

June 25, 1963

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3,095,174

OVERHEAD MONORAIL TRACK SUSPENSION

Filed April 3, 1961

4 Sheets-Sheet 1

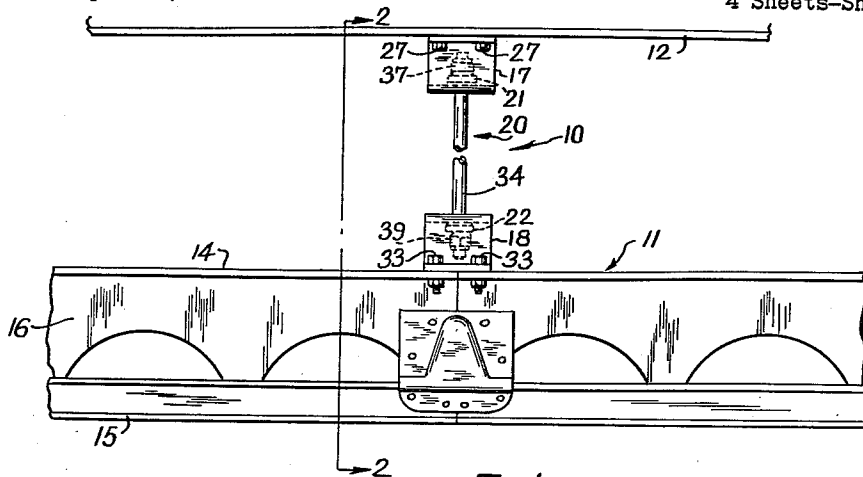


FIG. 1

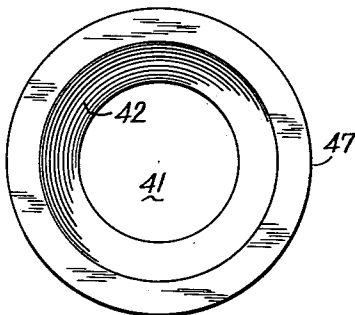


