Jan. 5, 1954 E. MULLEN ET AL 2,664,993

LOAD CARRIER FOR USE IN OVERHEAD TROLLEY CONVEYER SYSTEMS

Filed May 17, 1947 2 Sheets-Sheet 1

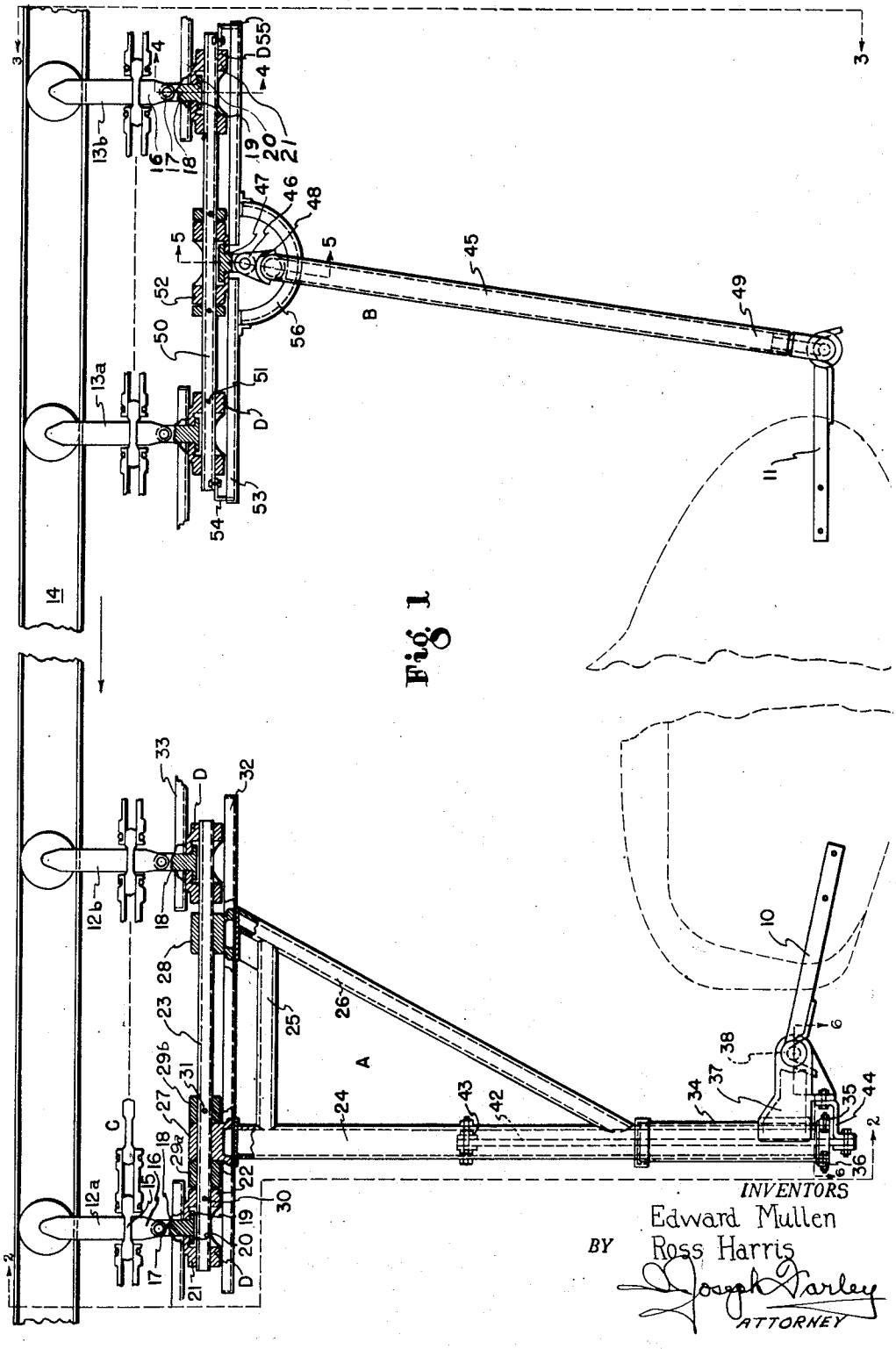


Fig. 1

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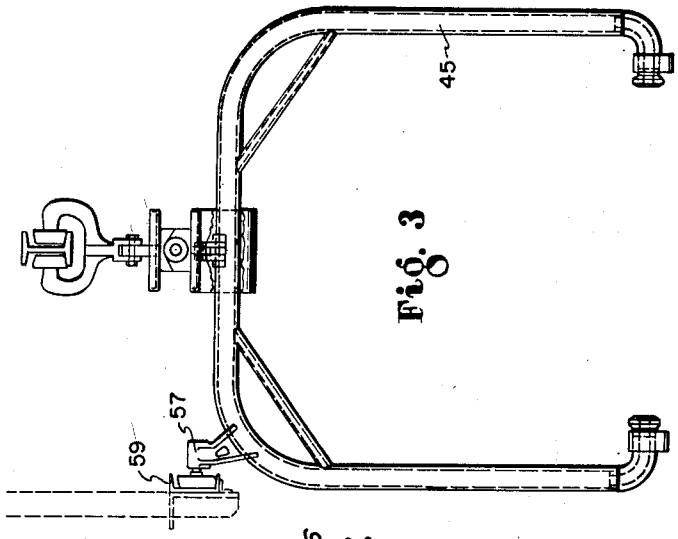


Fig. 3

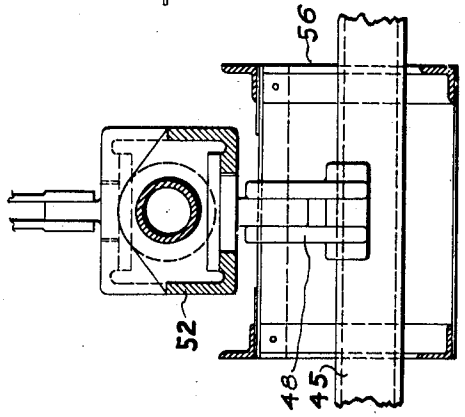


Fig. 5

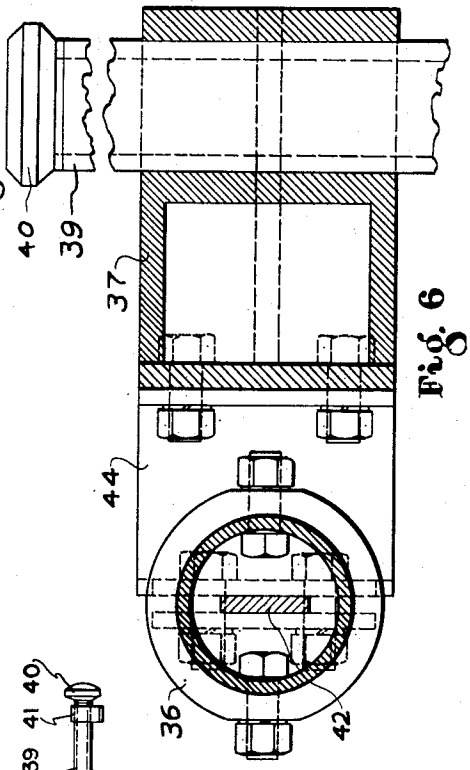


Fig. 6

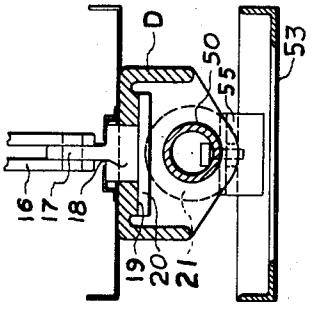


Fig. 4

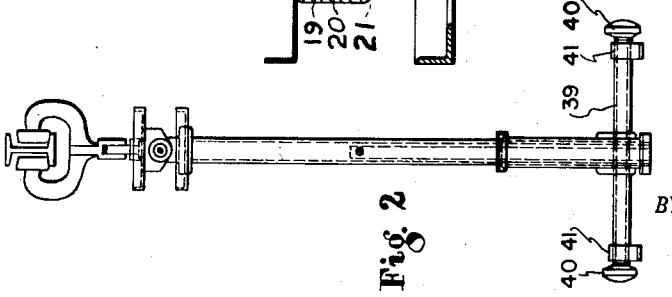


Fig. 2

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Patented Jan. 5, 1954

2,664,993

UNITED STATES PATENT OFFICE

2,664,993

LOAD CARRIER FOR USE IN OVERHEAD TROLLEY CONVEYER SYSTEMS

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Application May 17, 1947, Serial No. 748,704

5 Claims. (Cl. 198—177)

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This invention relates to overhead trolley conveyors and more particularly to conveyor fixtures adapted to support a load at points longitudinally spaced along the conveyor track and to be supported by a plurality of trolleys propelled along the conveyor track by a chain drive.

