

[54] **CUSHIONED TRACK WITH CROSS GROUSERS**

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[57] **ABSTRACT**

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A resilient spacer means, such as a pneumatic rubber tire, has an endless track assembly mounted thereon. The track assembly comprises an annular and articulated link assembly positioned on each side of the spacer means to closely couple a plurality of ground engaging track shoes together. Each track shoe has a ground engaging grouser secured thereto to be disposed parallel relative to the rotational axis of the cushioned track. A cross grouser is attached to each shoe to extend substantially perpendicularly relative to the first-mentioned grouser to resist lateral sliding movement of the cushioned track during operation thereof.

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[52] U.S. Cl.**305/19, 305/54**
 [51] Int. Cl.**B60c 27/20**
 [58] Field of Search305/54, 55, 19, 53; 152/227

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13 Claims, 15 Drawing Figures

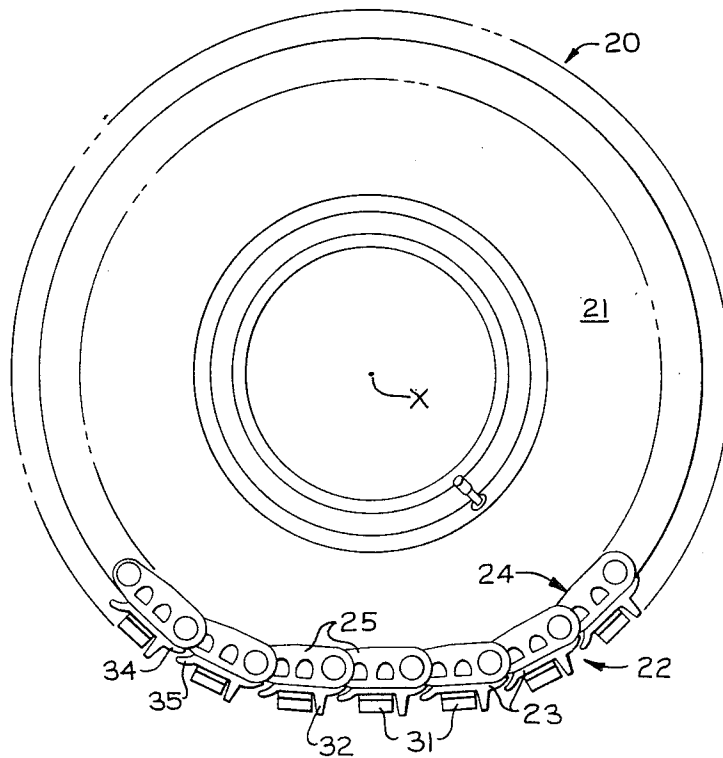
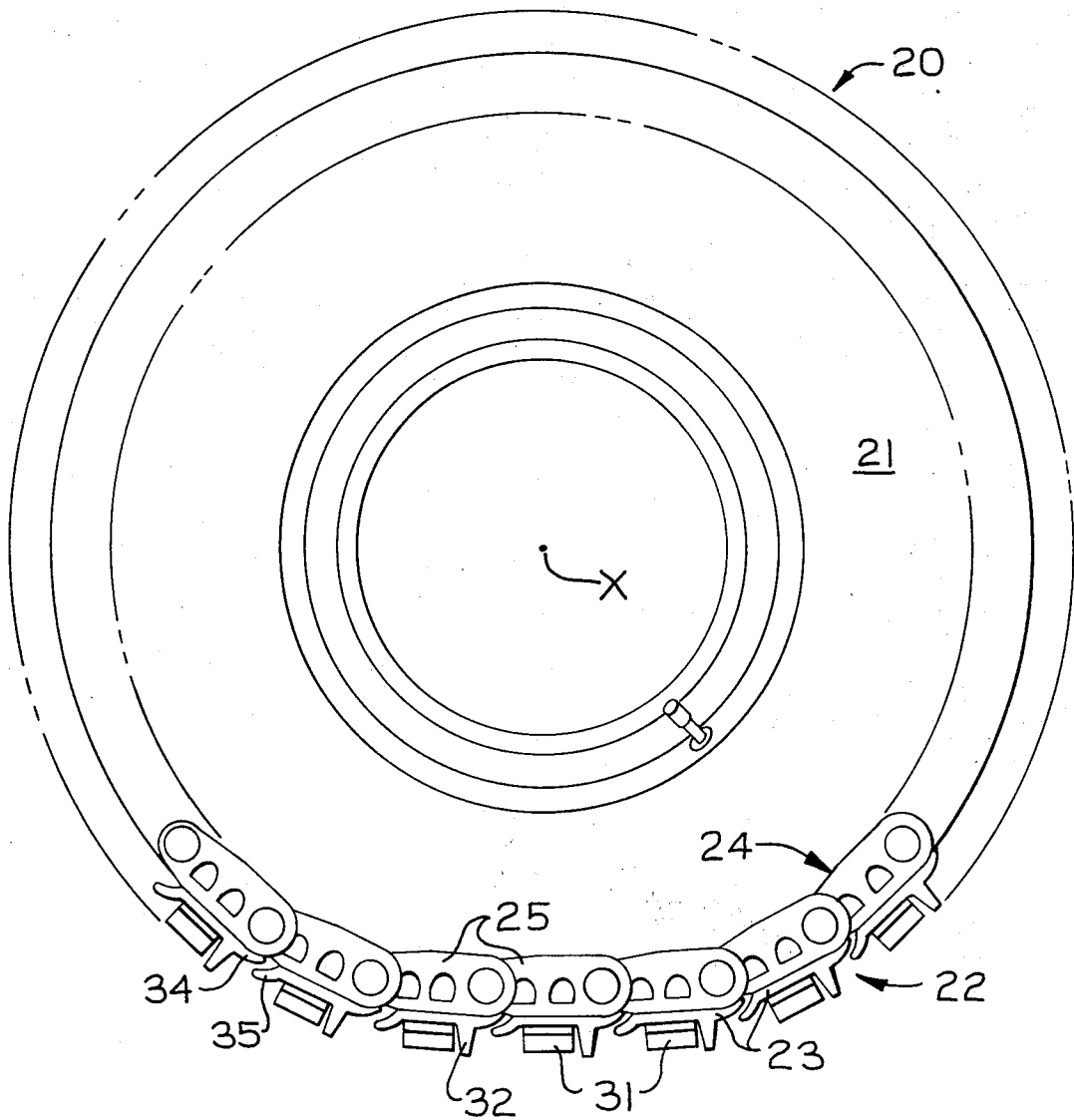