FIG. 6

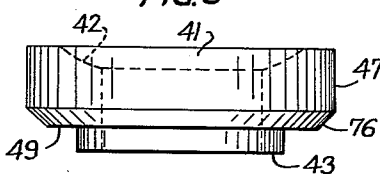


FIG. 5

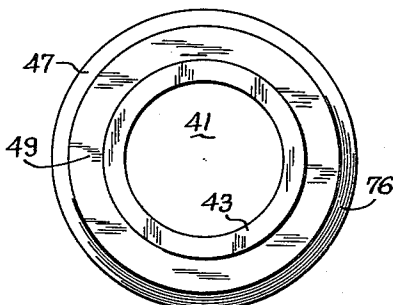


FIG. 7

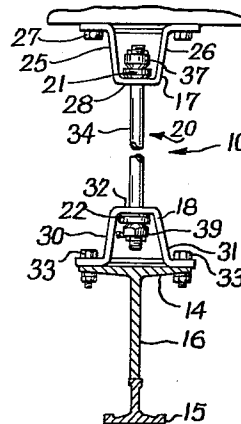


FIG. 2

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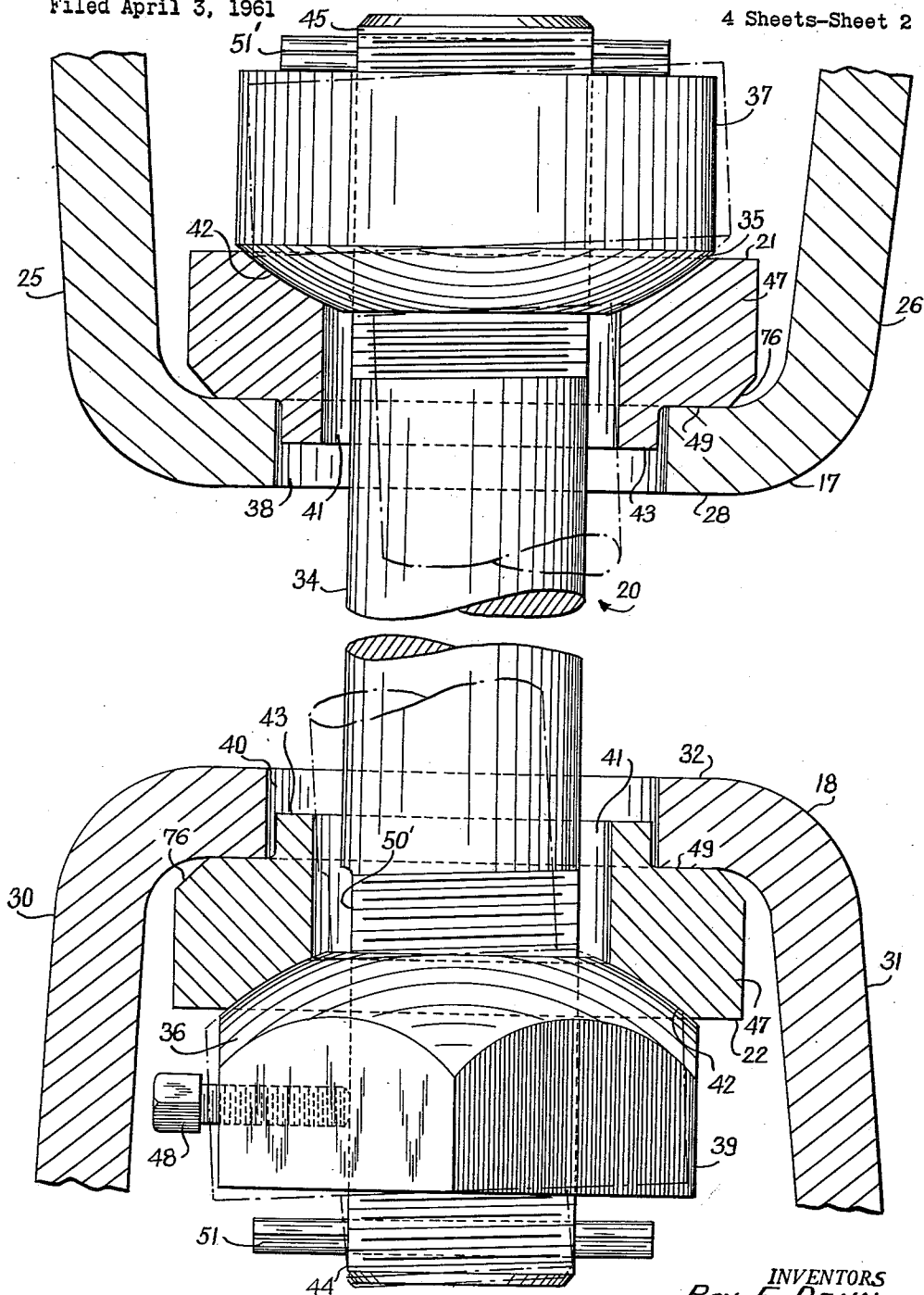


