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RAIL COUPLING

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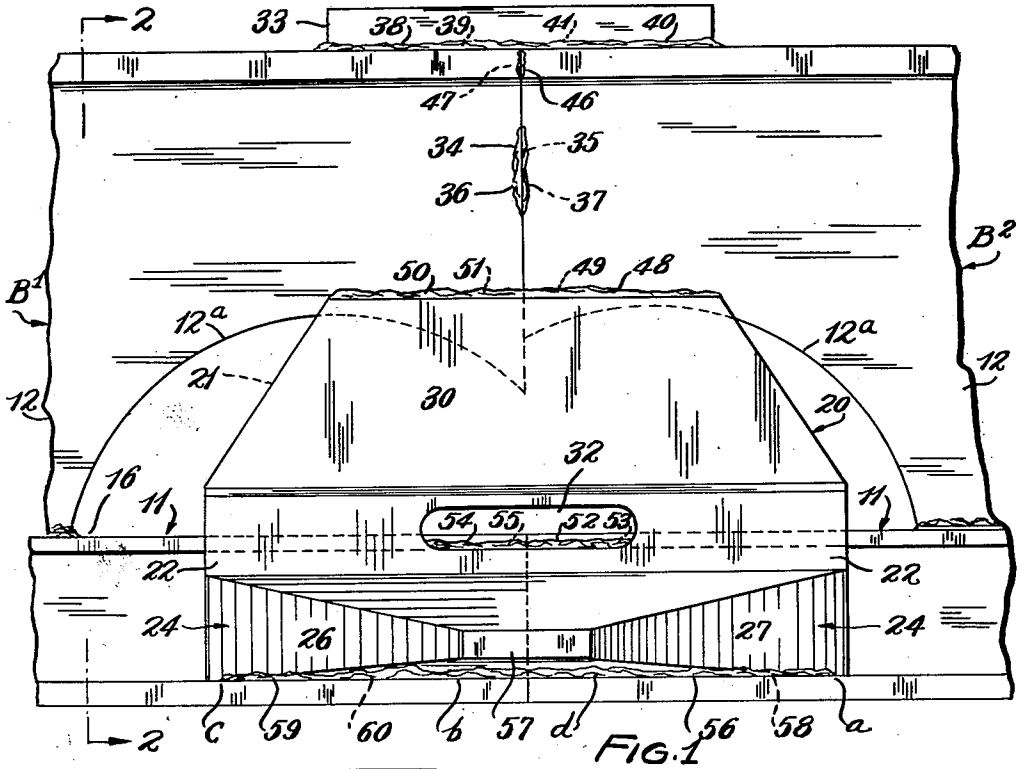


