocking area to one or less. This can reduce the possibility that the activated shutter will catch a traveling vehicle.

SUMMARY OF THE INVENTION

[0004] However, such blocking control requires time to determine the presence or absence of traveling vehicles in the blocking area or to control permission to enter the blocking area, which may reduce the transport efficiency of the traveling vehicles.

[0005] In view of this, example embodiments of the present invention provide traveling vehicle systems that each cause an activated shutter to function properly while decreasing or preventing a reduction in transport efficiency.

[0006] A traveling vehicle system according to an example embodiment of the present invention includes a track, a plurality of traveling vehicles to travel along the track in one direction, and a controller configured or programmed to control each of the traveling vehicles, wherein a portion of a traveling area for the traveling vehicles is shut off by a shutter activatable upon detection of an anomaly by a detector. The controller is configured or programmed to set as an interference section a section of the track that includes at least a presence area of the traveling vehicles with which the shutter activated upon detection of the anomaly comes into contact, and set as a lock section a section being adjacent downstream of the interference section in the one direction and having a section length in which two or more of the traveling vehicles are able to be present. The controller is configured or programmed to further permit the traveling vehicles to enter the interference section upon determining that a number of the traveling vehicles present in the lock section has not reached a specified number of two or more, and prohibit the traveling vehicles from entering the interference section upon determining that the specified number has been reached.

[0007] In a traveling vehicle system according to an example embodiment of the present invention, the traveling vehicles are permitted to continuously enter the interference section until the number of traveling vehicles present in the lock section reaches the specified number. This can increase the number of traveling vehicles that are allowed to enter the interference section per unit of time. In a traveling vehicle system according to an example embodiment of the present invention, when the number of traveling vehicles present in the lock section has reached the specified number, traveling vehicles are prohibited from entering the interference section. By this control, a traveling vehicle that cannot enter the lock section will not stay in the interference section, and thus the activated shutter can be prevented from catching the traveling vehicle. Consequently, the activated shutter can function properly while decreasing or preventing a reduction in transport efficiency.

[0008] In a traveling vehicle system according to an example embodiment of the present invention, the controller may permit the traveling vehicles to enter the interference section without checking the presence or absence of the traveling vehicles in the interference section. In a traveling vehicle system according to an example embodiment of the present invention, the number of traveling vehicles that are allowed to enter the interference section per unit of time can be increased in comparison with conventional blocking control of checking the presence or absence of the traveling vehicles in the interference section and then allowing the traveling vehicles to enter the interference section.
[0009] In a traveling vehicle system according to an example embodiment of the present invention, the shutter may have a time lag between shutting off the traveling area and detecting the anomaly, and the interference section may be set so that the traveling vehicles are able to travel through the interference section during the time lag. In a traveling vehicle system according to an example embodiment of the present invention, when an anomaly has been detected while a traveling vehicle is passing through the interference section, the traveling vehicle can be more reliably ejected from the interference section.
[0010] In a traveling vehicle system according to an example embodiment of the present invention, a boundary between the interference section and the lock section may be set at a position where the traveling vehicles are able to travel through the interference section during the time lag, a deceleration point for the traveling vehicles or a stop point for the traveling vehicles may be set on the track further downstream in the one direction than a portion of the traveling area shut off by the shutter, and the lock section may be set to be a section between the boundary and the deceleration point or a section between the boundary and the stop point. In a traveling vehicle system according to an example embodiment of the present invention, even when the point where congestion of traveling vehicles is likely to occur is located downstream of the portion shut off by the shutter, the activated shutter can function properly while reducing or preventing the reduction in transport efficiency.
[0011] In a traveling vehicle system according to an example embodiment of the present invention, the deceleration point or the stopping point may be set at a branch point where the track branches in two or more directions. In the traveling vehicle system thus configured, even when the branch point where congestion of the traveling vehicles is likely to occur is located downstream of the portion shut off by the shutter, the activated shutter can function properly while reducing or preventing the reduction in transport efficiency.
[0012] In a traveling vehicle system according to an example embodiment of the present invention, the detector may be a fire detector to detect a fire, and the shutter may include a fire door. In a traveling vehicle system according to an example embodiment of the present invention, even if the fire door activatable upon detection of an anomaly by the fire detector is operable to shut off the traveling area, the activated shutter can function properly while decreasing or preventing the reduction in transport efficiency.
[0013] According to example embodiments of the present invention, the activated shutter can function properly while decreasing or preventing the reduction in transport efficiency.
[0014] The above and other elements, features, steps, characteristics and advantages of the present invention will become more apparent from the following detailed description of the example embodiments with reference to the attached drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0015] FIG. **1** is a schematic diagram illustrating a configuration of a traveling vehicle system according to an example embodiment of the present invention.