FIG. 3

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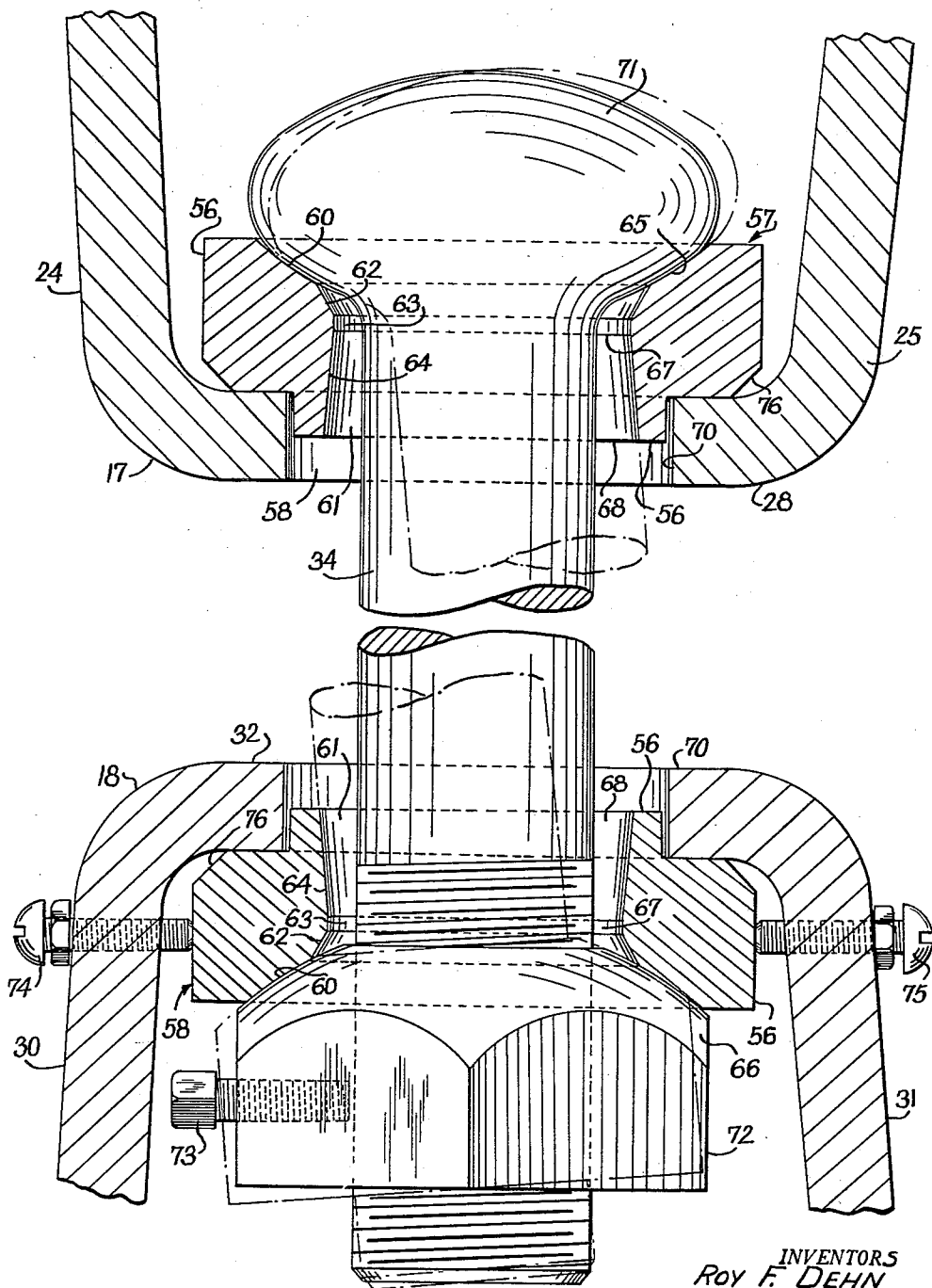


FIG. 4

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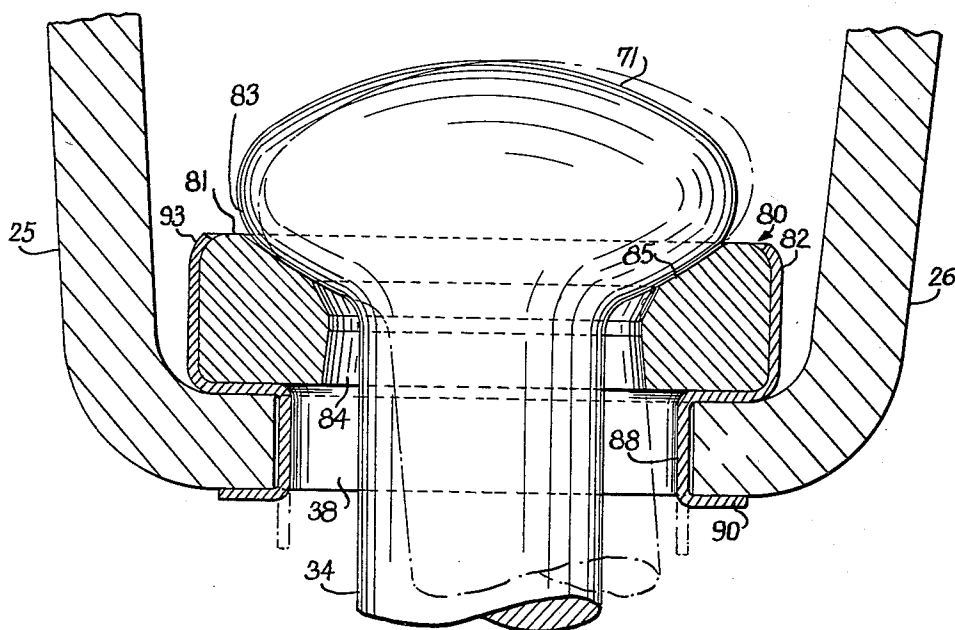