Fig. 1.



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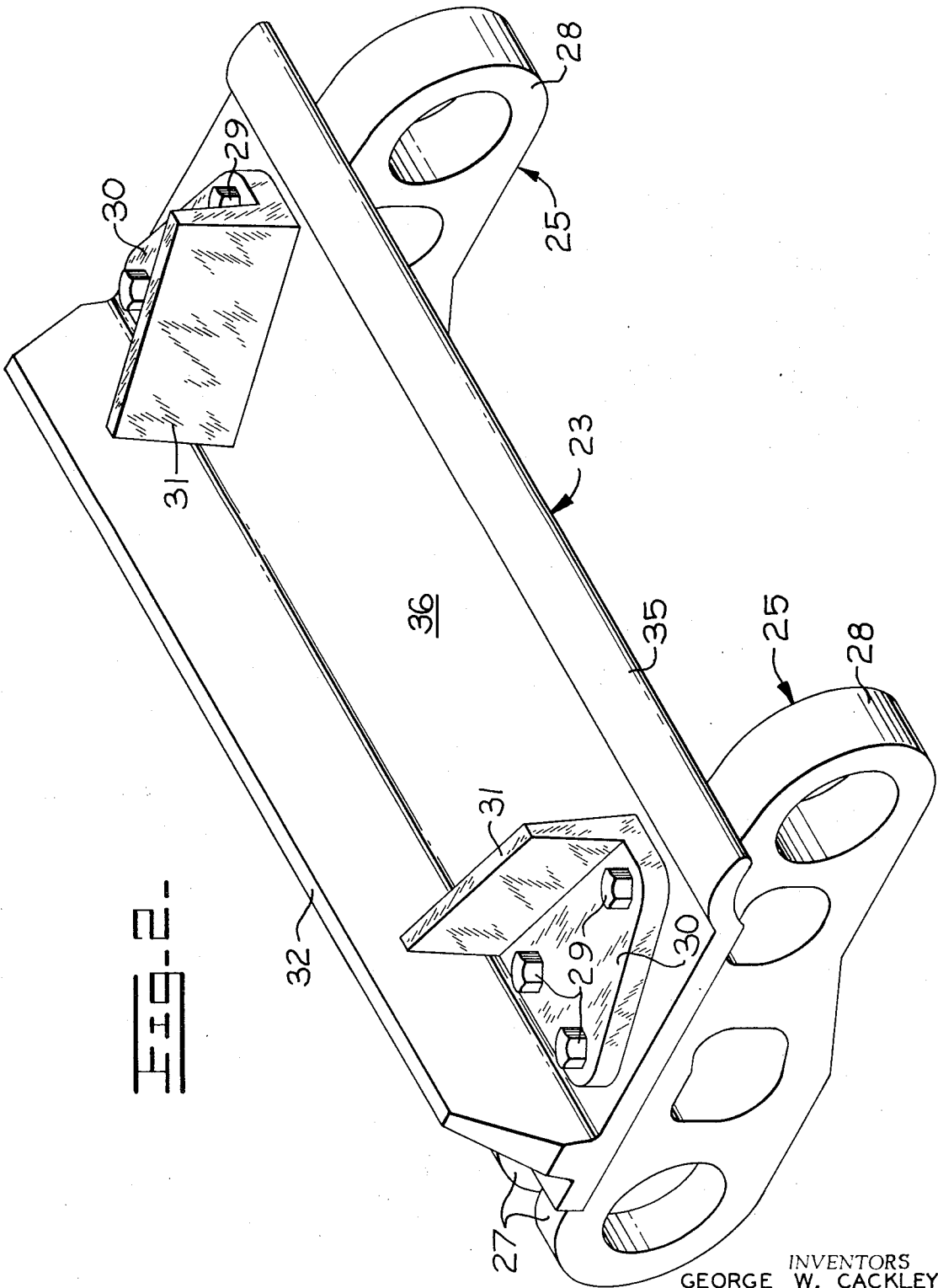


FIG. 2-

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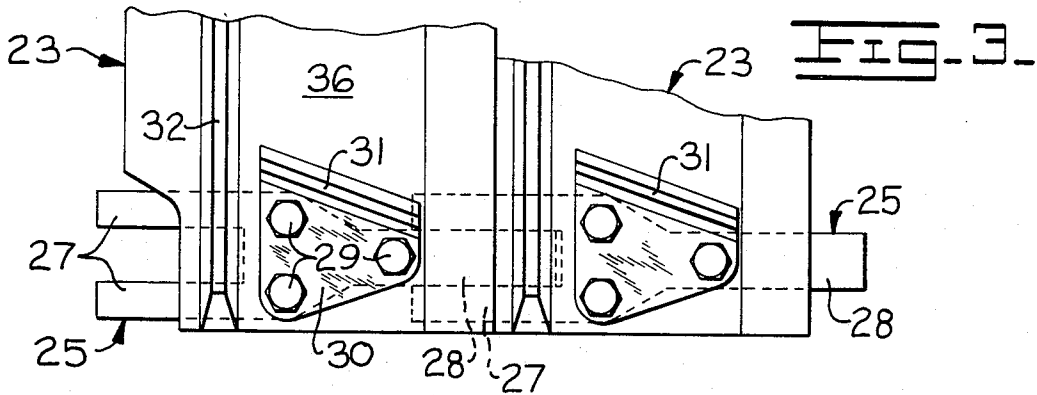


FIG. 3.

