Nov. 6, 1962 H. A. COTESWORTH ET AL 3,062,155

OVERHEAD MONORAIL SYSTEM

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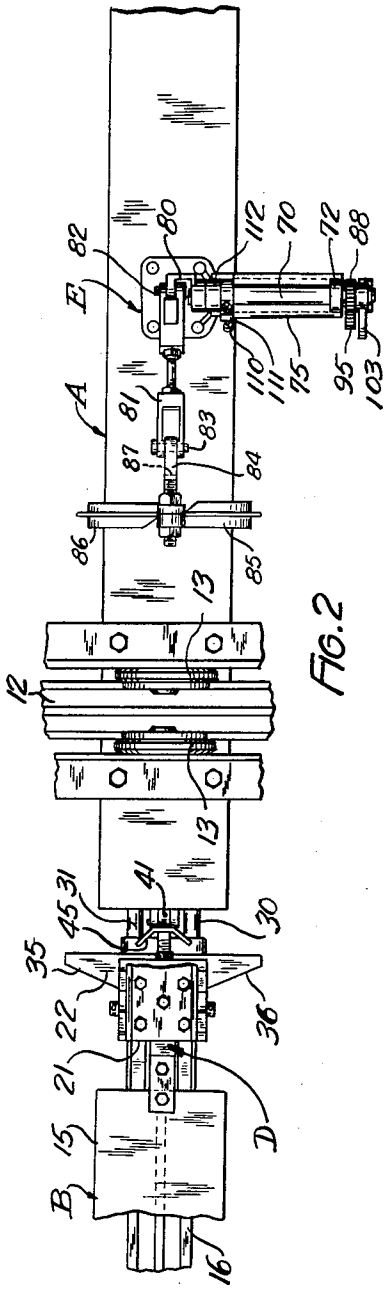


