United States Patent

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[54] **SUSPENDED RAILWAY LOCOMOTIVE**
7 Claims, 4 Drawing Figs.

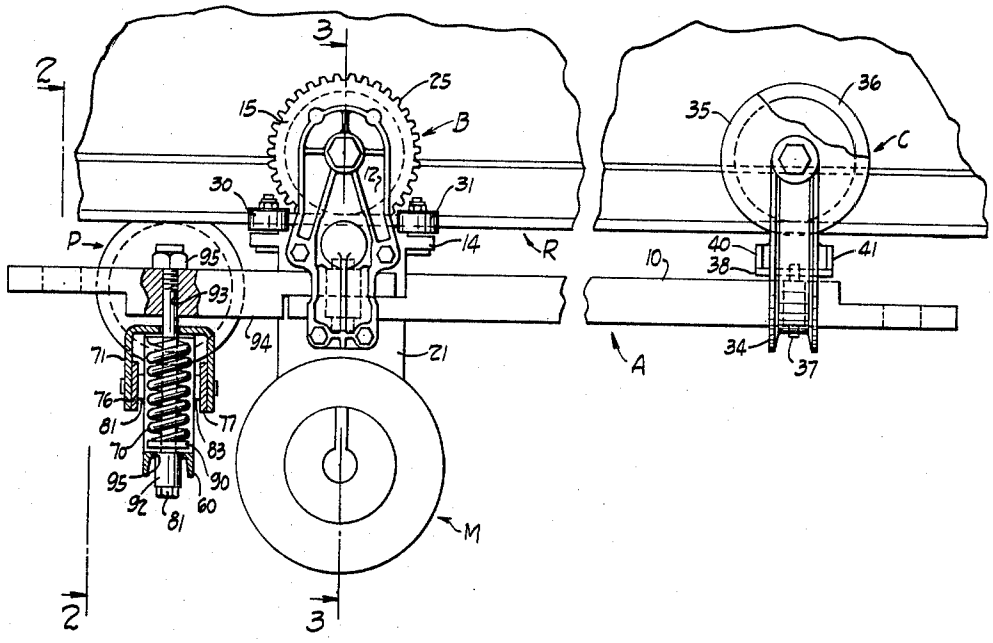
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B61c 11/00, E01b 25/22
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105/154, 156; 104/95; 105/30, 153, 155; 198/128

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ABSTRACT: An overhead monorail carrier-type material-handling system having an articulated assembly movable along an inverted T-shaped monorail and including a drive unit comprising drive wheels engaging one side of the projecting rail flanges and a pressure-producing or traction-increasing unit having pressure wheels biased against the other side of the rail flanges and connected to the drive unit for movement only about an axis nonparallel to the axes of rotation of the drive and pressure wheels.