[0016] FIG. **2** is a functional block diagram illustrating a functional configuration of the traveling vehicle system in FIG. **1**.
[0017] FIG. **3** is a sequence diagram of traveling vehicle control at the time of entry into an interference section.
[0018] FIG. **4** is a sequence diagram of the traveling vehicle control when a fire door is activated.

DETAILED DESCRIPTION OF THE EXAMPLE EMBODIMENTS

[0019] Example embodiments of the present invention will be described below with reference to the drawings. In the description of the drawings, identical elements or features will be denoted by identical reference signs and redundant explanations will be omitted. The dimensional proportions in the drawings do not necessarily match those in the description. The terms “upstream” and “downstream” used to describe example embodiments indicates upstream and downstream in a predetermined traveling direction (the arrow directions indicated along tracks **11** illustrated in FIG. **1**: one direction) of an overhead traveling vehicle (traveling vehicle) **5** (hereinafter, simply referred to as “traveling vehicle **5**”).
[0020] A traveling vehicle system **1** is a system configured to transport an article by using the overhead traveling vehicle **5** capable of moving along the tracks **11**. The traveling vehicle **5** is an automated traveling vehicle, and examples thereof include an overhead traveling vehicle and a rail-guided vehicle. Herein, the traveling vehicle system **1** in which the traveling vehicle **5** travels in a building of a factory or the like along one-way tracks **11** installed on a ceiling or the like of the building will be described as an example. As illustrated in FIG. **1**, the traveling vehicle system **1** mainly includes the tracks **11**, a plurality of stations ST, a plurality of the traveling vehicles **5**, and a traveling vehicle controller (controller) **3**.
[0021] The tracks **11** are structures on which the traveling vehicles **5** travel and are suspended from the ceiling. FIG. **1** illustrates an example of a layout of the tracks **11** in the present example embodiment. The tracks **11** in the present example embodiment are set such that the traveling vehicles **5** travel one way in the arrow directions illustrated in FIG. **1**. On the tracks **11**, branch points BP where the tracks **11** branch and merging points CP where the tracks **11** merge are provided.
[0022] The stations ST face the tracks **11**. Each station ST is a portion where an article is delivered to and from a traveling vehicle **5**. Examples of the station ST in a semiconductor processing plant include a load port to deliver a FOUP between a semiconductor processing device and a traveling vehicle **5** and a buffer on which the traveling vehicle **5** can temporarily place the FOUP.
[0023] The building in which the traveling vehicle system **1** is disposed is provided with a fire detector (detector) **81** and a fire door (shutter) **83**. The fire detector **81** detects a fire that has broken out in the building. When having detected a fire, the fire detector **81** transmits a detection signal to the traveling vehicle controller **3** and also activates the fire door **83** to partition a space in the building. The fire door **83** is provided to prevent a fire from entering and prevent the spread of fire. The fire door **83** is disposed in a retreat position, for example, on the ceiling, a side wall, or a floor of the building, and is configured to advance from the retreat position to an advance position at the time of an anomaly.
[0024] The fire door **83** that has advanced from the retreat position (the fire door **83** when activated) shuts off a portion of the traveling area for the traveling vehicles **5** along the tracks **11**. The fire door **83** completes advancing to the advance position 30 seconds after receiving the detection signal transmitted from the fire detector **81**. In other words, the fire door **83** has a time lag of, for example, about 30 seconds from the time when a fire has been detected by the fire detector **81** to the time when it shuts off the traveling area for the traveling vehicles **5** (partitions the space). More specifically, the fire door **83** starts operating in a predetermined time (e.g., about 10 seconds) after having received the detection signal, and completes advancing to the advance position in a predetermined time (e.g., about 20 seconds) after having started operating. The time of the time lag disclosed above is an example and may be less than about 30 seconds or longer than about 30

seconds, for example. The time after receipt of the detection signal until the fire door **83** starts operating does not have to be ensured.