FIG. 2

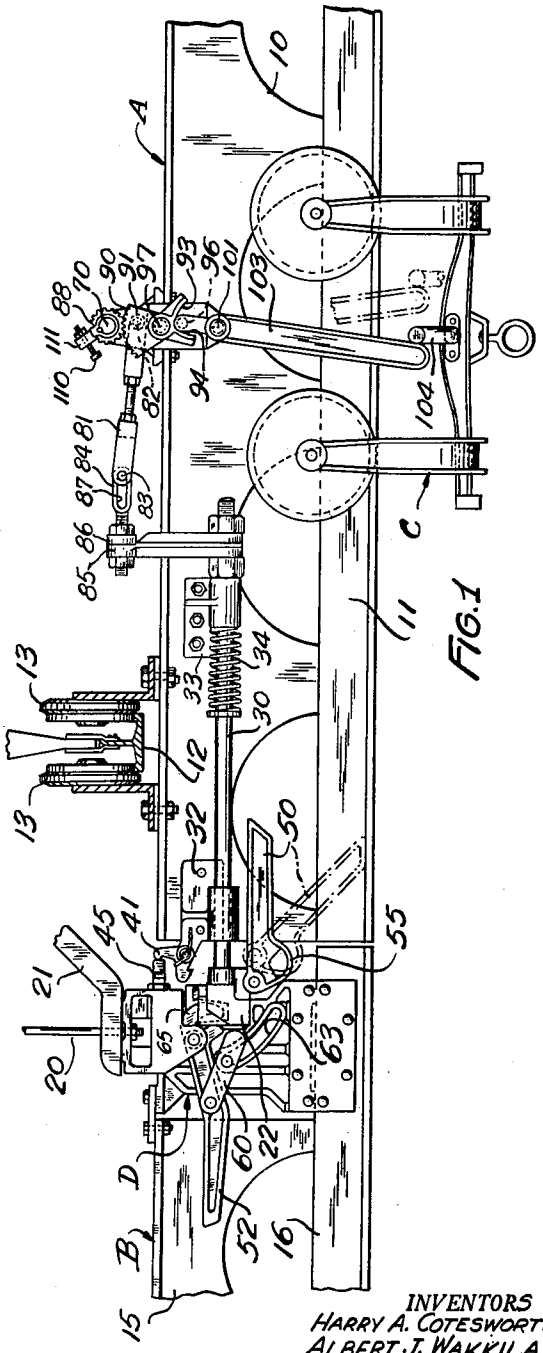


FIG. 1

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OVERHEAD MONORAIL SYSTEM

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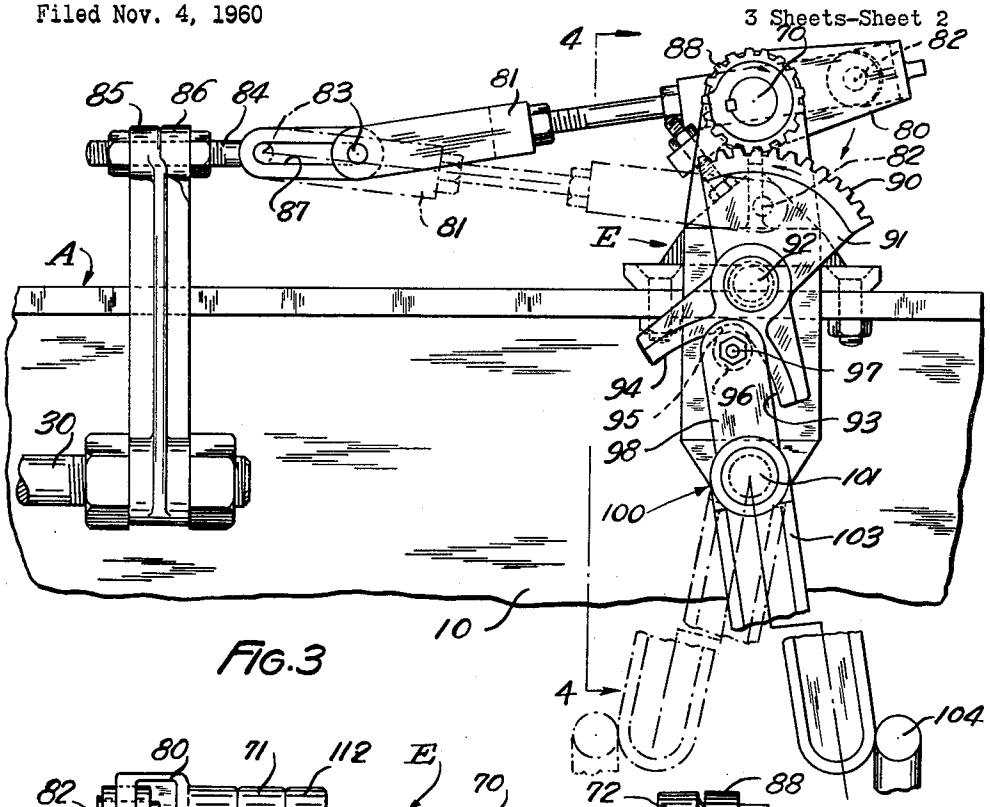