FIG. 1

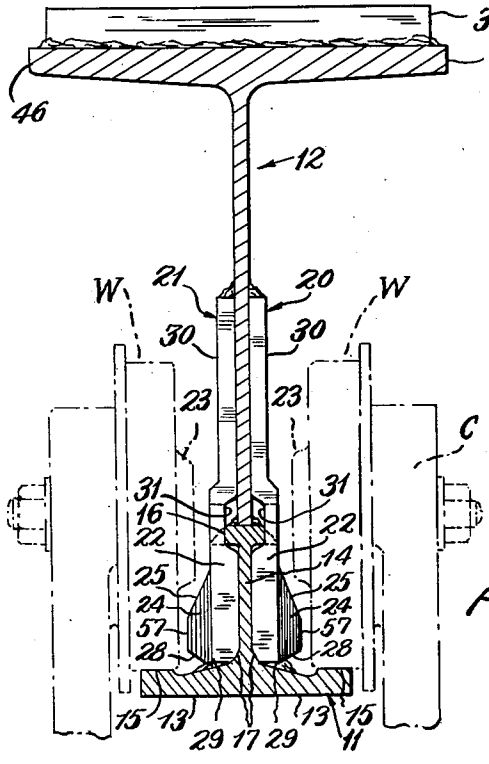


FIG. 2

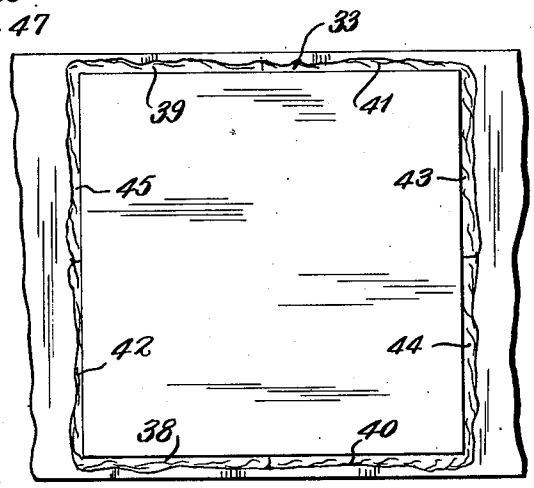


FIG. 3

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RAIL COUPLING

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The present invention relates to overhead carrier systems and to a coupling or splice structure for connecting the adjoining ends of adjacent beam-type rails of an overhead monorail system and, more particularly, the splicing of overhead beam-type rails of the character manufactured and sold by the Cleveland Tramrail Division of The Cleveland Crane & Engineering Company under the name "Arch Beam."

In the construction of overhead carrier systems comprising suspended overhead rails of the beam-type and having horizontally extending flanges adjacent to the lower edge of a vertical web and on which flanges pairs of carrier wheels travel, it has always been necessary to form the rail joints at, or quite close to, the hangers by which the rails are suspended. The hangers are generally suspended from the overhead building structural framework, the pattern of which generally varies with each building and is determined by considerations other than the support of the monorail system used therein. The result is that each monorail system must be tailored, so to speak, to the individual building in which it is to be installed. This generally requires that the rails be cut so that their joints fall below the overhead building framework and results in waste of material and the comsumption of considerable time and labor.

Prior to the present invention, there has been no known method or structure for splicing beam-type rails intermediate the rail hangers which has proved to be entirely satisfactory. One problem in splicing overhead beam-type rails is the difficulty of providing the necessary strength at the bottom of the rail, that is, adjacent to the carrier wheel supporting flanges inasmuch as the pairs of carrier wheels which travel along the opposite sides of the rails ride close to the central flange or web of the rails and leave little clearance on the side thereof, and the clearance between the bottom of the rails and the brackets or superstructure on which the carrier wheels are journaled in relatively close and, in some cases, there is no bottom clearance whatever as the bottom of the rails are engaged by traction wheels, etc. In some systems, for example, the particular system mentioned above, the carrier wheels have inwardly projecting hubs which further reduce the space between the wheels and the web of the rails.

The principal object of the present invention is the provision of a new and improved beam-type rail coupling structure for rails of the above-described type by which adequate strength can be provided adjacent to the bottom flange of the rail whereby a strong, compact rail joint can be formed that will require no direct support by hangers or the like, so that rail ends can be spliced at any point intermediate the rail hangers, and which will not interfere with the passage of carriage wheels along the rails.

A more specific object of the present invention is to provide a method and/or structure for forming a joint between ends of beam-type rails of the above-described

type which employs welding and which does not appreciably distort the bottom flanges of the rails.

A still more specific object is to provide a coupling structure for rails of the above-described type which can be used regardless of where the ends of the rails fall with relation to their arch configurations.

A further object of the present invention is to provide a method and/or structure for forming a joint between ends of beam-type rails of the above-described type which employs welds the majority of which are of the "down-weld" type and which can be made quickly and easily with a minimum of time and effort.

The invention resides in certain constructions and combinations and arrangements of parts and further objects and advantages 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:

Fig. 1 is a fragmentary elevational view of an overhead carrier system embodying the invention;

Fig. 2 is a sectional view taken approximately on line 2—2 of Fig. 1, and showing the carriage structure in dot-dashed lines; and

Fig. 3 is a plan view of Fig. 1 showing the preferred method of joining the top flanges of the beam-type rails.

The rails B1 and B2 shown in the drawings are of the commercial construction previously referred to. Each rail comprises a lower, inverted T-portion **11** welded to an upper T-section portion **12** made from a standard I-beam, and having semicircular cut-out portions **12***a*, as shown. The bottom T-section portion **11** has a pair of lateral flanges **13** projecting normally from each side of the bottom edge of the vertical flange or web **14**. Lateral flanges **13** each have a raised surface adjacent their outer edge in a manner providing a pair of treads **15** on which wheels W of the overhead carrier travel. The upper edge of section **11** may, in some instances, also contain a pair of smaller lateral flanges **16**. The lower, inverted T-section **11** is usually made of medium to high-carbon steel and the upper T-section portion **12** is usually made of a low-carbon structural grade steel.