[0025] The traveling vehicle controller **3** includes an input **31**, a display **32**, a communication module **33**, and a traveling vehicle controller **40** as illustrated in FIG. **2**. The input **31** may include a keyboard and a mouse, for example, and is usable by a user to input various operations and various setting values. In the present example embodiment, the setting of a specified number N of vehicles in the lock section A**2**, which is described later in detail, and other settings are set by input from the input **31**. The display **32** includes a liquid crystal display, for example, and is operable to display various setting screens and input screens to be input by the input **31**, for example. The input **31** and the display **32** do not need to be provided integrally with the traveling vehicle controller **3**, and can be substituted by terminal devices that can communicate with each other.

[0026] The communication module **33** is configured to communicate with other devices and the like and, for example, transmits a transport command to each traveling vehicle **5** and receives information (position data) on the current position of the traveling vehicle **5** via a wireless communication network. The communication module **33** also receives a transport command including information on a station ST as a destination, from a higher-level controller via a local area network (LAN), for example.

[0027] The traveling vehicle controller **40** is configured or programmed to perform various control processes in the traveling vehicle system **1**, which is described later in detail, and includes a CPU, a ROM, a RAM, and the like. As illustrated in FIG. **2**, the traveling vehicle controller **40** can be configured or programmed, for example, as software that is a program stored in the ROM, loaded into the RAM, and executed by the CPU. The traveling vehicle controller **40** may be configured as hardware with electronic circuitry, for example.

[0028] The traveling vehicle controller **40** is configured or programmed to control the traveling of the traveling vehicle **5** on the basis of a transport command transmitted from, for example, a higher-level controller (not illustrated). The traveling vehicle controller **40** also ascertains the position of each traveling vehicle **5** on the basis of the position information (described later in detail) periodically **4** continuously transmitted from the traveling vehicle **5**. The traveling vehicle controller **40** sets as an interference section A**1** a section, of the tracks **11**, that includes at least a presence area EA of a traveling vehicle **5** with which the fire door **83** activated upon detection of an anomaly comes into contact, and sets as a lock section A**2** a section that is adjacent downstream of the interference section A**1** in one direction and where two or more traveling vehicles **5** can be present.

[0029] The presence area EA here is an area the upstream end of which is the rear end position of a traveling vehicle **5** in a state in which the fire door **83** is in contact with the front end of the traveling vehicle **5** and the downstream end of which is the front end position of a traveling vehicle **5** in a state in which the fire door **83** is in contact with the rear end of the traveling vehicle **5**. The interference section A**1** in the present example embodiment includes only by the presence area EA of a traveling vehicle **5** with which the fire door **83** activated upon detection of an anomaly comes into contact. The interference section A**1** only needs to be a section that includes the presence area EA, and may be set longer upstream and/or downstream of the presence area EA.

[0030] In more detail, the interference section A**1** is set so that, when a detection signal has been received from the fire detector **81** as soon as a traveling vehicle **5** has entered the interference section A**1**, the traveling vehicle **5** can travel through the interference section A**1** before the fire door **83** triggered to be activated by this reception finishes advancing to the advance position. In other words, the boundary between the interference section A**1** and the lock section A**2**, which is a downstream end position of the interference section A**1**, is set at a position where the traveling vehicle **5** can travel through the interference section A**1** during the time lag described above.

[0031] The meaning of the section where two or more traveling vehicles **5** can be present in the lock section A**2** here includes not only having a section length in which two or more traveling

vehicles **5** can be present with no space therebetween in the front and the rear in the traveling direction, but also having a section length in which two or more traveling vehicles **5** can be present with a predetermined space therebetween in the front and the rear in the traveling direction. The predetermined space therebetween in the front and the rear in the traveling direction is a minimum distance between the vehicles set in advance for each traveling vehicle system **1**, and the traveling vehicles **5**, **5** lined up behind each other are controlled such that the distance therebetween does not become the minimum distance or less.

[0032] For the traveling vehicle controller **40** in the present example embodiment, on the tracks **11** downstream, in the one direction, of the portion of the traveling area for the traveling vehicles **5** shut off by the fire door **83**, a deceleration point for the traveling vehicles **5** or a stop point for the traveling vehicles **5** are set. Examples of configurations of the deceleration point for the traveling vehicles **5** or the stop point for the traveling vehicles **5** in the traveling vehicle system **1** include the branch points BP at each of which a track **11** branches into two or more, the merging points CP at each of which two or more tracks **11** merge, entry positions into curve sections, positions where the stations ST are disposed, and entry positions into blocking areas BA, for example.