FIG. 8

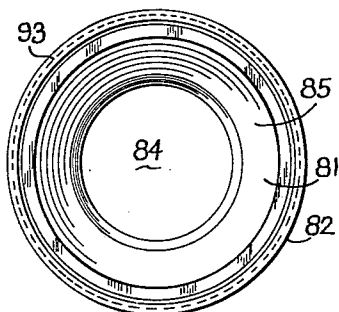


FIG. 10

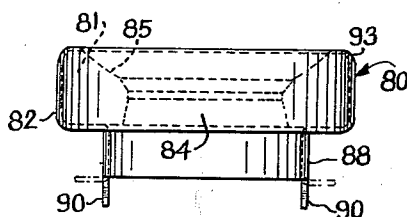


FIG. 9

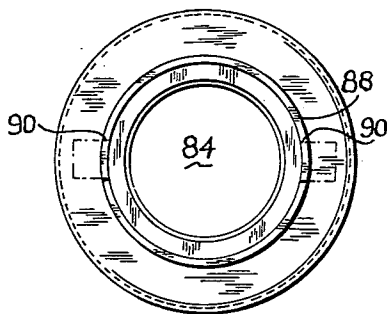


FIG. 11

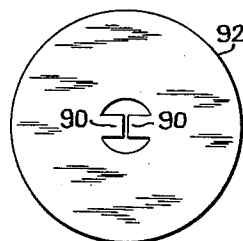


FIG. 12

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3,095,174

OVERHEAD MONORAIL TRACK SUSPENSION
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Filed Apr. 3, 1961, Ser. No. 100,214
8 Claims. (Cl. 248—324)

This application is a continuation-in-part of our co-pending application Serial No. 10,700, filed on February 24, 1960 and now abandoned.

This invention relates to overhead track suspensions and, more particularly, to flexible monorail track suspensions having a hanger rod extending from a support member to a track member and securing the track member to the support member in a manner which permits the hanger rod to swing with respect to the support member.

The principal object of this invention is the provision of a new and improved flexible track suspension which may be manufactured more easily and assembled more reliably than the prior art suspensions.

Another principal object of this invention is the provision of a new and improved flexible track suspension having a longer life than the flexible track suspensions of the prior art.

A further object of this invention is the provision of a new and improved flexible track suspension having a support member, a track support, a hanger rod extending through an opening in each support, an enlarged convex bearing surface at each end of the hanger rod, and an annular thrust member encircling the hanger rod, interposed between at least one of the enlarged convex bearing surfaces and the adjacent support member, and having a concave bearing surface for receiving the enlarged convex surface and an annular skirt extending into the opening in the support member adjacent the enlarged convex bearing surface to permit free swinging of the hanger rod and prevent wear caused by a thrust member jamming against the hanger rod.

A further object of this invention is the provision of a new and improved flexible track suspension having a support member, a track support, a hanger rod extending through an opening in each support, an enlarged convex bearing surface at each end of the hanger rod, and an annular thrust member interposed between at least one of the enlarged convex bearing surfaces and the adjacent support member and having a concave bearing surface for receiving the enlarged convex surface and a frusto-conical surface encircling the hanger rod to provide a larger area of contact between the hanger rod and thrust member than is provided by the prior art, thus eliminating undue stresses which are placed on the hanger rods in the prior art.

A further object of this invention is the provision of a new and improved flexible track suspension having a support member, a track support, a hanger rod extending through an opening in each support, an enlarged convex bearing surface at each end of the hanger rod, and an annular thrust member encircling the hanger rod, interposed between at least one of the enlarged convex surfaces and adjacent support member, and being made of a powdered metallurgy material having internal voids which are saturated by a lubricant to prevent galling and rusting of the engaged convex and concave surfaces which would impair free swinging of the hanger rod and shorten the life of the flexible suspension.

A further object of the present invention is the provision of a new and improved flexible track suspension having a support member, a track support, a hanger rod threaded at both ends and extending through openings in the supports, nuts having a convex bearing surface threaded onto

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the respective ends of the hanger rod, an annular thrust member encircling the hanger rod, interposed between each nut and adjacent support, and having a concave bearing surface for receiving a convex surface and means for securing the nuts in position on the hanger rod, thereby providing a flexible suspension which is more easily manufactured and more reliably assembled than the prior art suspensions.

A further object of the present invention is the provision of a new and improved flexible track suspension having a support member, a track support, a hanger rod having at least one end threaded, with the threads partially milled, extending through openings in the support members, and mounted in such a manner to permit the hanger rod to swing, and a setscrew engaging the milled surface of the hanger rod and securing a portion of the hanger rod mounting to the hanger rod, thus avoiding undue mutilation of the threads of the hanger rod and permitting relevering the track member and re-using the hanger rods.