According to the provisions of the present invention, the end portions of adjoining rails are connected by a pair of coupling plates **20**, **21** adapted to overlie adjacent end portions of the vertical webs of adjoining rails. The coupling plates are alike and have a unique configuration which may, for the purposes of description, be considered to consist of a lower portion **29** adapted to overlap adjacent end portions of the webs of the lower, inverted T-section portions **11** of adjoining rails and an upper portion **30** adapted to overlap corresponding end portions of the web of the upper T-section portion **12** of the rails.

The lower portion **29** of each coupling plate comprises a generally rectangularly-shaped portion **22** whose thickness corresponds to the normal clearance between the hub **23** of the wheel W of the carrier C and the web **14** of the bottom portion of the rail, and whose height corresponds roughly to the height of the web of the bottom portion, or, as shown, to the approximate distance between the axis of the wheel W and the bottom horizontal flanges. This rectangular portion has its lower, inside edge rounded, as indicated at **17**, to receive the rail's fillet radius, and has a truncated, four-sided, pyramidal section **24** on its outer surface. The upwardly facing side or surface **25** of the pyramidal section **24** is sloped downwardly and outwardly so as to provide passage for the hub **23** of the wheel W. The two end sides or surfaces **26** and **27** are sloped outwardly toward the center such that if a wheel should strike either surface as it approaches the joint, it will be

gradually forced outwardly so as to pass by the maximum thickness of the plate without damage to the carrier, etc. The lower pyramidal side or surface **28** is beveled to allow proper positioning of the weld material. Preferably, the lower edge **29** of the rectangular section **22** is also beveled to allow deeper penetration of the weld.

The upper portion **30** of the coupling plate previously referred to comprises a generally rectangular-shaped section. This upper section **30** has substantially the same width as the lower section **29**, and has a height sufficiently great to extend above the top of the cutout arch-shaped sections of the beam. While this section may be of a generally rectangular shape, it is shown in the preferred embodiment as having its upper corners removed thereby giving a trapezoidal appearance.

In order for the coupling plate to be usable with beam-type rails having a pair of small lateral flanges **16** on the upper edge of their lower, inverted T-section portions, a longitudinal groove **31** is provided along the lower inside edge of the upper portion **30** in the region where it joins the bottom section **22** of the coupling plate. This groove extends across the full length of the plate and is sufficiently deep to permit the coupling plate to fit snugly against the vertical web of the beam. In some cases, the thickness of the coupling plate above this groove may be reduced to approach that of the web thickness of the top portion of the beam, as shown in the preferred embodiment. A slotted opening **32** in the remaining thickness of plate provided by groove **31** makes possible a weld connection between the coupling plate and the top portion of the lower inverted T-section, as will later be described. A weld in this position ties the central region of the coupling plate to the rail structure and also transfers stress from the top portion of the lower, inverted T-section to the coupling plate. This center tie may not be necessary in all cases, for example, in those cases where the total height of the coupling plate is small. In some cases instead of having one slotted opening which overlies the joint between the rails, it may be advantageous to have two or more smaller holes or openings through the plate on each side of the joint.

In forming a joint between the rails **B1**, **B2**, the ends of the rails are brought into aligned, abutting relationship and, if desired, temporarily secured in that position as by clamping the lateral flange of a structural beam to the bottom surface of the adjoining rails. The plates **20**, **21** are then placed against opposite sides of the webs of the rails, are centered on the joint, and are held in that position by clamps or the like (not shown). The top flanges of the rails may be welded directly together. In the preferred embodiment, however, a small plate **33** is utilized, which plate is welded to and overlies the joint in the top flange of the rail. This small plate makes it possible to use fillet welds in making this connection instead of butt welds. Fillet welds are easier to make and have the big advantage of utilizing the weld material in shear instead of tension and/or compression.