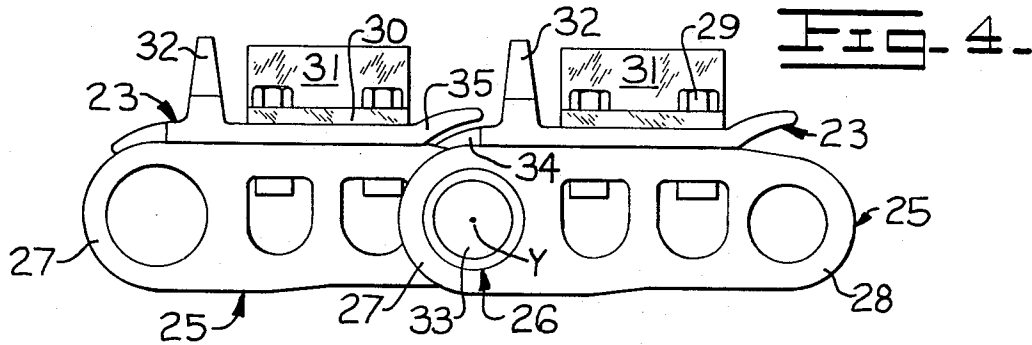


FIG. 4.

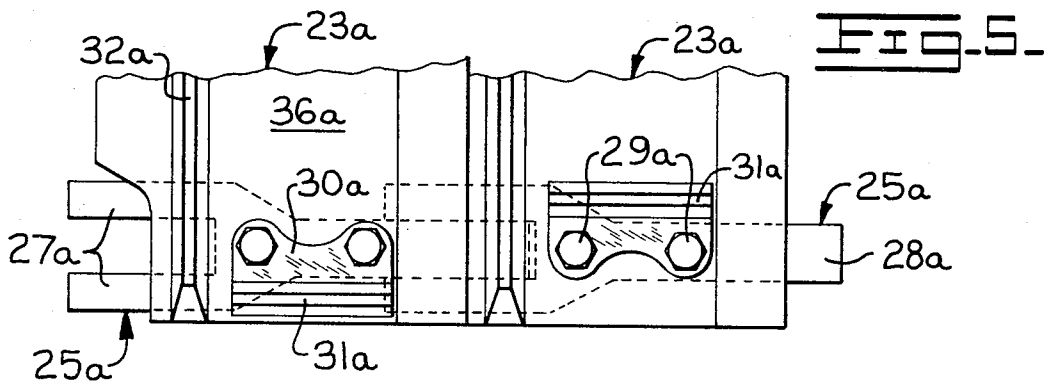


FIG. 5.

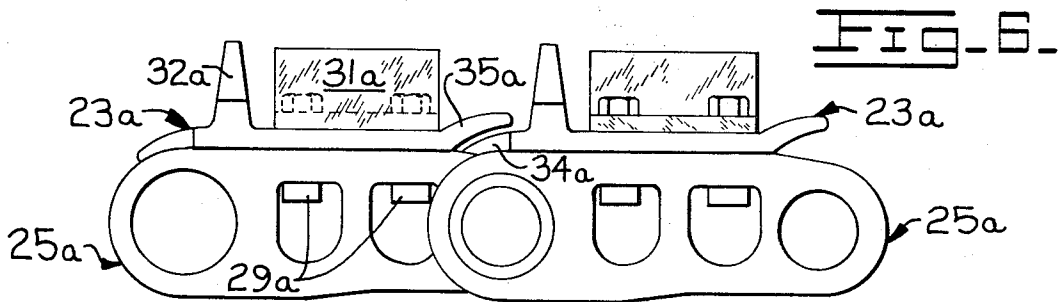


FIG. 6.