A still further object of this invention is the provision of a new and improved annular thrust member having an opening therethrough, a concave bearing surface on one side adapted to receive an enlarged convex surface of a hanger rod of a track suspension, and an axially extending skirt on the other side adapted to extend into an opening in a support member through which the hanger rod extends to permit free swinging of the hanger rod which would be prevented if the thrust member engaged the hanger rod.

Another object of this invention is the provision of a new and improved annular thrust member having a concave bearing surface on one side adapted to receive an enlarged convex bearing surface on a hanger rod of a track suspension and an opening therethrough defined by a frusto-conical wall surface having its minimum diameter adjacent the side having the concave bearing surface adapted to engage the hanger rod over a relatively large area, in view of the prior art, to eliminate undue stresses on the hanger rod.

Still another object of this invention is the provision of a new and improved annular thrust member having an annular socket member having an opening therethrough and a concave bearing surface on one side adapted to receive an enlarged convex bearing surface of a hanger rod of a track suspension and a shell made of a material different from the material of which the socket member is made, surrounding the socket member, and having a skirt which is adapted to extend into an opening in a support member and deformable tabs on the skirt which are adapted to be bent after insertion of the skirt into the opening to secure the socket in proper position to permit swinging of the hanger rod.

Other objects and 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 which is described with reference to the accompanying drawings in which:

FIG. 1 is a side elevation of a portion of an overhead track system supported by the track suspension of this invention,

FIG. 2 is a view of the track suspension of FIG. 1 taken along the line 2—2 thereof,

FIG. 3 is an enlarged sectional view of the suspension of FIGS. 1 and 2 with portions broken away,

FIG. 4 is an enlarged sectional view of a modified embodiment of the track suspension of this invention,

FIG. 5 is a side view of the annular thrust member shown in FIG. 3,

FIG. 6 is a top plan view of the annular thrust member shown in FIG. 5,

FIG. 7 is a bottom view of the annular thrust member shown in FIG. 5,

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FIG. 8 is a view of a portion of the hanger rod of FIG. 4 utilizing a different type of annular thrust member,

FIG. 9 is a side view of the annular thrust member of FIG. 8,

FIG. 10 is a top view of the annular thrust member of FIG. 9,

FIG. 11 is a bottom view of the annular thrust member of FIG. 9, and

FIG. 12 is a plan view of a blank used in the manufacture of the annular thrust member of FIG. 9.

Referring to the drawings, FIG. 1 is a view of an overhead track system embodying this invention and shows a track member 11 suspended from an overhead support member 12 by a track suspension 10. The support member 12 may be a ceiling, a beam, or other structural member of a building.

The track member 11 is of a type well known in the art having an upper transverse flange 14, a lower flange 15 for supporting the wheels of a carrier or the like, and a web 16 connecting the flanges.

The track suspension 10 comprises a bracket 17, a bracket 18, a hanger rod 20, and annular thrust members 21, 22. The bracket 17 is substantially U-shaped, having leg portions 25, 26 which are secured to the support member 12 by suitable fastening means such as screws 27 and which are joined by a transverse connecting portion 28. The bracket 18 is similar to the bracket 17 and is also substantially U-shaped, having leg portions 30, 31. The leg portions 30, 31 are joined by transverse connecting portion 32 and are secured to the upper flange 14 of the track 11 by suitable fastening means such as bolts 33.

The hanger rod 20 has a shank portion 34 on the ends of which are enlarged convex bearing surfaces 35, 36. As shown in FIG. 3, these convex surfaces constitute one side of nuts 37 and 39. The brackets 17 and 18 are provided with openings 38 and 40 in their respective transverse connecting portions 28 and 32. The openings 38 and 40 are considerably larger in diameter than the diameter of the shank 34 of the hanger rod 20, but are of a smaller diameter than the diameters of the nuts 37, 39. The shank 34 of the hanger rod 20 extends through the openings 38 and 40.

The thrust members 21 and 22 are generally angular in shape and each is provided with an opening therethrough designated 41. Each of the annular thrust members 21, 22 is provided with an concave bearing surface or seat 42 in one side of their body portions 47. The side of the annular members opposite the side having the concave bearing surface 42 has an annular skirt 43 which has an annular diameter less than the diameter of the openings 38 and 40 in the bracket members. This annular skirt is adapted to be inserted in the openings 38 and 40 in the brackets with the surface 49 of the annular thrust members resting on the transverse connecting portions 28, 32 in the respective brackets, and is shown so positioned in FIG. 3. The skirt portions thus properly position the hanger rod 20 for free swinging movement and prevent the thrust members from jamming against the shank 34 of the hanger rod.