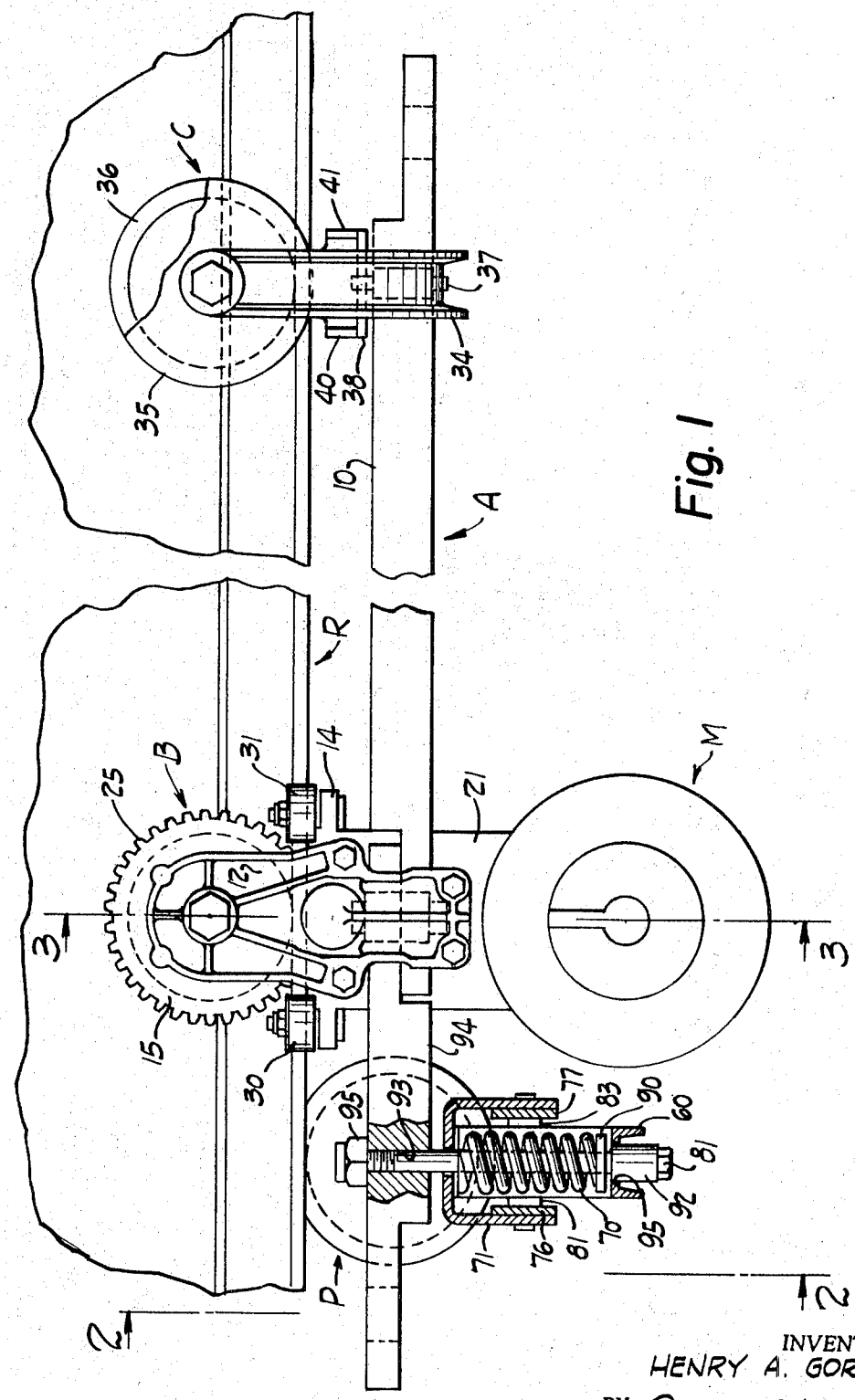


Fig. 1

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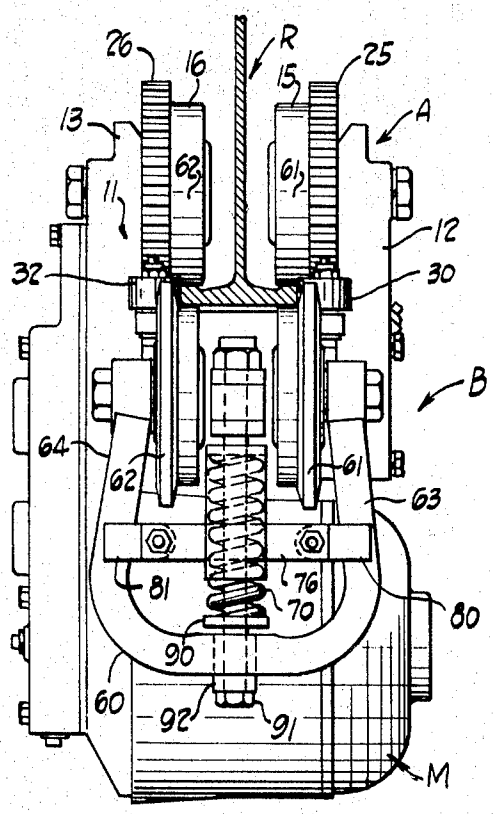