In providing carrying means of this type a number of problems are encountered in making provision for horizontal and vertical curves in the conveyor track especially where each of the trolleys which contribute to the support of a single load is propelled by a common drive chain.

The nature of such problems may be seen by referring to a typical case wherein four longitudinally spaced trolleys are used to support a single rigid load, two adjacent trolleys being adapted to support each end of the load with a plurality of additional trolleys interposed between the two pairs of load supporting trolleys, and all of the trolleys being propelled by a common drive chain. If the relative motion of such trolleys be considered independently of any carrying means or load attached thereto, the various types of movement which must be provided for in such carrying means becomes apparent.

Taking first the case of a horizontal curve in the track, as the first of the load supporting trolleys enters such curve, it is necessary that such trolley pivot about a vertical axis relative to the following trolleys. As the first trolley rounds a curve the drive chain suspended between the first two trolleys will form a chord cutting across the arc of the curve. Such chord line will be defined by the rear pivotal point in the chain link which is attached to the first trolley bracket and the forward pivotal point in the chain link attached to the second trolley bracket. Since such pivotal points in the respective chain links are usually longitudinally spaced from the vertical axis of the trolley brackets in question, a second chord line lying outside of the line of the chain intermediate the first two trolley brackets will be defined by the vertical axes of the trolley brackets. The length of such second chord line will be somewhat shorter than the distance between the same trolleys' axes on the straight section of track before entering the curve due to the fact that as soon as the first trolley enters the curve, the chain between the first two trolleys assumes a position other than its most extended position. Therefore, if a carrying fixture supported by the first two trolleys were such as to define a fixed distance between the trolleys, the first trolley would not be free to follow the path of the curve

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but would tend to be held in a straight position by the tension developed in the drive chain.

Thus, it will be seen that any rigid carrying fixture suspended from the first two trolleys should include provision for permitting each of the trolleys to move closer to each other in rounding a horizontal curve as well as to permit each trolley to pivot about its vertical axis independent of the other trolleys and independent of the position of the fixture between the first two trolleys.

As the trolleys continue around the curve, it will be seen that a series of short chord lines will be formed by the chain extending between adjacent trolley brackets and that a major chord line will be defined by the forward and rear end of a load suspended from a point between the first two load carrying trolleys and at a second point between the last two load carrying trolleys.

Since the drive chain attached to each of the trolley brackets follows more closely the curved path of the conveyor track than the major chord line described above, it is apparent that the suspension connections at one end must be free to move closer to the suspension connections at the other end while the load is rounding a curve in the track by an amount equal to the difference in length between that of the major chord line mentioned and the length of the chain between the points establishing such chord line. It is also apparent that during the rounding of such curve, the major chord line will extend in a horizontal direction different both from the line joining the first two load supporting trolley brackets and that joining the last two load supporting trolley brackets. Thus, if any rigid form of member is used to divide the load between the first two or the last two load supporting brackets, provision must be made for the pivotal movement of such rigid member about a vertical axis relative to the fixture members which more directly support the load.

In the case of vertical curves, similar problems are encountered with respect to changes in the relative distances between the forward and rear end supporting point as compared to the length of chain between such points. In addition, in order that the individual bracket members may be free to assume a position normal to the surface of the track throughout such vertical curve, it becomes necessary to provide in the attachment to the load carrying means a connection which permits pivotal movement of the individual brackets about a transverse axis relative to

the other brackets as well as to the load carrying means.