The enlarged convex bearing surfaces 35, 36 on nuts 37, 39 are received in the concave bearing surfaces 42 in the annular thrust members. The ends of the shank 34 are threaded at 44, 45 to receive the nuts 39, 37. Preferably, as shown in FIG. 3, the nut 37 is made from round stock while nut 39 is made from hexagonal stock. Of course, either nut 37 or 39 may be made from stock having other cross-sectional shapes.

The nut 39 is provided with a setscrew 48 for securing the nut in proper position on the hanger rod. The threads 44 at the end of the hanger rod which threadedly engage nut 39 are partially milled, thus providing a flat portion 50 on the end of the hanger rod. The setscrew 48 is tightened against the flat 50 and thereby avoids mutilating the threads on the hanger rod. Thus the hanger rod

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can be releveled or re-used, which would not be the case if the threads were damaged.

Numerous ways of utilizing and assembling the suspension shown in FIG. 3 would occur to one skilled in the art to which it relates. Preferably, the nut 37 is threaded onto the hanger rod 20. Spring pin 51' is then inserted through an opening in the hanger rod. Nut 37 is then backed up against the pin 51' to properly position the nut 37. The brackets 17, 18 are properly secured to the support member 12 and track member 11. The annular thrust members 21, 22 are preferably welded to the brackets before they are secured to the respective support members. The hanger rod is inserted through the openings 41 in the respective annular thrust members and the nut 39 is threaded onto the hanger rod. With the convex surfaces 35, 36 received in the concave surfaces 42 of the thrust members, setscrew 48 is tightened against flat 50 on the hanger rod to secure the nut 39 in position on the hanger rod. Spring pin 51 is then inserted through an opening in the lower end of the hanger rod. This pin will function to hold the nut 39 on the hanger rod in the event the setscrew 48 and nut 39 loosen.

The convex bearing surfaces on the nuts will cooperate with the concave bearing surfaces on the annular thrust members to provide a ball and socket type of swivel joint. Thus the hanger rod will be permitted to swing, as shown in the dot-dash lines in FIG. 3, and thus avoid undue bending stresses which would be present if the hanger rod could not swing.

In FIGURE 4 of the drawings a modified embodiment of the track suspension of this invention is shown in which each of the annular thrust members 57, 58 which are utilized have a concave bearing surface 60, similar to the concave bearing surface 42 of the annular thrust members shown in FIG. 3, an annular skirt 56, and an opening 61 defined in part by a tapered surface 62, a cylindrical surface 63, and a frusto-conical surface 64. The slope of the frusto-conical surface is such that the smallest diameter thereof is adjacent the concave bearing surface 60 in the one side of the annular thrust member and the largest diameter thereof is adjacent the other side of the annular thrust member opposite the concave bearing surface. The frusto-conical surface of the annular thrust members shown in FIG. 4 encircles the shank 34 of the hanger rod and is interposed between the convex bearing surfaces 65, 66 and the respective supports 17, 18.

The size of the openings through the annular thrust members shown in FIG. 4 permits swinging movement of the hanger rod, as indicated in the dot-dash lines of FIG. 4. The slope of the frusto-conical surface is such that the shank 34 of the hanger rod 20 contacts the thrust members along a line extending from one edge 67 of the frusto-conical surface to the other edge 68 thereof. Because of the extent of the contact between the shank 34 of the hanger rod and the frusto-conical surface the hanger rod is relieved of concentrated stresses which would be imposed on the shank in the event the shank were limited in its swinging movement by contact with only one edge of an opening such as the edge 70 surrounding the opening in the brackets. The possibility of bending and breaking of a hanger rod due to such stresses is thereby eliminated.

In the modified embodiment of FIG. 4 the shank of the hanger rod is provided with a head 71 rather than a nut 37, as in the embodiment of FIG. 3. The head on the hanger rod shank in FIG. 4 is provided with the convex bearing surface 65 which is received in the concave surface 60 of the annular thrust member 57. On the other end of the shank of the hanger rod there is positioned a nut 72 which has the convex bearing surface 66 which engages the concave bearing surface 60 in the annular thrust member 58 which is located between the nut 72 and the bracket 18 and is similar to thrust member 57.