Although several sequences of welding can be used to attach the rails, the preferred procedure consists in starting with a tack weld **34** on the front side of the rails, attaching the top portion of the webs, followed by a similar tack weld **35** on the back side of the webs. A weld seam **36** is then laid along the joint between the top portions of the webs on the front side of the rails followed by a similar weld seam **37** on the back side of the rails. A fillet weld **38** is laid along the front edge of the plate **33** beginning at one corner of the plate and extending to the center of its front side. A similar seam **39** is made on the back side of the rail. Fillet weld **40** is then made on the front side, starting at the other corner of the plate and extending to the point at which seam **38** stops. Fillet weld **41** is similarly made on the back side. Fillet welds **42**, **43**, **44**, **45** are made in a similar manner, in all cases, beginning at a corner and extending to the centerline of the plate. Weld seams **46** and **47** are then made, one on each side of the outside edges of the top flange. Fillet welds **48** on the near side and **49** on the far side are then made between the top horizontal edge of the coupling plate and the web of the rail starting in each case at the outside edge of the plate and proceeding towards its centerline. Fillet welds **50** on the near side and **51** on the far side are similarly made. Following completion of the welds **50** and **51**, welds **52** and **53** are made on the near and far sides, respectively, at the central, slotted opening in the plate, beginning at the edges of the opening and proceeding towards its center. Welds **54** and **55**, near and far sides, respectively, are similarly made. Weld **56** is then made along the bottom edge of the coupling plate **20** beginning at point *a* which lies approximately one-quarter inch from the right-hand edge of the plate and proceeding to a point *b* beyond the centerline and overlying rail **B1** in approximately the region below the left-hand edge of the outer surface **57** of the frustum. Weld **58** is similarly made on the back side of the rails. Weld **59** is then made along the bottom edge of plate **20** beginning at point *c* which is approximately one-quarter inch from the left-hand edge of the plate and proceeding to point *d* below the right-hand edge of the surface **57** such that welds **56** and **59** overlap each other between *b* and *d* in the region overlying the rail joint. Weld **60** is similarly made along the bottom edge of plate **21** on the back side of the rails. It has been found that this welding procedure is effective in preventing distortion of the members and in accomplishing the welding operation with a minimum of warpage and distortion. While the small plate **33** is shown in the drawings as being used to effect a joint between the top flanges of the rail, it is not a necessary part of this invention and is shown only as a preferred means of accomplishing the welding procedure.

The heat generated in the welding operation may produce warpage of the rails and plates if the welds are improperly made. For this reason the above-described welding procedure and sequence is important. While the actual attachment of plates **20** and **21** has been described as beginning in the position between the top of plate **20** and rail **B2**, it can also be started in any other corresponding position provided the welding procedure is carried on in a similar manner.

It is apparent that the objects of the invention enumerated have been attained as well as others, and that a compact rail coupling for overhead carrier systems has been provided which enables the splicing of beam-type rails at practically any part of the carrier system irrespective of the location of the rail hangers, whereby considerable savings in time, material and labor may be effected in the installation of the system. It is further apparent that a coupling structure for beam-type rails and a welding procedure therefor has been provided which utilizes only welds which are essentially of the "down-weld" type and which can be made easily and efficiently. By forming the plates as described, they provide the necessary rigidity to firmly support the rail joint and yet do not interfere with the passage of the wheels on the carriage structure.

While the preferred embodiment of the invention has been described in considerable detail, I do not wish to be limited to the particular constructions shown and described which may be varied within the scope of the invention, and it is my intention to hereby cover all adaptations, modifications and alternative constructions that come within the spirit and scope of the appended claims.

Having thus described my invention, I claim:

1. A coupling member for an overhead carrier system having rail sections made up of a T-section and a wheel supporting inverted T-section attached thereto, an elongated plate having at least a portion of a lateral surface provided with a pyramidal projection shaped in the form of a frustrum of an irregular pyramid, said pyramidal projection having its sides inclined with the vertex near one side of the base for said pyramid, and at least one

opening in said plate intermediate the inner end of said pyramidal projection and the remote end of said plate therefrom, whereby upon positioning said plate on said rail sections the plate way be readily welded to said rail sections adjacent the joint between said T-sections through said opening.