Furthermore, unless the load is to be permitted to swing freely in a longitudinal path relative to the load supporting brackets, a rigid form of carrying means must be provided which will maintain one end of the load in a substantially fixed position relative to a load supporting bracket member associated with such end. To permit the swinging movement mentioned may be objectionable for a number of reasons including possible danger and damage incident thereto, inconvenience where it is desired to perform certain operations on the load as it is being carried, as well as additional space which would be required between adjacent loads to prevent one load from swinging into another as it started up or down a vertical curve.

On the other hand, it will be recognized that the provision of a rigid structure for preventing such a swinging motion augments the difficulty in providing necessary freedom for the movements discussed above.

The preferred embodiment disclosed herein incorporates the necessary freedom of movement discussed above while providing a fixed longitudinal position for the load relative to at least one of the supporting trolleys.

Such embodiment utilizes forward and rear carrying fixtures, each of which is supported by a pair of longitudinally spaced trolleys. One of these fixtures is held rigid against a longitudinal swinging movement while the other is free to articulate about transverse axes in a manner permitting it to be brought into and out of engagement with the load as well as to permit its supporting trolleys to shift their position relative to those associated with the first-mentioned fixture.

In general, it is the object of the present invention to provide a carrying fixture adapted to support an elongated rigid load, such as an automobile body or chassis, from two longitudinally spaced points under an overhead conveyor track, and to be supported by a plurality of trolleys each of which is propelled along the conveyor track by a common drive chain.

More specifically, it is an object of the present invention to provide carrying means of this general type which will permit

(*a*) The pivotal movement of each load supporting trolley bracket about a vertical axis independent of the other trolley brackets and of the load and load carrying fixture;

(*b*) The pivotal movement of each load supporting trolley bracket in a vertical plane passing through the conveyor track relative to the other trolley brackets, load and load carrying fixture;

(*c*) Each end of the load to be supported by a pair of trolleys through a rigid member extending therebetween which is connected to the trolley brackets in a manner permitting variation in the distance between the vertical axes of such brackets;

(*d*) The load to be held in a fixed longitudinal position relative to one of said rigid members, the other of said rigid members and supporting trolleys associated therewith being free to shift their position relative to the first-mentioned rigid member for varying the distance therebetween;

(*e*) The pivotal movement of the rigid members extending between the pairs of load supporting trolleys about vertical axes relative to each other and to the load.

Another object is to provide carrying means incorporating provision for the relative movements outlined above which is simple, economical of construction and dependable.

A further object is to provide a four point suspension for the load wherein two of the points associated with one pair of supporting trolleys are rotatable about a vertical axis while the other two points associated with the other pair of supporting trolleys are rotatable about a transverse axis in a manner whereby the load may be first attached to the first-mentioned two points and thereupon rotated about a vertical axis into alignment with the last-mentioned two points, the latter points thereupon being brought into engagement with the load through their rotation about the mentioned transverse axis.

Another object is to provide resilient means for normally retaining the points of suspension rotatable about a vertical axis in their aligned position relative to the other two points of suspension.

These and other objects will appear more clearly from a detailed description of a particular embodiment of our invention and by reference to the drawings forming a part hereof and wherein:

Fig. 1 is a side elevation of a double fixture for a single load suspended from two pairs of trolleys adapted to run along the conveyor track.

Fig. 2 is an end elevation of the forward fixture assembly taken along the line 2—2 of Fig. 1.

Fig. 3 is an end elevation taken along the line 3—3 of Fig. 1.

Fig. 4 is an enlarged sectional view taken along the line 4—4 of Fig. 1.

Fig. 5 is an enlarged detailed view taken along the line 5—5 of Fig. 1.

Fig. 6 is an enlarged detailed view taken along the line 6—6 of Fig. 1.

Referring to Fig. 1 a load, in the present illustration an automobile body, is provided with a pair of forward bumper brackets 10 and a similar pair of rear bumper brackets 11. A forward carrier fixture A and rear carrier fixture B are adapted to supportingly engage such brackets. The carrier assemblies A and B are in turn suspended from a pair of forward trolley brackets 12*a*, 12*b* and rear trolley brackets 13*a*, 13*b* which are provided with trolley wheels for running along the conveyor track 14 suspended from the framework of a building by suitable means not shown.