Fig. 2

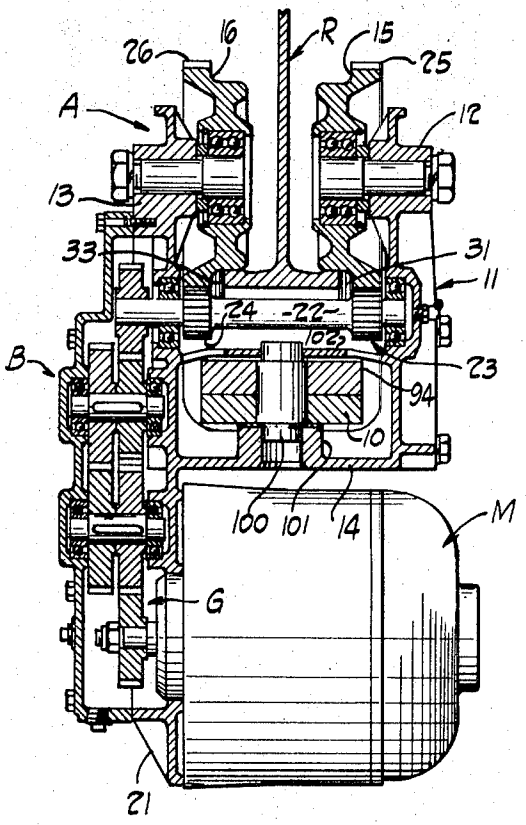


Fig. 3

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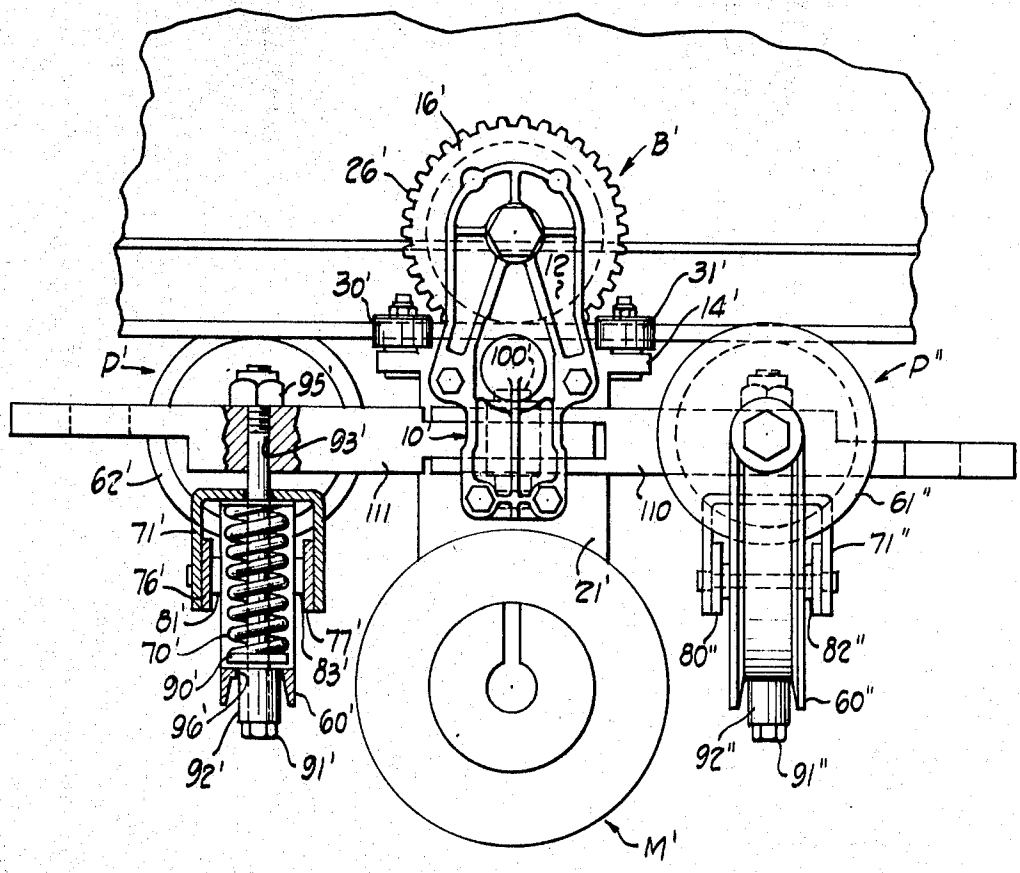


Fig. 4

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SUSPENDED RAILWAY LOCOMOTIVE

FIELD OF THE INVENTION

The present invention relates to overhead monorail carrier-type material-handling systems.

SUMMARY OF THE INVENTION

The invention provides a novel and improved articulated overhead monorail-supported assembly having driving wheels engageable with one side of the rail flanges and pressure-applying wheels biased into engagement with the opposite side of the rail flanges for increasing the traction of the driving wheels.