[0033] In the present example embodiment, each branch point BP where a track **11** branches into two or more is set as the stop point for a traveling vehicle **5**. More specifically, the branch point BP is a position where the traveling vehicle **5** stops when the blocking control does not give permission to enter the corresponding blocking area BA. At a position in front of the branch point BP, the traveling vehicle **5** asks the traveling vehicle controller **3** for permission to enter the blocking area BA. The traveling vehicle controller **3** checks the presence or absence of a traveling vehicle **5** in the blocking area BA, and permits the traveling vehicle **5** to enter the blocking area BA only when having confirmed that no traveling vehicle **5** is present in the blocking area BA.

[0034] The lock section A**2** is set to be located between the above-described boundary, which is set so that the traveling vehicle **5** can travel through the interference section A**1** during the above-described time lag, and the deceleration point or the stop point described above. In the present example embodiment, it is located between a branch point BP and the interference section A**1**.

[0035] The ranges of the interference section A**1**, the lock section A**2**, and the blocking areas BA described above are defined based on position information in the tracks **11** and are stored in a storage or memory (not illustrated), for example. The traveling vehicle controller **3** stores map information storing the arrangement of the tracks **11** so that each position on the tracks **11** can be uniquely identified by the position information. To the tracks **11**, bar codes or the like on which information corresponding to this position information is displayed are affixed so as to be able to be read by a scanner or the like provided to each traveling vehicle **5**.

[0036] When having determined that the number of traveling vehicles **5** present in the lock section A**2** has not reached the specified number N of two or more, the traveling vehicle controller **40** permits a traveling vehicle **5** to enter the interference section A**1** without checking the presence or absence of a traveling vehicle **5** in the interference section A**1**. When having determined that the specified number N has been reached, it prohibits the traveling vehicle **5** from entering the interference section A**1**. In the present example embodiment, “three” is set as the above-described specified number N, for example. Thus, when having determined that the number of traveling vehicles **5** present in the lock section A**2** has not reached three, the traveling vehicle controller **40** permits the traveling vehicle **5** to enter the interference section A**1** without checking the presence or absence of traveling vehicles **5** in the interference section A**1**. When having determined that the number of traveling vehicles **5** in the lock section A**2** has reached three, it prohibits the traveling vehicle **5** from entering the interference section A**1**.

[0037] Each traveling vehicle **5** is able to transfer an article. The traveling vehicle **5** includes a position acquirer **51** and a traveling controller **53**, as illustrated in FIG. **2**, in addition to the known mechanisms configured to transfer an article.

[0038] The position acquirer **51** is configured or programmed to acquire position information of the

vehicle on the tracks **11**. The position acquirer **51** may include, for example, a reader or scanner to read the bar codes or the like that are affixed to the tracks **11** and on which position information is displayed and an encoder or the like. The position acquirer **51** transmits, as position information, information on a point obtained by the reader or scanner and the travel distance after passing through the point obtained from the encoder to the traveling vehicle controller **3**. The information acquired by the position acquirer **51** is transmitted to the traveling vehicle controller **3** in response to periodic or continuous inquiries from the traveling vehicle controller **3**.

[0039] The traveling controller **53** is configured or programmed to control traveling of the traveling vehicle **5**, and may include an electronic controller including a central processing unit (CPU), a read only memory (ROM), and a random access memory (RAM), for example. The traveling controller **53** is configured or programmed to control the traveling of the traveling vehicle **5** on the basis of a transport command transmitted from the traveling vehicle controller **3**. The transport command transmitted from the higher-level controller (not illustrated) includes information on a station ST as a destination.

[0040] The traveling controller **53** requests entry permission from the traveling vehicle controller **3** at specified positions. In the present example embodiment, the upstream end SP of the interference section A**1** and the branch points BP are set as the specified positions, and the traveling controller **53** requests entry permission at the upstream end SP and the branch points BP from the traveling vehicle controller **3**. The traveling controller **53** may stop once at the upstream end SP and request entry permission, or may request the entry permission just before arriving at the upstream end SP. If the traveling controller **53** cannot receive the entry permission from the traveling vehicle controller **3**, the traveling vehicle **5** stops at the upstream end SP. Similarly, the traveling controller **53** may stop once at each branch point BP and request entry permission, or may request the entry permission just before arriving at the branch point BP. If the traveling controller **53** cannot receive the entry permission from the traveling vehicle controller **3**, the traveling vehicle **5** stops at the branch point BP.