FIG. 3

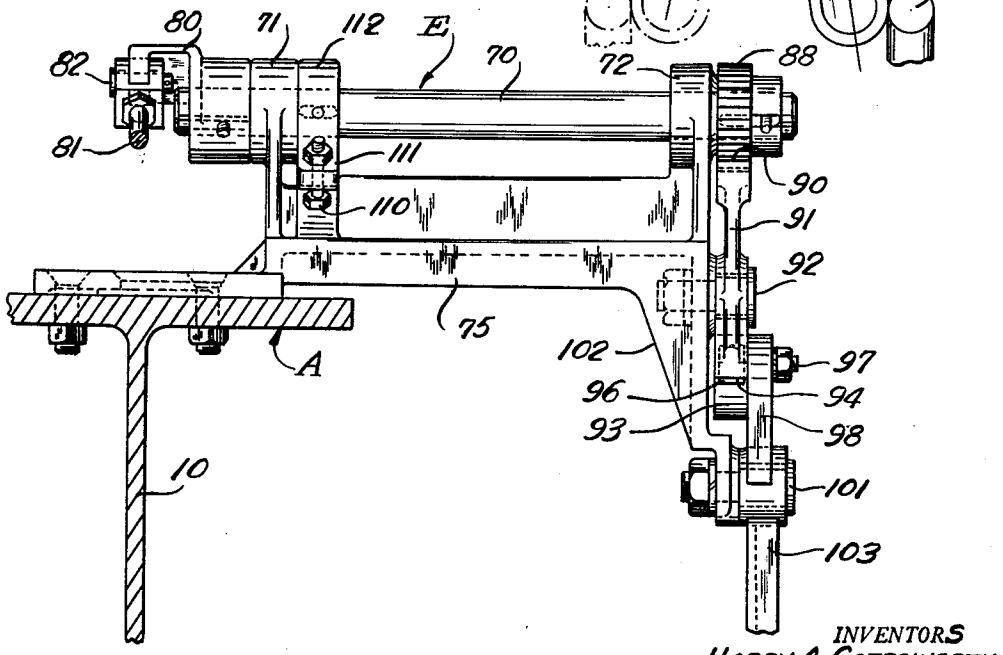


FIG. 4

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Nov. 6, 1962 H. A. COTESWORTH ET AL 3,062,155

OVERHEAD MONORAIL SYSTEM

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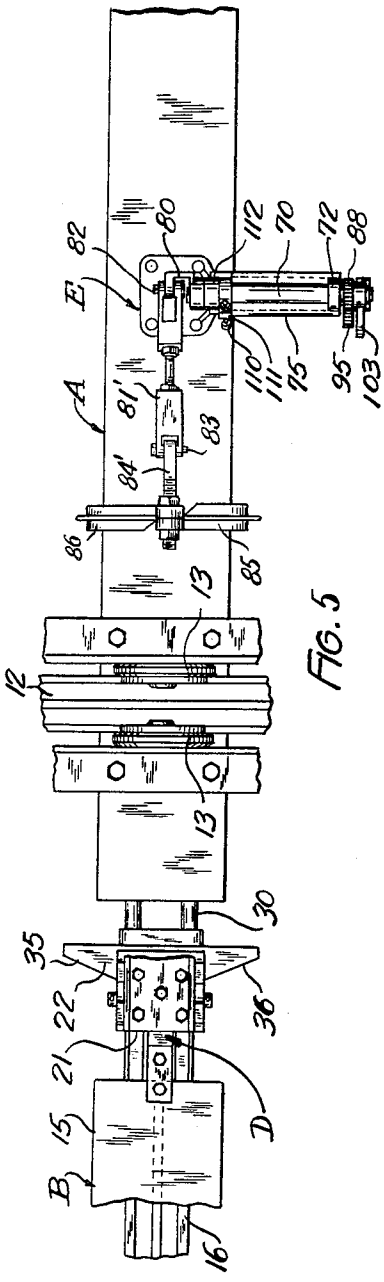