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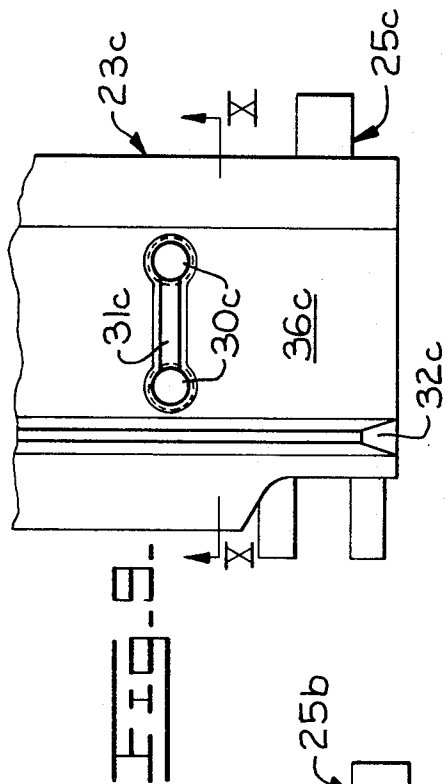


FIG. 10

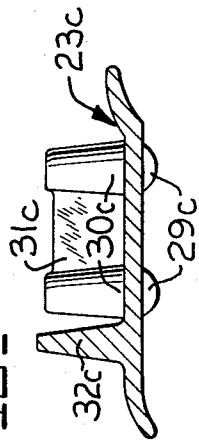


FIG. 11

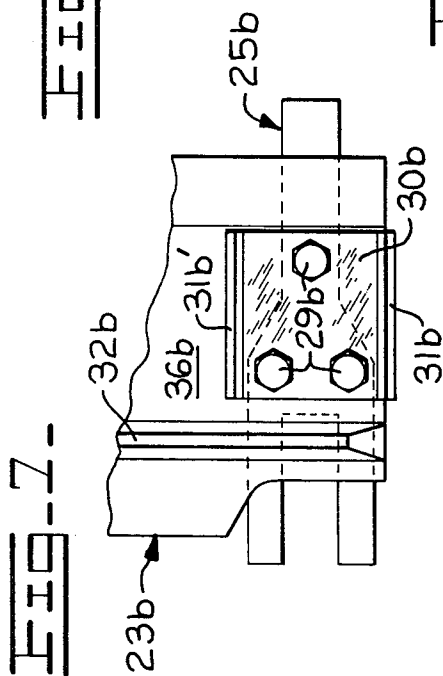
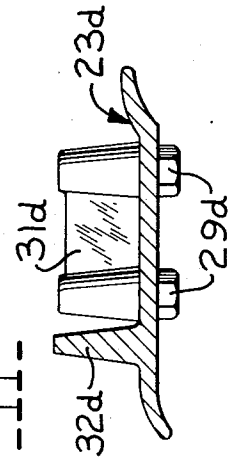
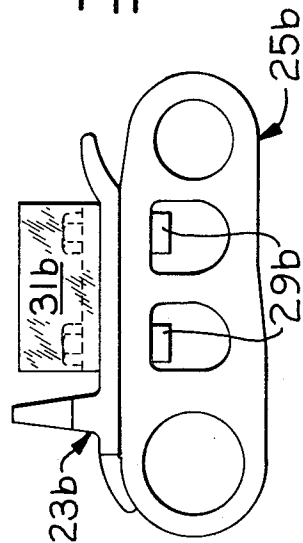