[0041] In the traveling vehicle system **1** thus configured, operation of each traveling vehicle **5** when the traveling vehicle controller **3** allows the traveling vehicle **5** to enter the interference section A**1** will be described mainly with reference to FIG. **3**. The following describes the operation of the traveling vehicle **5** from a state in which the number of traveling vehicles **5** in the lock section A**2** is zero to a state in which it becomes three.

[0042] When the traveling vehicle **5** approaches the upstream end SP of the interference section A**1** (e.g., one meter before the upstream end SP), it requests entry permission into the interference section A**1** from the traveling vehicle controller **3** (step S**1**). The traveling vehicle controller **3**, from which the entry permission has been requested, checks the number of traveling vehicles **5** present in the lock section A**2**. When having confirmed that the number of traveling vehicles **5** present in the lock section A**2** is zero, the traveling vehicle controller **3** determines that the specified number (N=3) has not been reached (step S**2**). The traveling vehicle controller **3** permits a traveling vehicle **5** to enter the interference section A**1** without checking the presence or absence of traveling vehicles **5** in the interference section A**1** (step S**3**). The traveling vehicle **5** that has entered the interference section A**1** exits the interference section A**1** and then stops in the lock section A**2** before the branch point BP and requests entry permission into the blocking area BA from the traveling vehicle controller **3** (step S**4**).

[0043] When the second traveling vehicle **5** following the first traveling vehicle **5** approaches the upstream end SP of the interference section A**1** (e.g., one meter before the upstream end SP), it requests entry permission into the interference section A**1** from the traveling vehicle controller **3** (step S**5**). The traveling vehicle controller **3**, from which the entry permission has been requested, checks the number of traveling vehicles **5** present in the lock section A**2**. When having confirmed that the number of traveling vehicles **5** present in the lock section A**2** is one for the first traveling vehicle **5**, the traveling vehicle controller **3** determines that the specified number (N=3) has not

been reached (step S**6**). The traveling vehicle controller **3** permits the second traveling vehicle **5** to enter the interference section A**1** without checking the presence or absence of traveling vehicles **5** in the interference section A**1** (step S**7**). The second traveling vehicle **5** that has entered the interference section A**1** exits the interference section A**1** and then stops in front of the first traveling vehicle **5**. The area where the second traveling vehicle **5** stops is also the lock section A**2** (step S**8**).

[0044] When the third traveling vehicle **5** following the second traveling vehicle **5** approaches the upstream end SP of the interference section A**1** (e.g., one meter before the upstream end SP), it requests entry permission into the interference section A**1** from the traveling vehicle controller **3** (step S**9**). The traveling vehicle controller **3**, from which the entry permission has been requested, checks the number of traveling vehicles **5** present in the lock section A**2**. When having confirmed that the number of traveling vehicles **5** present in the lock section A**2** is two for the first traveling vehicle **5** and the second traveling vehicle **5**, the traveling vehicle controller **3** determines that the specified number (N=3) has not been reached (step S**10**). The traveling vehicle controller **3** permits the third traveling vehicle **5** to enter the interference section A**1** without checking the presence or absence of traveling vehicles **5** in the interference section A**1** (step S**11**). The third traveling vehicle **5** that has entered the interference section A**1** exits the interference section A**1** and then stops in front of the second traveling vehicle **5**. The area where the third traveling vehicle **5** stops is also the lock section A**2** (step S**12**).

[0045] When the fourth traveling vehicle **5** following the third traveling vehicle **5** approaches the upstream end SP of the interference section A**1** (e.g., one meter before the upstream end SP), it requests entry permission into the interference section A**1** from the traveling vehicle controller **3** (step S**13**). The traveling vehicle controller **3**, from which the entry permission has been requested, checks the number of traveling vehicles **5** present in the lock section A**2**. When having confirmed that the number of traveling vehicles **5** present in the lock section A**2** is three for the first traveling vehicle **5**, the second traveling vehicle **5**, and the third traveling vehicle **5**, the traveling vehicle controller **3** determines that the specified number (N=3) has been reached (step S**14**). The traveling vehicle controller **3** does not permit the fourth traveling vehicle **5** to enter the interference section A**1** (step S**15**). After this, the fourth traveling vehicle **5** periodically requests entry permission into the interference section A**1** from the traveling vehicle controller **3** until it is permitted to enter by the traveling vehicle controller **3**.