FIG. 5

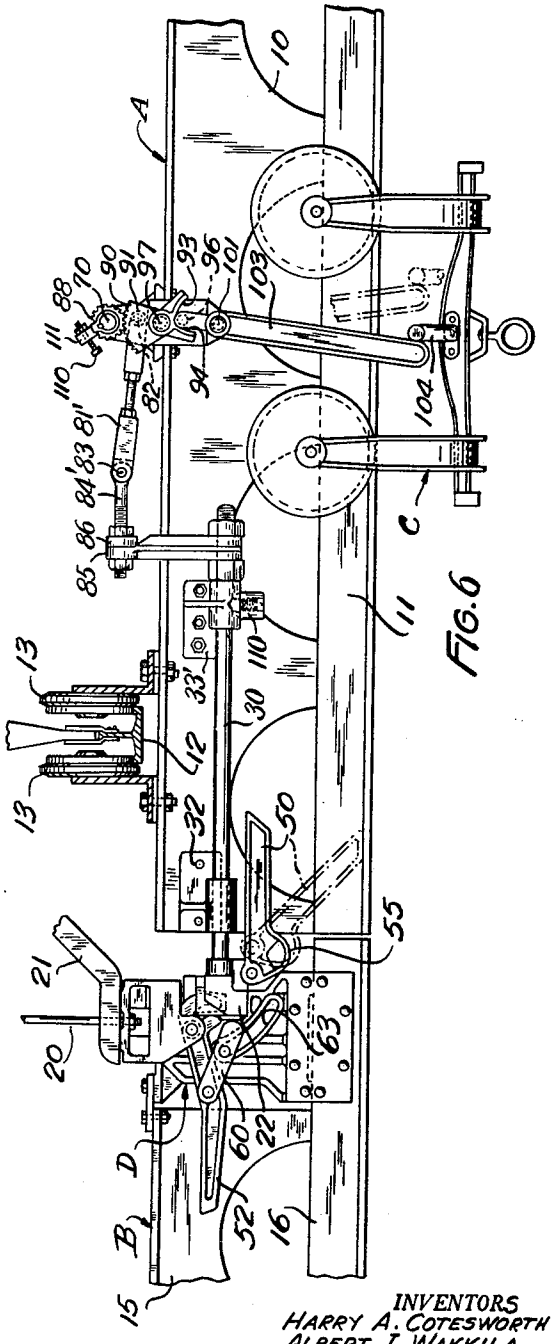


FIG. 6

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OVERHEAD MONORAIL SYSTEM

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4 Claims. (Cl. 104—98)

The present invention relates to material handling, overhead, monorail carrier systems comprising an overhead transfer bridge having a carrier rail adapted to be selectively aligned with a carrier rail of one or more stationary tracks or transfer bridges and, more particularly, to mechanism for locking a transfer bridge to a stationary track or to another transfer bridge with the respective carrier rails in end-to-end alignment while a carrier is being moved from one to the other.

This application is a continuation-in-part of our copending application Serial No. 832,107, filed August 6, 1959.

The principal object of the present invention is the provision of a new and improved overhead, monorail carrier system having a transfer bridge selectively alignable with one or more stationary tracks or transfer bridges and comprising safety stops at or adjacent to the open ends of the rails for limiting the movement of carriers towards the ends of the respective rails unless locked in proper alignment with another rail, in combination with means for aligning, locking and unlocking the rails in end-to-end position operable by a carrier traveling on the system.

The invention resides in certain constructions and combinations and arrangements of parts and further advantages of the invention will be apparent to those skilled in the art to which it relates from the following description of the preferred embodiment described with reference to the accompanying drawings forming a part of this specification, in which similar reference characters designate corresponding parts, and in which:

FIG. 1 is a fragmentary, side elevational view of a material handling overhead monorail carrier system embodying the invention;

FIG. 2 is a fragmentary top plan view of the portion of the overhead carrier system shown in FIG. 1;

FIG. 3 is an enlarged fragmentary, side elevational view of a portion of FIG. 1 with certain of the parts in a different operating position;

FIG. 4 is a sectional view approximately on the line 4—4 of FIG. 3 with portions in elevation; and

FIGS. 5 and 6 are views similar to FIGS. 1 and 2 but showing a modified construction.

While the invention is susceptible of various modifications and alternate constructions, two preferred embodiments are shown in the drawings and herein described in detail. It is to be understood, however, that there is no intention to thereby limit the invention to the specific forms disclosed, but it is our intention to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring to the drawings, FIG. 1 is a fragmentary view of an overhead, monorail carrier system showing one end of an overhead transfer bridge A and one end of a stationary track structure B. The transfer bridge A and stationary structure B are shown in side elevation and positioned so that a material handling carrier, designated generally as C can be transferred from one structure to the other. The system is preferably of the electrified type in which the carriers and transfer bridges are electrically

powered, but for simplicity the system illustrated is one in which the carriers are hand-propelled.

The transfer bridge A comprises a track assembly, including a girder **10** of T-section, to the lower part of which is welded a carrier rail **11** of inverted T-section. The opposite ends of the girder are suspended from inverted T-section rails **12** for movement transversely of its length by means including wheels **13**. The rails **12** are suspended from an overhead structure in a suitable manner so as to form a runway for the transfer bridge A. The particular means by which the runway for the bridge is supported forms no part of the present invention and suffice it to say it is preferably flexibly suspended by hanger rods, not shown, to assist in relieving stresses, wheel flange friction, etc.