The trolleys, which form no part of the present invention, are of the type wherein a pair of opposed bracket members are provided with opposed trolley wheels for running along either side of the lower flange of an I-beam type of conveyor track. Such bracket members converge at their lower ends and are adapted to support from within a center link 15 of a standard keystone or rivetless type of drive chain C. Below the center link 15 a yoke member 16 rigidly associated with each trolley bracket is adapted to be pivotally connected as at 17 with a swivel member 18, two of which are utilized in each of the carrying assemblies A and B. Each of the swivel members 18 is provided with an annular flange 19 adapted to supportingly engage the inner surface of a wall 20 formed as a part of a support bracket D. The ends 21 and 22 of the bracket D are provided with aligned bores for accommodating and supporting a longitudinal shaft 23 which extends between adjacent trolley brackets 12*a*, 12*b*, being supported at either end by identical means.

The members thus far described are utilized in both forward and rear carrying fixtures A and B, and it is only with respect to the remaining

parts of such assemblies that the forward and rear assemblies differ.

In the forward fixture A a triangular rigid framework is made up of a vertical main tubular member 24 and horizontal and angular tubular supporting members 25, 26 respectively welded together. This triangular framework is suspended from the shaft 23 by forward and rear attaching members 27 and 28, the forward attaching member 27 being longitudinally positioned by a spacer collar 29a and a retaining collar 29b. The forward bracket D is pinned to the shaft 23 as shown at 30, as is the retaining collar 29b indicated at 31. The rear bracket D, on the other hand, is free to slide longitudinally on the shaft 23 in a manner permitting the bracket members 12a and 12b to move relatively closer to each other as required in passing through a horizontal or vertical curve. The attaching members 27 and 28 are not secured against pivotal movement about the shaft 23, and each of the support brackets D is accordingly free to pivot about the axis of the shaft 23 as required to permit the bracket members 12a and 12b to follow any irregularity in the conveyor track or to follow a compound curve requiring such movement.

Grease and dirt collector pans 32 and 33 are attached respectively to the triangular framework and to the top of the castings D, where, as in the case of a finished automobile body, such protection is desirable.

The lower end of the tubular member 24 passes within a sleeve 34 and is provided with an annular thrust collar 35 for swivel supporting engagement of the annular flange 36 at the lower end of the sleeve member 34. A bracket 37 welded to the sleeve 34 is provided with a transverse bore 38 for seating a transverse shaft 39, as more clearly shown in Fig. 2. Inwardly of the enlarged ends 40 of the shaft 39, the ends 41 of the bumper brackets 10 engage with the shaft 39 thereby providing two point support for the forward end of the load.

A torsion bar 42 is attached at its upper end to the tubular member 24, as shown at 43, and at its lower end to the bracket 37 by means of a Z-shaped intermediate bracket 44. Thus, while the bracket 37 and shaft 39 may be rotated out of their normal position, as may be required in loading or unloading, the torsion bar will otherwise return such members to their normal position. Details of this construction may be seen more clearly by reference to the enlarged sectional view of Fig. 6.

While the forward assembly A provides a rigid framework for fixing the longitudinal position of the load relative to the trolley bracket 12a, the rear assembly B is provided with an inverted U-shaped tubular member 45 which is pivotally connected at 46 to a swivel connecting member 47 by means of a bracket 48 in a manner permitting the lower ends 49 to swing to and from their load engaging position and likewise permitting the longitudinally extending shaft 50 and associated trolley brackets 13a, 13b to shift their position longitudinally relative to the load and the forward assembly A. In the case of the rear assembly B, as in the forward assembly A, one of the brackets D associated with the trolley bracket 13b is free to shift its longitudinal position on the shaft 50 while the other bracket D associated with the forward trolley bracket 13a is pinned to the shaft 50 as indicated at 51 thereby fixing its longitudinal position on such shaft.

It will be noted that the central bracket 52 is identical in form to the four brackets D associated with the respective load supporting trolley brackets but is positioned to provide the swivel joint on the lower side of the shaft 50.

The collector pan 53 in the case of the rear assembly is attached to either end of the shaft 50 by suitable angles 54, 55 and a semi-circular section 56 of such pan passes below the horizontal portion of the tubular member 45. Details of these connections may be seen in the enlarged fragmentary sectional views of Figs. 4 and 5.