[0046] In the traveling vehicle system **1** thus configured, operation of each traveling vehicle **5** when the fire detector **81** has detected a fire when the traveling vehicle controller **3** allows the traveling vehicle **5** to enter the interference section A**1** will be described below mainly with reference to FIG. **4**. Step S**1** to step S**8** therein are the same as those in FIG. **3**, and thus detailed description thereof is omitted. The following describes operation of the above-described third traveling vehicle **5**, assuming that the fire detector **81** has detected a fire after the second traveling vehicle **5** has stopped in the lock section A**2**.

[0047] When having detected a fire, the fire detector **81** transmits a detection signal to the fire door **83** (step S**21**) and also transmits the detection signal to the traveling vehicle controller **3** (step S**23**). The fire door **83** completes advancing to the advance position 30 seconds after receiving the detection signal transmitted from the fire detector **81** (step S**22**). Before the fire detector **81** detects the fire, the second traveling vehicle **5** that had entered the interference section A**1** has exited the interference section A**1** and stops in the lock section A**2** before the fire door **83** advances (CLOSE) to the advance position (step S**8**).

[0048] When the third traveling vehicle **5** following the second traveling vehicle **5** approaches the upstream end SP of the interference section A**1** (e.g., one meter before the upstream end SP), it requests entry permission into the interference section A**1** from the traveling vehicle controller **3** (step S**24**). After receiving the detection signal from the fire detector **81**, the traveling vehicle controller **3** does not permit entry into the interference section A**1** even if entry permission is requested from the traveling vehicle **5**. In other words, even if entry permission is requested from

the third traveling vehicle **5**, the traveling vehicle controller **3** after step S**24** does not permit it to enter the interference section A**1** (step S**25**). After this, the third traveling vehicle **5** periodically requests entry permission into the interference section A**1** from the traveling vehicle controller **3** until it is permitted to enter by the traveling vehicle controller **3**.

[0049] The operation and effect of the traveling vehicle system **1** in the above-described example embodiment will be described. In the traveling vehicle system **1** according to the above example embodiment, traveling vehicles **5** are permitted to continuously enter the interference section A**1** without checking the presence or absence of traveling vehicles **5** in the interference section A**1** until the number of traveling vehicles **5** present in the lock section A**2** reaches the specified number N. In the traveling vehicle system **1** according to the above example embodiment, when the number of traveling vehicles **5** present in the lock section A**2** has reached the specified number N, traveling vehicles **5** are prohibited from entering the interference section A**1**. By this control, a traveling vehicle **5** that cannot enter the lock section A**2 2** from the interference section A**1** will not stay in the interference section A**1**, and the activated fire door **83** can be prevented from catching the traveling vehicle **5**. Consequently, the activated fire door **83** can function properly while decreasing or preventing a reduction in transport efficiency.

[0050] In the traveling vehicle system **1** according to the above example embodiment, the traveling vehicle controller **3** permits the traveling vehicles **5** to enter the interference section A**1** without checking the presence or absence of the traveling vehicles **5** in the interference section A**1**. By this control, the number of traveling vehicles **5** that are allowed to enter the interference section A**1** per unit of time can be increased in comparison with conventional blocking control of checking the presence or absence of the traveling vehicles **5** in the interference section A**1** and then allowing the traveling vehicles **5** to enter the interference section A**1**.

[0051] In the traveling vehicle system **1** according to the above example embodiment, the fire door **83** has a time lag between shutting off the traveling area of the traveling vehicles **5** and detecting the anomaly, and the interference section A**1** is set so that the traveling vehicles **5** are able to travel through the interference section A**1** during the time lag (the distance, the upstream end position, the downstream end position, and the like of the interference section A**1** are set). By this configuration, when an anomaly has been detected while a traveling vehicle **5** is passing through the interference section A**1**, the traveling vehicle **5** can be more reliably ejected from the interference section A**1**.