As is well understood in the art, the transfer bridge A is adapted to move along its runway into selective alignment with a plurality of stationary tracks to transfer overhead carriers from one location to another and return the carriers to the same or to a different location. In the embodiment shown, the track structure B is stationary and comprises a T-girder **15** having an inverted T-carrier rail **16** welded to the bottom thereof. The girder **15** is suitably supported by means, including the hanger **20** and the bracket **21** connected to the top of the casting D so that the outer end of the rail **16** has the same elevation as the adjacent end of the bridge rail **11**. As seen in FIG. 1, the girder **15** terminates short of the end of rail **16** and a casting or member D is fixed in the opening thus formed.

The bridge A is adapted to be locked against movement on its runway with the rails **11, 16** in end-to-end alignment by a bolt-like member **22** provided with a flared notch adapted, when the member **22** is projected towards the adjoining end of the stationary track B to receive the adjacent edge portion of the member D, as shown in FIG. 1, to interlock the bolt member **22** with the member D. The member **22** is attached to the ends of two rods **30, 31** located on opposite sides of the girder **10** and slidingly supported for movement lengthwise of the girder by a pair of spaced brackets **32, 33**, at opposite sides of the girder **10**. The brackets have bosses formed integral therewith in which the rods **30, 31** are slidably supported. The rods support the member **22** for movement between a retracted or bridge unlocked position and an extended or bridge locked position. The latter position is shown in FIG. 1. The member **22** is preferably biased by a spring **34** into its locking position and its outer forward face is provided with cam surfaces **35, 36** which slope rearwardly towards opposite sides and cooperate with the casting D to cam the member rearwardly or toward its retracted position as the rails **11, 16** are moved into alignment if the member happens to be in its extended position.

The preferred embodiment herein shown comprises mechanisms whereby the member **22** may be pre-set in its retracted or inoperative position and actuated to automatically interlock the transfer bridge with a stationary track section as the transfer bridge aligns therewith. For this purpose the member **22** is provided with a catch at its top adapted to be engaged by a hook on a bell crank shaped pawl or latch **41** pivoted to the girder **10** of the transfer bridge above the catch on the member **22**. As shown, the latch **41** is pivoted between projecting flanges of the brackets **32** secured to the end of the girder **10** and is normally urged or spring biased in a counterclockwise direction as viewed in FIG. 1, that is, in a direction to engage the end of the latch member with the catch on the member **22**.

The latch **41** is adapted to be automatically tripped or rotated in a clockwise direction to release the member **22**

as the rail of the transfer bridge is moved into end-to-end alignment with the stationary rail by a cam member **45**, adjustably connected to the upper end of the casting D, which cam is adapted to be engaged by the projecting end of the vertically extending arm of the latch **41** to rotate the same clockwise and release the member **22** from the end of the latch **41**. The cam member **45** is in the form of a V-shaped bar fixed to the outer end of a threaded rod, the other end of which is threaded into a suitable threaded bore in the bracket D. The bar is so positioned that the ends thereof make an acute angle relative to the path of travel of the transfer bridge and the upper arm of the latch **41** has a camming surface adapted to engage therewith and trip the latch as the rails are aligned.

Safety stops in the form of members or levers **50, 52** pivoted to the track sections adjacent to their open ends and adapted to normally lie in the path of the wheels of the carriers, are provided to prevent the carrier wheels and in turn the carriers from accidentally rolling from the ends of the rails **11** or **16** in the event another rail is not aligned therewith. These stops are adapted to be automatically raised and lowered when the rails are aligned by movement of the member **22** to its locking and retracted positions. The lever **50** is forked or split and the yoke thereof is pivoted to a depending web on the member **22** with the legs of the lever straddling the web of the girder **10** and the free ends of the lever normally resting on the lateral flanges of the rail **11** in the path of carrier wheels traveling on the rail. As member **22** moves forwardly to interlock with casting D, the portion **55** of the forked lever **50** strikes the adjacent edge of casting D or the plates by which it is connected to the rail **16**, and swings the legs of the lever upwardly to a position above the wheels of the carrier. The stop at the adjoining end of the rail **16** comprises the two levers **52** pivoted to casting D, one on either side thereof. Each of these levers is provided with a projection having a surface or edge which is engaged by the member **22** as it moves forwardly into locking position to swing the levers upwardly to a position above the wheels of the carrier, as shown in FIG. 1.