One of the principal objects of the invention is the provision of a novel and improved power-propelled monorail-supported assembly, for example, a material-handling carrier, a crane end truck, or a tractor, etc., which includes power-driven wheels and pressure-producing wheels adapted to be biased into engagement with the side of the monorail opposite the power-driven wheels for increasing the traction thereof.

Another of the principal objects of the invention is the provision of a novel and improved monorail-supported assembly of the character referred to which has an articulated frame structure facilitating its movement about curves, etc., in the track system.

The invention resides in certain constructions, combinations and arrangement of parts and further objects and advantages will be apparent from the following description of the preferred embodiments with reference to the accompanying drawings in which similar reference characters designate corresponding parts, and in which:

FIG. 1 is a fragmentary side elevational view of a portion of an overhead monorail system showing a section of overhead monorail having an assembly supported thereon for movement therealong and embodying the present invention;

FIG. 2 is a sectional view approximately on the line 2–2 of FIG. 1;

FIG. 3 is a sectional view approximately on the line 3–3 of FIG. 1; and

FIG. 4 is a view similar to FIG. 1 but showing a further embodiment of the invention.

The present invention is susceptible of being embodied in overhead monorail supported assemblies or devices of various constructions and it is to be understood that the preferred embodiments herein shown and described are merely illustrative of the invention; that the invention is not limited to the devices or to the constructions shown, and that the invention covers all devices and constructions within the scope of the appended claims.

Referring to the drawings, the preferred embodiment of the invention shown in FIGS. 1 to 3 comprise a monorail-supported assembly or device A which may be either a material-handling carrier, a crane end truck, etc. The assembly A comprises a member **10** connected between two two-wheeled assemblies or units B and C which support the member **10** for movement along the monorail R. The unit B which carries the left-hand end of the member **10**, as viewed in the drawings, is a drive unit and comprises a drive unit frame member **11** having spaced side portions **12** and **13** extending upwardly from a central portion **14** along opposite side sides of the monorail R. Driven flange wheels **15** and **16**, located at sides of the frame portions **12** and **13**, which face one another and at opposite sides of the monorail R, are rotatably supported in the frame portions **12** and **13**, respectively. The tread portions of the wheels **15** and **16** engage the tread portions on the top sides of the outwardly extending lower flanges of the monorail R and support the left-hand end of the assembly A for movement along the monorail.

The wheels **15** and **16** are driven by an electric motor M connected to a downwardly extending portion **21** of the frame **11** and connected through gearing, designated generally by the referend character G, to a shaft **22** rotatably supported in the frame **11** and extending transversely of the tractor immediately below the monorail R. The shaft **22** has a pair of pinion gears **23, 24** formed thereon which are continuously in mesh with gears **25, 26** formed on the periphery of the flanges of the wheels **15** and **16**, respectively. The motor M is preferably of the reversible type and when actuated rotates the wheels **15** and **16** to drive the device A along the monorail R in the desired direction depending upon the direction of rotation of the motor M.

The drive unit B shown, is provided with a pair of guide wheels **30, 31, 32, 33** at each side of the monorail R which wheels are rotatably supported in the central portion **14** of the frame **11** for rotation about vertical axes and their peripheries engage the extending sides of the projecting lower flanges of the monorail R and assist in guiding the drive head assembly B along the monorail R.

The right-hand end of the member **10** is carried by the wheeled unit C comprising an inverted channel or U-shaped member **34** in the upper ends of the side or tine portions of which flange wheels **35, 36** are rotatably supported. The wheels **35, 36** are at the sides of the tine portions of the member **34** facing one another and ride upon the top tread portions of the projecting flanges of the rail R. The right-hand end of the member **10** rests upon the transverse bottom part of the U-shaped member **34** and is pivotally connected to the member by a pin **37**. The lower end of the pin, which end is of reduced diameter, extends through an opening in the transverse part of the member **34** and the upper end, which is also reduced in size, through a similar opening in a member **38** welded or otherwise secured to crossmembers **40** and **41** connecting the upstanding parts or tines of the U-shaped member **34** immediately above the member **10**. The axis about which the member **10** is connected to the wheeled unit C, that is, the axis of the pin **37** is normal to the transverse part of the U-shaped member **34** and the axis of rotation of the wheels **35** and **36**.