It may be seen that with this construction the load is supported at four points, two of which are furnished by the forward fixture A and two by the rearward fixture B. Each of these assemblies is free to pivot about the longitudinal shafts 23 and 50, respectively, so that the load may center itself with its weight distributed equally at the four supporting points. If it is desired to constrain the load against any lateral swinging, permitted by such pivotal connections, at certain sections of the conveyor line where lateral forces may be applied to the load, as in assembling operations or otherwise, side trolleys 57 may be provided on the rear assembly B, as shown in Fig. 3, to engage auxiliary track members 59. Such auxiliary track sections may be limited to those sections of the conveyor line where support against side sway is desired.

It will be noted that complete freedom of movement such as may be required in passing through any horizontal, vertical or compound curve in the conveyor track is provided for. Thus, each of the trolley brackets is free to pivot about a vertical axis relative to the other trolley brackets as well as to the carrying assemblies supported therefrom. Each of the brackets is further free to pivot about a transverse axis relative to the other trolleys and the load carrying assemblies as well as about a longitudinal axis provided by the longitudinally extending shafts 23 and 50, respectively. At the same time, the forward fixture A and the load are fixed in longitudinal position relative to the forward trolley bracket 12a so as to prevent longitudinal swinging of the load and to permit minimum spacing between adjacent loads.

While a satisfactory embodiment incorporating the essential features of this invention has been described in detail, it will be recognized that numerous changes in the detailed construction are possible without departing from the scope of the invention as set forth in the appended claims.

We claim:

1. In an overhead conveyor system of the type wherein a plurality of trolley assemblies are propelled along a conveyor track by a single drive chain, carrying means adapted to support a rigid load at points spaced longitudinally of the conveyor track and to be supported by a plurality of said trolley assemblies, said carrying means being characterized by a member adapted to rigidly fix the longitudinal position of said load relative to one of said trolley assemblies through engagement with one end of said load, and a second member for engaging the other end of said load, said second member being pivotally suspended for longitudinal movement to and from its load engaging position.

2. In an overhead conveyor system of the type wherein a plurality of trolley assemblies are propelled along a conveyor track by a single drive chain, carrying means adapted to support a rigid load at points spaced longitudinally of the conveyor track and to be supported by a plurality of

said trolley assemblies, said carrying means being characterized by a member adapted to rigidly fix the longitudinal position of said load relative to one of said trolley assemblies through engagement with one end of said load, and a second member for engaging the other end of said load, said second member being pivotally suspended for longitudinal movement to and from its load engaging position, the other of said load supporting trolley assemblies being free to shift in longitudinal position relative to said one trolley assembly.

3. In an overhead conveyor system of the type wherein a plurality of trolleys are propelled along a conveyor track by a single drive chain, carrying means adapted to support a rigid load at points spaced longitudinally of the conveyor track and to be supported by a plurality of said trolley assemblies, said carrying means being characterized by a pair of longitudinally spaced depending load engaging members, a longitudinally extending supporting member pivotally connected to each of said load engaging members, each of said supporting members being pivotally connected to a pair of supporting trolleys, and said carrying means providing a fixed longitudinal relationship between said load and one of said supporting trolleys.

4. In an overhead conveyor system of the type wherein a plurality of trolleys are propelled along a conveyor track by a single drive chain, carrying means adapted to support a rigid load at points spaced longitudinally of the conveyor track and to be supported by a plurality of said trolley assemblies, said carrying means being characterized by a pair of longitudinally spaced depending

load engaging members, a longitudinally extending supporting member pivotally connected to each of said load engaging members, each of said supporting members being pivotally connected to a pair of supporting trolleys, and one of said load engaging members and its associated supporting member providing a fixed longitudinal relationship between said load and one of its supporting trolleys, and the other of said load engaging members being free to move longitudinally relative to said load.

5. In an overhead conveyor system, a plurality of longitudinally spaced chain driven trolleys provided with brackets adapted to support loads, a load carrier suspended from a plurality of said brackets, said carrier comprising a pair of independently suspended longitudinally spaced fixture assemblies, one of said assemblies having a rigid framework suspended from at least two of said trolley brackets, said framework being adapted at its lower end to engage one end of a rigid load, and the other of said assemblies being pivotally suspended relative to a transverse axis and adapted at its lower end to pivotally engage relative to a transverse axis the other end of said load.

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