Each of the levers **52** has a relatively short lever **60** pivotally connected thereto intermediate its ends. The levers **60** are connected together by a rod or shaft fixedly pinned thereto adjacent to their free ends and projecting through an arcuate slot **63** in the member D. The construction is such that as the levers **52** are raised so as to permit the wheels of a carrier to pass thereunder the levers **60** are moved into a substantially horizontal position and project from the levers **52** toward the right as viewed in the drawings, that is, toward the lever **50**. When in this position they prevent the dropping of the levers **52** while a wheel of a carrier is thereunder, that is, in a position between the levers **50** and **52**. When the levers **52** are in their raised position the member **22** is prevented from being retracted and the rails unlocked or released from one another by two arcuate projections **65**, one on each of the levers **52**, which are projected into suitable apertures in the member **22** as the levers **52** are raised by the forward movement of the member **22**, that is, movement of the member **22** into locking position with an aligned rail.

The member **22** is adapted to be moved to its retracted position against the force of the spring **34**, by a carrier operated mechanism, designated generally by the reference character E. This mechanism comprises a shaft **70** rotatably supported in bosses **71, 72** formed integral with the upper ends of upwardly projecting end members of a bracket **75** bolted to the upper flange of the girder **10**. The shaft **70** extends transversely of the girder and, as viewed in FIG. 4, is provided with an eccentric means, specifically a crank arm **80** keyed thereto and to the free end of which an adjustable link or pitman **81** is pivotably connected by a pin **82**. The opposite end of the link **81** is connected by a pin **83** to a member **84** adjustably connected to the adjoining ends of two angular shaped members **85, 86**, the lower ends of which are adjustably connected to the right-hand ends of the rods **30, 31**, respectively. The pin **83**, which is fixed in the left-hand end of the adjustable link **81** projects through an elongated slot **87** in the member **84** to provide a lost motion connection between the link **81** and the member **84**.

The right-hand end of the shaft **70** is provided with a gear **88** keyed thereto which gear is continuously in mesh with a gear segment **90** formed on the upper end of a member **91** pivotally connected to the bracket **75** by a bolt **92** located substantially directly underneath the shaft **70**. The member **91** is extended to the opposite or lower side of its pivot **92** and is provided with downwardly facing arcuate cam surfaces **93, 94**, having a dwell **95** therebetween. The cam surfaces are adapted to be engaged by a cam roller **96** rotatably connected by a bolt **97** to the upper end of a lever **98**, the lower end of which is fixed to a member **100** pivotally connected by a bolt **101** to the lower end of the downwardly projecting portion **102** of the bracket **75**. The member **100** includes a downwardly projecting lever **103**, the lower end of which is adapted to extend into the path of and be engaged by a member **104** carried by a carrier moving along the track **11** of the transfer bridge A.

The parts are normally in the positions shown in FIG. 3 and as the carrier, which is destined for transfer to the rail **16** of the stationary track B, approaches the end of the rail **11** of the transfer bridge A the member **104** on the carrier engages the lower end of the lever **103** to move it in a clockwise direction. This rotates the lever **98** in the same direction causing the cam roller **96** to engage and travel along the cam surface **93** rotating the member **91** in a counterclockwise direction to move the crank arm **80** from the position shown in full lines to the position shown in dot-dash lines, which is the position shown in full lines in FIG. 1. This causes the pin **83** of the adjustable link **81** to move to the left-hand end of the slot **87** in the member **84**. The height of the members **104** may vary and as the member **104** moves underneath the lever **103** the lever may be rotated sufficient to cause the cam roller **96** to leave the cam surface **93**, but this is immaterial as the lever **103** will return to the full line position after the member **104** has moved from underneath the lever.