In addition to the wheeled units B and C by means of which the assembly A is suspended from and moved along the rail R, the assembly A comprises a pressure-producing assembly or unit P for increasing the pressure with which the drive wheels **15** and **16** engage the rail R and in turn the traction which these wheels are capable of producing. The unit P leads the drive unit B, assuming that the direction of travel of the assembly A is from right to left, as viewed in FIG. **1**. Obviously if the direction of movement is in the opposite direction the pressure unit P trails the driving unit B.

The pressure assembly or unit P includes a channellike or U-shaped frame member **60** having a pair of flanged wheels **61** and **62**, rotatably connected to the upper ends of the side or tine portions **63** and **64** thereof, respectively. The tread portions of the wheels **61** and **62** are biased into engagement with the bottom side of the projecting lower flanges of the monorail R by a compression spring **70** interposed between a yoke member **71** having downwardly extending tines fixedly secured to transversely extending members **76** and **77** bolted to members **80, 81** and **82, 83** formed integral with the frame member **60** at the leading and trailing sides thereof, respectively, assuming the direction of travel is from right to left. The lower end of the spring **70** engages a washer **90** on a vertically projecting bolt **91** having a spaced tube **92** interposed between the head thereof and the washer **90**.

The upper end of the bolt **91** extends through an aperture **93** in a member **94** and is threaded into a locknut **95** welded to the top side of the member **94**. The spacer tube **92** loosely extends through an aperture **96** in the frame **60**. The upward pressure exerted by the spring **70** against the yoke member **71** and in turn the pressure of the wheels **61** and **62** against the bottom side of the monorail R can be adjusted by threading the bolt **91** a greater or a lesser distance into the nut **95**. When the tractor is disassembled from the monorail R, the washer **90** engages the top side of the transverse portion of the frame **60** thus maintaining the parts in approximately the same assembled position which they occupy when the tractor is on a monorail.

The adjoining ends of the members **10** and **94** are overlapped an appreciable distance and are pivotally connected to the frame **10** of the drive unit B by a trunnion pin **100**, the lower reduced end of which extends into an opening on an upstanding boss **101** on the frame **11**, and the upper reduced end of which extends into an opening in a part **102** of the frame **10** which overlies or extends over the top of the overlapped ends of the members **10** and **94**. The adjoining ends of the members **10** and **94** fit loosely but without undue play on the trunnion pin **100** and between the upper end of the boss **101** and the overlying part **102** of the frame **10**.

The connection of the members **10** and **94** to the drive unit B is such that while the members may pivot about the axis of the trunnion pin **100**, that is, about an axis parallel with the upstanding sides or tines **63** and **64** of the frame **10** and normal to the transverse portion **14** thereof, they cannot pivot or move any appreciable amount about an axis transversely of the trunnion pin **100**. With the construction described it will be readily apparent that although the pressure-producing unit P is offset in the direction of the length of the rail R from the driving unit B, pressure of the wheels **61** and **62** of the pressure unit P against the underside of the rail R will be resisted by the driving wheels **15** and **16** and will increase the pressure otherwise existing between the driving wheels **15** and **16** of the driving unit B and the upper sides of the projecting flanges of the rail R.

A so-called monorail supported "tractor" T embodying the present invention is shown in FIG. 4. The tractor T is similar in construction to the device A shown in FIGS. 1 to 3 with the exception that the wheeled unit C and the member **10** are replaced by a pressure-producing unit, which is a duplicate of the pressure-producing unit P shown in FIGS. 1 to 3, and the manner in which the adjoining ends of the drawbar or member **110** which is the counterpart of the member **10** in FIGS. 1 to 3, and the drawbar or member **111** which is the counterpart of the member **94** of FIGS. 1 to 3 are connected to one another and to the trunnion pin of the drive unit.

Since the drive unit, designated B' is a duplicate of the drive unit B shown in FIGS. 1 to 3, the corresponding parts of the unit B' are designated with the same reference characters as those used in describing the unit B but with a prime mark affixed thereto and since the pressure-producing units shown in FIG. 4 are duplicates of the pressure-producing unit P, shown in FIGS. 1 to 3 with the exception of the members **110** and **111**, the pressure-producing units of FIG. 4 are designated P' and P'' and the duplicate parts of the respective units are designated by the same reference characters with those applied to pressure unit P' having a prime mark affixed thereto and those applied to the pressure unit P' having a double prime mark affixed thereto.