FIG. 8



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Fig. 12

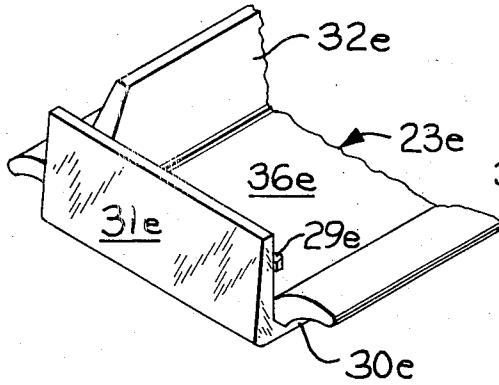


Fig. 13

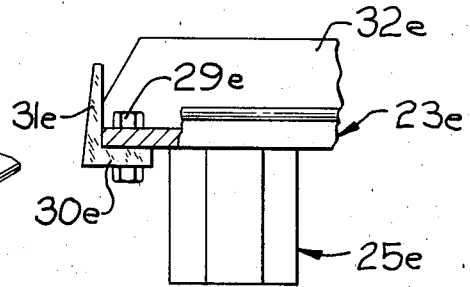


Fig. 14

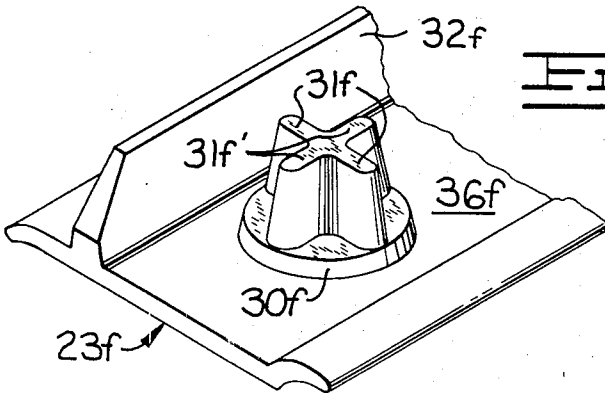
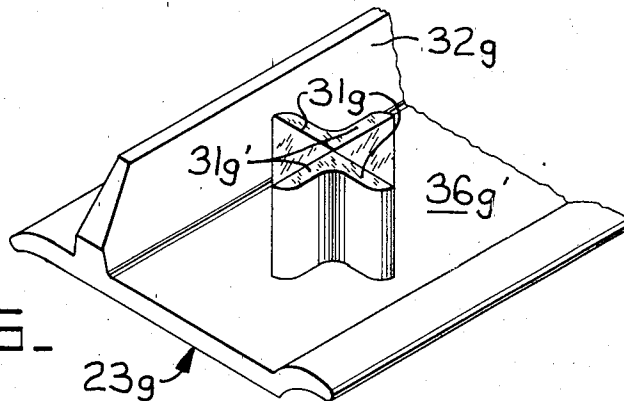


Fig. 15



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CUSHIONED TRACK WITH CROSS GROUSERS

BACKGROUND OF THE INVENTION

This invention relates to a wheel of the cushioned track type which is particularly adapted for use on land vehicles.

The present advent of cushioned track machines has facilitated expeditious and efficient performance of earth working operations. Under certain operating conditions, such as side hill operations on earth having a hard under-surface covered with a layer of slippery mud, a cushioned track vehicle may tend to slide laterally relative to its intended direction. Paradoxically, the problem is made particularly apparent due to the vehicle's high degree of stability and aggressiveness regarding the wide variety of work tasks which it is capable of performing.

SUMMARY AND OBJECTS OF THIS INVENTION

An object of this invention is to overcome the above, briefly described problems by providing a secondary or cross-grousered track shoe particularly adapted for use in the track assembly of a cushioned track. The cushioned track exhibits a high degree of working efficiency, especially during side hill earthmoving operations and the like, due to the ability of the cross-grousers to resist the tendency of the cushioned track to slide laterally.

The cushioned track comprises an annular resilient spacer means mounted for rotation about a central axis thereof and an endless track assembly mounted completely around the spacer means. The track assembly comprises a plurality of ground engaging track shoes and annular connecting means attached to the shoes to closely couple them together.

A primary grouser is secured exteriorly on at least some of the shoes to extend in the direction of such central axis. Such shoes further have a secondary or cross-grouser attached thereto to extend at least approximately perpendicular relative to the primary grouser.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects of this invention will become apparent from the following description and accompanying drawings wherein:

FIG. 1 is a side elevational view of a cushioned track employing a cross-grouser embodiment of this invention therein;

FIG. 2 is an enlarged isometric view of a track shoe and attached links sub-assembly employed in the FIG. 1 cushioned track;

FIG. 3 is a partial top plan view of two of the FIG. 2 sub-assemblies attached together;

FIG. 4 is a side elevational view of the FIG. 3 sub-assemblies;