With the parts in the positions, as just referred to, the carrier is held spaced a short distance from the end of the rail until the transfer bridge is moved to the position in which the rail thereof aligns with the rail of the stationary track. As this position is reached the latch **41** is rotated in a clockwise direction by the cam member **45** to release the bolt member **22** which is then projected or moved into locking position by the spring **34**. During this movement of the bolt member **22** the member **84** is moved to the left so that the pin **83** reassumes its original position at the right-hand end of the slot **87**.

The transfer bridge A and stationary track B remain with their rails locked in alignment with one another until the carrier is returned to the transfer bridge. As the carrier travels onto the transfer bridge, the member **104** again travels underneath and actuates the lever **103**, but at this time the lever **103** is rotated in a counterclockwise direction to cause the cam roller **96** to travel along the cam surface **94** to rotate the member **90** in a clockwise direction to return the crank arm **80** to its original position, that is the position shown in FIG. 3. When the carrier moves from left to right underneath the lever **103** it may rotate the lever sufficiently to cause the cam roller **96** to leave the cam surface **94**, but this is immaterial as the lever will return to a position in which the cam roller **96** rests at the dwell **95** as soon as the member **104** has passed from underneath the lever.

Attention is called to the fact that in the embodiment shown, when the crank arm **80** is in the position shown in full lines in FIG. 3, the line through the center of the pins **82, 83** at opposite ends of the adjustable link **81** is above the center of the shaft **70**. As is apparent, the link **81** does not lie on a line connecting the center of the shaft

70 and the point of the connection of link 81 to the eccentric means or crank arm 80 and therefore is not in a dead center position. Rotation of the lever 80 in a counterclockwise direction, however, is limited by an adjustable stop in the form of a bolt 110 adjustably connected to a projection 111 on a member 112 connected to the shaft 70 immediately at the right-hand side of the boss 71 as viewed in full lines in FIG. 4.

When the parts are returned to the position shown in FIG. 3 and the transfer bridge A is moved away from the stationary track B the latch 41 will reengage the bolt member 22. The latch 41 may be omitted if desired. In this event the bolt member 22 will be retained in its retracted position against the action of the spring 34 by the fact that the crank arm 80 has passed over dead center and the further fact that its movement in a counterclockwise direction under the action of the spring 34 is limited by the adjustable stop 110.

An alternative construction, wherein the bolt member 22 is reciprocated in both directions by carrier movement along the system in opposite directions, is shown in FIGS. 5 and 6. The material handling system shown in these figures is similar to that shown in FIGS. 1 to 4 and already described, with the exception that in the embodiment of FIGS. 5 and 6, the spring 34, the latch 41 and the cam 45 are omitted and the lost motion connection in the pitman connecting the members 85, 86 with the crank arm 80 is dispensed with. The duplicate parts are designated by the same reference characters, if the part serves the same general purpose but if of slightly different configuration, a prime mark is affixed to the reference character designating it.

Referring to the drawings, the part 81', which corresponds to the part 81 of the preferred embodiment, is in the embodiment shown in FIGS. 5 and 6, pivoted to the part 84', corresponding to the part 84 of the preferred embodiment, by the pin 83 without any lost motion therebetween. In other words, the pin 83 projects through a cylindrical hole or aperture in the member 84'. In order to hold the bolt member 22 in its respective engaged and disengaged positions, as the case may be, the bracket 33', which corresponds to the bracket 33 of the preferred embodiment, is provided with a spring-pressed detent located in a boss 110 projecting downwardly from the boss within which the right-hand end of the rod or shaft 30 is reciprocated. The spring-pressed detent engages within one or the other of two suitably spaced depressions in the shaft or rod 30 which serves to hold the bolt member 22 in either its engaged or disengaged position against accidental movement therefrom. The operation of the embodiment shown in FIGS. 5 and 6 is the same as that previously described with the exception of the fact that the bolt member 22 is reciprocated from one position to the other, that is, from operating to inoperating position or vice versa upon oscillation of the crank arm 80 by a carrier moving along the bridge in one direction or the other. As the carrier moves from right to left, as viewed in FIGS. 5 and 6, the bolt member 22 is projected into its operating position and as the carrier moves in the opposite direction it is retracted into its inoperative position.