In the embodiment of the invention shown in FIG. 4, the adjoining ends of the members **110** and **111** are interleaved with a portion of the member **111** extending loosely but without undue play into a slot in the adjoining end of the member **110** and the interleaved portions pivotally connected to the trunnion pin **100'** similar to the manner in which the overlapped portions of the members **10** and **94** of the embodiment shown in FIGS. 1 to 3 are connected to the trunnion pin **100**.

In view of the similarity of the device shown in FIGS. 1 to 3 and FIG. 4, the tractor T shown in FIG. 4 will not be described in detail.

From the foregoing description of the preferred embodiments of the invention it will be apparent that the objects heretofore enumerated and others have been accomplished and that there has been provided a novel and improved monorail suspended apparatus comprising pressure-producing wheels engaging the side of the monorail opposite the drive wheels for increasing the normal pressure between the drive wheels and the rail thereby increasing the traction which the drive wheels are capable of producing and that the unit further provides an articulated construction which permits the unit to travel more readily than would otherwise be the case around curves in a track system, etc.

While two preferred embodiments of the invention have been shown and described in considerable detail the invention is not limited to the particular devices or the particular constructions thereof shown and it is the intention to hereby cover all uses of the invention and modifications of the disclosed device which come within the practice of those skilled in the art to which the invention relates and the scope of the appended claims.

I claim:

1. In an assembly movable along an overhead rail having a central web and oppositely extending flanges adjacent to one edge of the central web: a first frame having spaced parallel parts, first wheels at the sides of said spaced parts facing one another and rotatably connected thereto, a motor connected to said first frame, means operatively connecting said motor to said first wheels, a member pivotally connected to said first frame for rotation about an axis nonparallel to the axis of rotation of said first wheels, a second frame having spaced parallel parts, second wheels at the sides of said spaced parts of said second frame facing one another and rotatably connected thereto, the axis of rotation of said second wheels being offset transversely of the pivotal connection of said member with said first frame and the axes of rotation of said first and second wheels being offset with respect to one another axially of the pivotal connection of said member with said first frame whereby said first and second wheels are engageable with opposite sides of the rail flanges and are offset lengthwise of the rail, and means connecting said second frame to said member comprising spring means for biasing said second wheels toward said first wheels.

2. In an assembly movable along an overhead rail having a central web and oppositely extending flanges adjacent to one edge of the central web: a first frame having spaced parallel parts, first wheels at the sides of said spaced parts facing one another and rotatably connected thereto, a motor connected to said first frame, means operatively connecting said motor to said first wheels, a member pivotally connected to said first frame for rotation only about an axis nonparallel to the axis of rotation of said first wheels, a second frame having spaced parallel parts, second wheels at the sides of said spaced parts of said second frame facing one another and rotatably connected thereto, the axis of rotation of said second wheels being offset transversely of the pivotal connection of said member with said first frame and the axes of rotation of said first and second wheels being offset with respect to one another axially of the pivotal connection of said member with said first frame whereby said first and second wheels are engageable with opposite sides of the rail flanges and are offset lengthwise of the rail, means connecting said second frame to said member comprising spring means for biasing said second wheels toward said first wheels, and means for limiting the movement of said second wheels relative to said member under the force of said spring means.

3. In an assembly movable along an overhead rail having a central web and oppositely extending flanges adjacent to one edge of the central web: a first frame having spaced parallel parts, first wheels at the sides of said spaced parts facing one another and rotatably connected thereto, a motor connected to said first frame, means operatively connecting said motor to said first wheels, first and second members pivotally connected to said first frame for rotation only about an axis nonparallel to the axis of rotation of said first wheels and extending in opposite directions from said first frame, second and third frames each having parallel spaced parts, second and third wheels at the sides of said spaced parts of said second and third frames, respectively, facing one another and rotatably connected thereto, the axis of rotation of said second wheels being offset transversely of the pivotal connection of said member with said first frame and the axis of rotation of said second and third wheels being offset with respect to the axis of rotation of said first wheels in the same direction axially of the pivotal connections of said first and second members with said first frame whereby said first and said

second and third wheels are engageable with opposite sides of the rail flanges and are offset lengthwise of the rail, and means connecting said second and third frames to said first and second members, respectively, comprising spring means for biasing said second and third wheels toward said first wheels.