2. A coupling member for an overhead carrier system having rail sections made up of a T-section and a wheel supporting inverted T-section attached to the lower edge of the web of said first mentioned T-section, an elongated rectangular plate having at least a portion of a lateral surface provided with a pyramidal projection shaped in the form of a frustrum of an irregular pyramid, said pyramidal projection having its sides inclined with the vertex near one side of the base for said pyramid, at least one opening intermediate an end of said plate and said projection, and a longitudinal groove on the opposite surface of said plate from said pyramidal projection and extending along an edge of said opening adjacent the pyramidal section to receive the joint between the T-sections, said latter surface having its edge near said projection rounded, whereby upon positioning the plate on the rail sections said plate overlaps the joint between said T-sections at said groove and may be readily welded to said rail sections adjacent said joint between said T-sections through said opening.

3. A coupling member for an overhead carrier system having rail sections made up of a T-section having spaced cutout portions removed along its lower edge and a wheel supporting inverted T-section attached to the remaining portions of said edge of said T-section, a plate having at least a portion of a lateral surface provided with a pyramidal projection shaped in the form of a frustrum of an irregular pyramid, said pyramidal projection having its sides inclined with the vertex near one side of the base for said pyramid, at least one opening intermediate an end of said plate and said projection, and a longitudinal groove on the opposite surface of said plate from said pyramidal projection and extending along an edge of said opening adjacent the pyramidal section whereby upon positioning the plate on the rail sections said plate overlaps the joint between said T-section at said groove and extends above the cutout portions of said T-section.

4. A coupling member for an overhead carrier system having rail sections made up of a T-section having spaced cutout portions removed along its lower edge and a wheel supporting inverted T-section attached to the remaining portion of said edge of said T-section, an elongated rectangular plate having at least a portion of a lateral surface provided with a pyramidal projection shaped in the form of a frustrum of an irregular pyramid, said pyramidal projection having its sides inclined with the vertex near one side of the base for said pyramid, at least one longitudinal opening intermediate an end of said plate and said projection, and a longitudinal groove on the opposite side of said plate from said pyramidal projection and extending along an edge of said opening adjacent the pyramidal section, said latter surface having its edge adjacent said projection rounded whereby upon positioning the plate on the rail sections said plate generally

conforms to the adjacent surface of said rail sections and overlaps the joint between said T-sections and extends above the cutout portions of said T-section.

5. In an overhead monorail carrier system including aligned rails made up of a T-section having spaced cutout portions removed along its lower edge and an inverted T-section attached to the remaining portion of said edge of said T-section and carrier wheels adapted and arranged to ride on said inverted T-section, said wheels being provided with an inwardly projecting hub spaced intermediate the rims of the wheels, elongated rectangular plates disposed upon opposite sides of said rails at each of the joints thereto and welded to overlap a portion of the adjacent aligned rail, said plates each being provided with a projection extending into the area intermediate the bottoms of the hubs and the flange engaging wheel rims, said projection being shaped in the form of a frustrum of an irregular pyramid, said pyramidal projections having the sides inclined with the vertexes adjacent said flanges, the opposite surfaces of said plates from the thus defined pyramidal projections being provided with a longitudinal groove substantially in alignment with the joint between said T-sections, the latter surfaces of said plate having the edges near said projection rounded whereby said plates are adapted to extend along said rails and above the cut out portions of said rail.

6. In an overhead carrier system having aligned rails made up of a T-section having spaced cutout portions removed along its lower edge and an inverted T-section attached to the remaining portions of said edge of said T-section for supporting wheels adapted to ride thereon, elongated rectangular plates disposed upon opposite sides of said rails at each of the joints thereto and welded by means of "down-welds" to overlap a portion of the adjacent aligned rail, said plates each having at least a portion of a lateral surface provided with a projection shaped in the form of a frustrum of an irregular pyramid, said pyramidal projections having the sides arranged inclined with the vertexes adjacent one side of the base for said pyramids, at least one longitudinal opening intermediate an end of said plates and said projection, the opposite surfaces of said plates from the thus defined pyramidal projections having the edges near said projections rounded and provided with longitudinal grooves extending along the edges of said opening adjacent said projections whereby said plates are adapted to extend along said rails with said rounded edges abutting the outwardly extending flange without obstructing the passage of the wheels on said flanges.

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