[0052] In the traveling vehicle system **1** according to the above example embodiment, a deceleration point for the traveling vehicles **5** or a stop point for the traveling vehicles **5** is set on the track **11** downstream in the one direction from a portion of the traveling area shut off by the fire door **83**, and the lock section A**2** is set to be a section between the boundary (the boundary between the interference section A**1** and the lock section A**2**, which is the downstream end position of the interference section A**1**) and the deceleration point or a section between the boundary and the stop point. By this configuration, even when the point where congestion of traveling vehicles **5** is likely to occur is located downstream of the portion shut off by the fire door **83**, the activated fire door **83** can function properly while decreasing or preventing the reduction in transport efficiency.

[0053] In the traveling vehicle system **1** according to the above example embodiment, the deceleration point or the stop point is set at each branch point BP where the corresponding track **11** branches into two or more. By this configuration, even when the branch point BP where congestion of the traveling vehicles **5** is likely to occur is located downstream of the portion shut off by the fire door **83**, the activated fire door **83** can function properly while decreasing or preventing the reduction in transport efficiency.

[0054] Although example embodiments have been described above, the present invention is not limited to the above-described example embodiments. Various modifications can be made without departing from the gist of the present invention.

[0055] In the traveling vehicle system **1** according to the above example embodiments, an example has been described in which the traveling vehicle controller **3** permits the traveling vehicles **5** to

continuously enter the interference section A**1** without checking the presence or absence of traveling vehicles **5** in the interference section A**1** until the number of traveling vehicles **5** present in the lock section A**2** reaches the specified number N of three. However, the above specified number N only needs to be two or more, and may be two or may be four or more.

[0056] In the traveling vehicle system **1** according to the above example embodiments, an example has been described in which a portion of the traveling area for the traveling vehicles **5** in the interference section A**1** is shut off by the fire door **83**. However, for example, a track portion defining the interference section A**1** may be capable of retreating. Specifically, the track portion capable of retreating retreats from its normal position to a retreat position to avoid contact with the fire door **83** when the fire door **83** is activated. Even in the traveling vehicle system **1** thus configured, a portion of the traveling area for the traveling vehicles **5** is shut off by the fire door **83** that is activated upon detection of an anomaly has been detected by the fire detector **81**.

[0057] In the traveling vehicle system **1** according to the example embodiments and the modifications described above, the overhead traveling vehicle **5** has been described as an example of the traveling vehicle. However, other examples of the traveling vehicle include an automated traveling vehicle to travel on a track installed on the ground or a frame.

[0058] While example embodiments of the present invention have been described above, it is to be understood that variations and modifications will be apparent to those skilled in the art without departing from the scope and spirit of the present invention. The scope of the present invention, therefore, is to be determined solely by the following claims.

Claims

1-**6**. (canceled)

7. A traveling vehicle system comprising: a track; a plurality of traveling vehicles to travel along the track in one direction; and a controller configured or programmed to control each of the traveling vehicles; wherein a portion of a traveling area for the traveling vehicles is shut off by a shutter activatable upon detection of an anomaly by a detector; the controller is configured or programmed to: set as an interference section a section of the track that includes at least a presence area of the traveling vehicles with which the shutter activated upon detection of the anomaly comes into contact; set as a lock section a section being adjacent downstream of the interference section in the one direction and having a section length in which two or more of the traveling vehicles are able to be present; further permit the traveling vehicles to enter the interference section upon determining that a number of the traveling vehicles present in the lock section has not reached a specified number of two or more; and prohibit the traveling vehicles from entering the interference section upon determining that the specified number has been reached.

8. The traveling vehicle system according to claim 7, wherein the controller is configured or programmed to permit the traveling vehicles to enter the interference section without checking for presence or absence of the traveling vehicles in the interference section.

9. The traveling vehicle system according to claim 7, wherein the shutter has a time lag between shutting off the traveling area and detecting the anomaly; and the interference section is structured so that the traveling vehicles are able to travel through the interference section during the time lag.

10. The traveling vehicle system according to claim 9, wherein a boundary between the interference section and the lock section is located where the traveling vehicles are able to travel through the interference section during the time lag; a deceleration point for the traveling vehicles or a stop point for the traveling vehicles is located on the track farther downstream in the one direction than a portion of the traveling area shut off by the shutter; and the lock section is between the boundary and the deceleration point or between the boundary and the stop point.

11. The traveling vehicle system according to claim 10, wherein the deceleration point or the stopping point is set at a branch point where the track branches in two or more directions.

12. The traveling vehicle system according to claim 7, wherein the detector is a fire detector to detect a fire, and the shutter includes a fire door.