In this embodiment a setscrew 73, similar to the setscrew utilized in the embodiment of FIG. 3, is used to

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secure the nut 72 to the hanger rod. The threads on the hanger rod shown in FIG. 4 may be milled to form a flat portion similar to portion 50 of the hanger rod in FIG. 3 to provide a flat surface against which setscrew 73 could be tightened.

The lower thrust member is secured in position by machine screws 74, 75 firmly engaged in openings in the leg portions of the bracket and bearing against the body portion 56 of the thrust member 58. The thrust member 58 is thereby prevented from falling from its illustrated position in the event the hanger rod would loosen because of any raising of the rail member. Also, because the annular thrust member is secured in position the likelihood of the thrust member being broken by lowering of the track member when the thrust member is misaligned with the opening in the bracket 18 is avoided.

The annular thrust members 21, 22, 57, 58 shown in FIGS. 3 and 4, are formed of a compressed powdered metallurgy material which includes graphite and internal voids which are saturated with a suitable lubricant. One such material is sold under the name of "U.S. Graphite Gramix No. 258." The use of this material assures a reserve of lubricant to prevent rusting of the concave and the convex surfaces. Since the convex surface is preferably steel, the engagement between the convex and the concave surfaces does not cause galling to the degree found in the prior art. These factors add considerably to the life of the hanger rod suspension.

The annular thrust members shown in FIGS. 3 and 4 are also beveled at 76 to easily clear the corners of the brackets.

Another modified form of thrust member is illustrated in FIGS. 8 to 12. This modified thrust member is indicated generally at 80. It comprises a socket 81 having a concave bearing surface 85 for engagement with the convex bearing surface 83 on the shank 34 of the hanger rod. The socket member may be formed of a metallic or a nonmetallic material, for example, Micarta or graphite.

The socket is provided with an annular opening 84 therethrough which may be defined by the surface of a cylinder as the thrust members of FIG. 3 or may correspond to the opening in the thrust members shown in FIG. 4. It is shown of the latter form in FIGS. 8-12. Surrounding the socket member 81 is an annular shell 82 having a skirt portion 88 which is adapted to be inserted in the opening in the brackets. On the skirt portion 88 there is provided deformable tabs 90 which may be bent after the skirt portion 88 is inserted in the bracket to secure the bracket to the socket member. The shell member 82 is made of a material which can be easily welded to the bracket member to secure the socket member and the concave bearing surface 85 in proper position with respect to the convex bearing surface 83 on the shank 34. As shown in FIG. 8, the convex bearing surface is on a head 71 as in FIG. 4, but obviously a nut, as in FIG. 3, may be used to provide the convex bearing surface.

FIG. 12 is a view of a blank 92 used in the manufacture of a shell 82 for the socket shown in FIG. 8. In its illustrated position the blank may be drawn to form the shell member shown in FIG. 8. The shell then could be rolled as at 93 to secure the socket member therein.

While the hanger rod is secured in upper and lower brackets 17 and 18, as shown in the accompanying drawings, the hanger rod may extend through an aperture in the upper flange 14 of the track member and an aligned aperture in the support member 12. In such a case the brackets 17, 18 are not used and the upper flange of the track member and the support member function as brackets and thus become support members. In such a case an enlarged convex surface would be received in the concave surface of a thrust member positioned between the enlarged convex surface and the flange 14 at one end of

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the hanger rod, and the enlarged convex bearing surface at the other end of the hanger rod would be received in a concave surface of a thrust member positioned between the convex surface and the support 12.

It can now be seen that the present invention provides a new and improved flexible track suspension which may be manufactured more easily and assembled more reliably and which has a longer life than the flexible track suspensions of the prior art.

While the preferred form of the invention has been described in considerable detail, it will be apparent that the invention is not limited to the construction shown or the uses referred to and it is our intention to cover all adaptations, modifications, and changes which come within the practice of those skilled in the art to which the invention relates and the scope of the appended claims.

Having described our invention, we claim:

1. A track suspension comprising an overhead support member having an opening therethrough, a track support member having an opening in substantial alignment with the opening in said overhead support, a hanger rod extending through said openings, a convex bearing surface on at least one end of the hanger rod adjacent one of said support members, an annular thrust member having a circular opening therethrough encircling the hanger rod, said opening through said annular thrust member being of larger diameter than said hanger rod to provide clearance therebetween, a concave bearing surface in one side of the annular thrust member receiving said convex bearing surface, and an annular skirt on the side of said thrust member opposite said one side encircling the hanger rod and extending into said opening in said one of said support members, said annular skirt having an opening therethrough which has a radius substantially equal to the radius of said opening through said thrust member and the center of which lies on the center line of said opening through said thrust member.