4. In a device movable along an overhead rail having oppositely extending flanges adjacent to the lower edge of a central web: a first assembly including a first frame having spaced parts adapted to extend upwardly along opposite sides of said rail, first wheels at the sides of said spaced parts of said frame facing one another and rotatably connected thereto, said first wheels being adapted to engage and travel along the top sides of said flanges of said rail, a motor connected to said first frame below said rail, drive means operatively connecting said motor to said first wheels, a second assembly at one side of said first assembly including an inverted channellike frame, second wheels rotatably connected to the upwardly projecting ends of said channellike frame and adapted to engage the underside of said flanges of said rail, a member pivotally connected to said first frame only for rotation about an axis normal to the axis of rotation of said first wheels, the axis of rotation of said second wheels being offset transversely of the pivotal connection of said member with said first frame and means connecting said channellike frame to said member including spring means biasing said second wheels against the underside of said rail.

5. In an apparatus movable along an overhead rail including oppositely extending flanges adjacent to the lower edge of a central web: a motor assembly including a frame having spaced parts adapted to extend upwardly along opposite sides of said rail, drive wheels at the sides of said spaced parts of said frame facing one another and rotatably connected thereto, said drive wheels being adapted to engage and travel along the top sides of said flanges of said rail, a drive motor connected to said frame below said rail, drive means operatively connecting said motor to said drive wheels, guide rollers at the leading and trailing ends of said frame and at opposite sides of said rail pivotally connected to said frame for rotation about axes normal to the axis of rotation of said drive wheels and engageable with opposite side sides of said projecting flanges of said rail, a pressure assembly at the leading and trailing sides of said motor assembly, each of said pressure assemblies including an inverted channellike frame, pressure wheels rotatably connected to the upwardly projecting ends of said channellike frames and adapted to engage the underside of said flanges of said rail, members pivotally connected to said frame only for rotation about an axis normal to the axis of rotation of said drive wheels, and means connecting said channellike frame to said members including spring means biasing said pressure wheels against the underside of said rail.

6. In a carrier-type overhead material-handling system having an overhead rail including oppositely extending flanges adjacent to the lower edge of a central web, a tractor for moving carriers along said rail comprising: a drive assembly including, a frame having spaced parts adapted to extend upwardly along opposite sides of said rail, drive wheels at the sides of said spaced parts of said frame facing one another and rotatably connected thereto, said drive wheels being adapted to engage and travel along the top sides of said flanges of said rail, a drive motor connected to said frame below said rail, drive means connecting said motor to said drive wheels; traction increasing assemblies at the leading and trailing sides of said motor head assembly, each of said traction increasing assemblies including an inverted channellike frame, pressure wheels rotatably connected to the upwardly projecting ends of said channellike frames and adapted to engage the underside of said flanges of said rail, leading and trailing drawbars having adjoining end portions pivotally connected to said drive assembly frame for rotation about an axis normal to the axis of rotation of said drive wheels, and means connecting said channellike frames to said leading and trailing drawbars including spring means biasing said pressure wheels against the underside of said rail.

7. In a carrier-type overhead material-handling system having an overhead rail including oppositely extending flanges adjacent to the lower edge of a central web, a tractor for moving carriers along said rail comprising: a drive assembly including, a frame having spaced parts adapted to extend upwardly along opposite sides of said rail, drive wheels at the sides of said spaced parts of said frame facing one another and rotatably connected thereto, said drive wheels being adapted to engage and travel along the top sides of said flanges of said rail, a drive motor connected to said frame below said rail, drive means connecting said motor to said drive wheels, guide rollers at the leading and trailing ends of said frame and at opposite sides of said rail pivotally connected to said frame for rotation about axes normal to the axis of rotation of said drive wheels and engageable with opposite side sides of said projecting flanges of said rail, pressure head assemblies at the leading and trailing sides of said drive head assembly, each of said pressure head assemblies including, an inverted channellike frame, pressure wheels rotatably connected to the upwardly projecting ends of said channellike frames and adapted to engage the underside of said flanges of said rail, leading and trailing drawbars having overlapping adjoining end portions pivotally connected to one another and to said drive assembly frame for rotation about an axis normal to the axis of rotation of said drive wheels, and means connecting said channellike frames to the leading and trailing drawbars including spring means biasing said pressure wheels against the underside of said rail.