FIGS. 5 and 6 are partial top plan and side elevation views, respectively, illustrating a modification of the FIG. 2 sub-assembly;

FIGS. 7 and 8 are partial top plan and side elevational views, respectively, illustrating another modification of the FIG. 2 sub-assembly;

FIG. 9 is a partial top plan view illustrating another modification of the FIG. 2 sub-assembly;

FIG. 10 is a cross-sectional view taken in the direction of arrows X—X in FIG. 9;

FIG. 11 is a cross-sectional view similar to FIG. 10, but illustrating a modification thereof;

FIGS. 12 and 13 are partial isometric and end elevational views, respectively, illustrating a modified track shoe; and

FIGS. 14 and 15 are partial isometric views illustrating further modifications of a track shoe.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a cushioned track 20 adapted to replace conventional tires or the like employed on standard earth working equipment, such as wheel-type tractors. The cushioned track comprises an annular resilient spacer means 21 having a substantially annular and polygonal-shaped endless track assembly 22 mounted completely therearound. The resilient spacer means may comprise an air inflated rubber tire or air bag, for example, mounted on a conventional rim assembly.

Other suitable types of spacer means are disclosed in U.S. Pat. application Ser. No. 884,903, filed on Dec. 15, 1969 by Robert A. Peterson et al., for "Cushioned Track and Method for Driving Same," assigned to the assignee of this application. The rim may be suitably connected to a vehicle's drive train (not shown) to be rotated about a central axis X thereof by an internal combustion engine (not shown). The illustrated tire spacer means embodiment may comprise suitably integrated interliner, body plies and tread plies.

The endless track assembly comprises a plurality of closely coupled ground-engaging shoes 23 circumferentially surrounding the spacer means. The shoes have widths defining outboard portions extending a substantially equal lateral distance beyond a respective side wall of spacer means 21. An annular articulated link assembly or connecting means 24 is preferably connected to respective outboard portions of the shoes and in slightly spaced relationship relative to a respective side wall of the spacer means.

The identical link assemblies may be bolted or otherwise suitably connected to radially inner surface portions of the outboard portions of the shoes to closely couple them together (FIGS. 1, 2 and 3). The substantially flat and uninterrupted inner surface portions of the shoes intimately contact and compress a substantial portion of the periphery of the spacer means so that such periphery assumes a substantially circumferentially continuous and polygonal-shaped configuration for driving purposes. Such driving relationship is fully described in above-referenced U.S. Pat. application Ser. No. 884,903.

FIGS. 3 and 4 illustrate a portion of the track assembly as comprising an adjacent pair of identical links 25. Each pair of links are pivotally connected together for pivotal movement about a common pivot axis Y by pivot means 26. The illustrated link embodiment is of the fork and blade type comprising a fork end portion 27 positioned to receive a blade end portion 28 of the adjacent link therein.

Each link may be secured to its respective shoe 23 by releasable bolt or securing means 29. Such bolt means further attach each corner of a support means or flat triangular plate or flange 30 exteriorly on the shoe which has a cross or secondary grouser 31 formed integrally therewith. A primary grouser 32 is formed in-

tegrally with shoe 23 and cooperates with cross-grouser 31 for purposes hereinafter more fully explained.

The pivot means 26 comprises a pivot pin 33, and preferably a mating bushing, positioned substantially parallel relative to the central rotational axis X of the cushioned track (FIG. 1) and substantially intermediate a respective pair of adjacent shoes connected together thereby. Such an arrangement facilitates a close coupling of the shoes together and also permits the grousers to move into contact with the ground at the formed footprint in a substantially smooth and uninterrupted manner. In addition, the shoes are permitted to completely mask the periphery of the spacer means for protection and anti-dirt infiltration purposes.

It should be further noted in FIGS. 1 and 4 that curved first and second lugs 34 and 35 are formed integrally with each shoe at respective length-wise ends thereof. The complementary lugs function in conjunction with the disposition of pin 33 to completely mask each other during rotation of the cushioned track. In particular, first lug 34 of one shoe will substantially underlie the covering second lug 35 of an adjacent shoe to protect the spacer means against damage and to prevent dirt infiltration during all phases of machine operation.