2. A track suspension comprising an overhead support member having an opening therethrough, a track support member having an opening in substantial alignment with the opening in said overhead support, a hanger rod extending through said openings, a convex bearing surface on at least one end of the hanger rod adjacent one of said support members, an annular thrust member having an opening therethrough encircling the hanger rod, a concave bearing surface on one side of the annular thrust member receiving said convex bearing surface, said opening through said annular thrust member being of larger diameter than said hanger rod and being defined in part by a frusto-conical surface having the minimum diameter adjacent said side of said annular thrust member having said concave bearing surface.

3. A track suspension comprising an overhead support member having an opening therethrough, a track support member having an opening in substantial alignment with the opening in said overhead support, a hanger rod extending through said openings, a convex bearing surface on at least one end of said hanger rod adjacent one of said support members, an annular thrust member having a circular opening therethrough encircling the hanger rod, said opening through said annular thrust member being of larger diameter than said hanger rod to provide clearance therebetween, a concave bearing surface on one side of said annular thrust member receiving said convex bearing surface, and an annular skirt on a side of said thrust member opposite said one side encircling the hanger rod and extending into the opening in said one of said support members, said annular skirt having a circular opening therethrough which has a radius substantially equal to the radius of said opening through said thrust member and the center of which lies on the center line of said opening through said thrust member, said thrust member and annular skirt being made of a powdered metallurgy material having internal voids and impregnated with a lubricant.

4. A track suspension comprising an overhead support member having an opening therethrough, a track support member having an opening in substantial alignment with the opening in said overhead support, a hanger rod extending through said openings, a convex bearing surface on at least one end of the hanger rod adjacent one of said support members, an annular socket encircling the hanger rod, a concave bearing surface in one side of the annular socket for receiving said convex bearing surface, a shell surrounding said socket member and having a skirt portion extending into said opening in said one of said support members, and deformable tab elements on said skirt portion adapted to be bent after said skirt portion is inserted in said opening in said one of said support members to secure said shell and socket member in position on said support member.

5. An annular thrust member comprising a body portion of a uniform circular cross section; a circular opening extending from one side of said body portion to the other side of said body portion; a concave bearing surface on said one side of said body portion; and an annular skirt extending from said other side of said body portion, with a smaller circular cross section than said body portion, and having a circular opening therethrough in alignment with the opening through said body portion, said circular opening through said annular skirt having the same radius as said opening through said body portion and the center thereof lying on the center line of said opening through said body portion.

6. An annular thrust member comprising a body portion having a uniform circular cross section; an opening extending from one side of said body portion to the other side of said body portion, said opening defined in part by a frusto-conical wall surface having its minimum diameter adjacent said one side of said body portion; a concave bearing surface on said one side of said body portion; and an annular skirt extending from said other side of said body portion of a smaller circular cross section than said body portion and having a frusto-conical wall

surface therethrough which is a continuation of the frusto-conical surface through said body portion.

7. An annular thrust member comprising a socket having a uniform circular cross section; an opening extending from one side of said socket to the other side of said socket; a concave bearing surface on said one side of said socket; a shell surrounding said socket; an annular skirt extending from said shell adjacent said other side of said socket and having an opening in alignment with the opening through said socket; and deformable tab elements extending from said skirt adapted to be bent after the skirt has been positioned in an opening in a support member to secure the socket and shell to the support member.

8. A track suspension comprising an overhead support member having an opening therethrough, a track support member having an opening in substantial alignment with the opening in said overhead support member, a hanger rod threaded at both ends extending through said openings, a first nut having a convex bearing surface on one side threaded onto one end of said hanger rod, a second nut having a convex bearing surface on one side threaded onto the end of said hanger rod opposite said one end, a pair of annular thrust members having a single radius opening therethrough encircling said hanger rod, one of said thrust members interposed between each of said nut members and the adjacent support member, a concave bearing surface on one side of each of said annular thrust members receiving said convex surface on the adjacent nut, and an annular skirt on the side of said thrust members opposite said one side and encircling said hanger rod and extending into said opening in said adjacent support member.

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