If it is desired to operate the track interlocking mechanism described manually as distinguished from having it operated by a carrier moving along the rail of the transfer bridge, the shaft 70 may be extended to the right as viewed in FIG. 4 and the extended end thereof provided with a pull chain mechanism similar to that shown in U.S. patent to A. F. Anjeskey, No. 2,642,814. It is also to be understood that while only one end of the transfer bridge A is shown similar mechanism is preferably provided at the opposite end.

From the foregoing, it will be apparent that the objects and advantages heretofore enumerated as well as others have been achieved, and that there has been provided an overhead monorail system having locking mechanism for a transfer or traveling bridge which will prevent movement of the bridge relative to an adjoining track with a carrier so positioned that it might move off the end of one of the tracks, and which locking mechanism can be operated by a carrier moving on this system.

While the preferred embodiment of the invention has been described in considerable detail, we do not wish to be limited to the particular construction shown which may be varied within the scope of the invention, and it is the intention to cover hereby all adaptations, modifications and arrangements thereof which come within the practice of those skilled in the art to which the invention relates.

Having thus described our invention, what we claim is:

1. In an overhead carrier system, a supporting structure, a first carrier rail on said supporting structure, a transfer bridge structure, a second carrier rail connected to said transfer bridge structure, means for selectively moving said bridge structure and said second carrier rail transversely of and into end-to-end alignment with said first rail, a carrier adapted to move from one of said aligned rails onto the other of said aligned rails, a member mounted upon one of said structures for movement into and out of engagement with the other of said structures for locking said structures together to maintain said first and second rails carried thereby in alignment, and means actuated by movement of said carrier along said second rail toward said first rail for moving said member into said locking position.

2. In an overhead carrier system, a supporting structure, a first carrier rail connected to said supporting structure, a transfer bridge structure, a second carrier rail connected to said transfer bridge structure, said transfer bridge structure transporting said second carrier rail transversely of and into end-to-end alignment with said first rail, a member mounted upon said transfer bridge structure for movement into and out of engagement with said supporting structure for locking said structures together to maintain said first and second rails carried thereby aligned, a shaft rotatably supported on said transfer bridge structure, eccentric means mounted on said shaft for rotation therewith, means including a pitman for connecting said member to said eccentric means, means actuated by movement of a carrier along said transfer bridge for rotating said shaft to move said member, and means for limiting rotation of said shaft in one direction with said pitman adjacent to but slightly to one side of a dead center position.

3. In an overhead carrier system, a supporting structure, a first carrier rail connected to said supporting structure, a transfer bridge structure, a second carrier rail connected to said transfer bridge structure, said transfer bridge structure transporting said second carrier rail transversely of and into end-to-end alignment with said first rail, a member mounted upon said transfer bridge structure for movement into and out of engagement with said supporting structure for locking said structures together to maintain said first and second rails carried thereby in alignment, means biasing said member in a direction to engage said supporting structure, a shaft rotatably supported in said transfer bridge structure, eccentric means mounted on said shaft, means including a pitman connecting said member to said eccentric means, a lost motion connection in said last named means, means actuated by movement of a carrier along said transfer bridge for rotating said shaft to move said member, and means for limiting rotation of said shaft in one direction with said pitman adjacent to but slightly to one side of a dead center position.

4. In an overhead carrier system, a supporting structure, a first carrier rail connected to said supporting structure, a transfer bridge structure, a second carrier rail connected to said transfer bridge structure, said transfer bridge structure transporting said second carrier rail transversely of and into end-to-end alignment with said first rail, a member mounted upon said transfer bridge structure for movement into and out of engagement with said supporting

structure for locking said structures together to maintain said first and second rails carried thereby in alignment, means biasing said member in a direction to engage said supporting structure, a shaft rotatably supported on said transfer bridge, eccentric means mounted on said shaft, means including a pitman connecting said member to said eccentric, a lost motion connection in said last named means, means actuated by movement of a carrier along said system in opposite directions for moving said member into and out of engagement with said supporting structure, and means for limiting rotation of said shaft in one direction with said pitman adjacent to but slightly to one side of a dead center position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,550,140 Bennington ---------- Aug. 18, 1925