Although one primary grouser 32 is illustrated in the preferred embodiments, it should be understood that two or more such grousers may be employed thereon in suitably spaced relationship. The grouser extends radially outwardly from the track shoe and fully across the width thereof. The grouser is also preferably positioned closely adjacent to pivot means 26 to induce a smooth transition of the track assembly and related desiderata at the formed footprint during rotation of the cushioned track over the ground.

In the grouser embodiment illustrated in FIGS. 1-4, both primary grouser 32 and secondary or cross-grousers 31 are tapered in a direction radially outwardly from the shoe to facilitate penetration during operation of the cushioned track. In addition, the primary grouser is preferably slightly higher than the secondary grouser (FIG. 4) to assure that the secondary grouser will not unduly interfere with the normal forward and reverse movement of the cushioned track which is primarily occasioned by the primary grousers. Secondary grouser 31 may be disposed perpendicular relative to the primary grouser, or at least approximately so, as illustrated by the approximate seventy degree disposition illustrated in FIG. 3.

Secondary grouser 31 extends at least half-way and preferably substantially fully across the length of flat outer surface portions 36 of the shoe, between primary grouser 32 and lug 35. The substantial height and length of a secondary grouser provides a substantial broadside area or surface area means for preventing the cushioned track and attached vehicle from slipping sideways. As mentioned above, the illustrated primary and secondary grouser combination is particularly useful on side hill earth working operations wherein the footing is somewhat unstable.

An absence of secondary grousers 31 might result in inducing the cushioned track vehicle to skate sideways down the side of a hill on the tips of primary grousers 32. A conventional track-type vehicle does not normally face such a problem due to the larger number of

track shoes which constantly remain in contact with the ground. Likewise, conventional rubber tired vehicles exhibit substantially large side areas on the treads thereof to resist lateral movement. Although a cross-grouser is positioned adjacent to a respective width-wise end of track shoe 23 in FIG. 2, in certain application only one such cross-grouser need be employed.

FIGS. 5 and 6 illustrate another embodiment of this invention wherein structures corresponding to those illustrated in FIGS. 1-4 are depicted by like numerals, but with the latter numerals each being accompanied by an *a*. A like numbering procedure is used for the further described embodiments of FIGS. 7-15, but with the numerals appearing therein being accompanied by successive lower case letters *b* through *g*.

In the FIGS. 5 and 6 embodiment, two aligned bolt means 29*a* attach a support means or plate 30*a* to each track shoe 23*a* and an underlying link 25*a*. A cross grouser 31*a* is disposed perpendicularly relative to primary grouser 32*a* and in parallel relationship to an imaginary line connecting aligned bolt means 29*a*. As illustrated in FIG. 5, such cross-grouser may thus be placed closely adjacent to a free edge of the track shoe or may be reversed thereon to place the cross-grouser substantially inboard thereof.

The FIGS. 7 and 8 embodiment comprises a support means or plate 30*b* attached to a track shoe 23*b* and an underlying link 25*b* by means of three bolt means 29*b*. Laterally spaced and parallel cross-grousers 31*b* and 31*b'* are secured to opposite ends of the plate and disposed perpendicularly relative to primary grouser 32*b*.

The FIGS. 9 and 10 embodiment discloses a cross grouser 31*c* attached to conically shaped and spaced support 30*c*. The support means are in turn attached directly to a flat portion 36*c* of track shoe 23*c* by means of rivets 29*c* or the like. Links 25*c* may be independently secured to the underside of the track shoe by bolts or other suitable fastening means.

FIG. 11 illustrates a variation of the FIGS. 9 and 10 embodiment wherein bolts 29*d* are releasably attached to conically shaped supports 30*c* in lieu of the rivets 29*c*.

FIGS. 12 and 13 illustrate an embodiment wherein a support means or flange 30*e*, formed integrally with cross-grouser 31*e*, is attached to the underside of flat surface portion 36*e* of track shoe 23*e* by bolt means 29*e*. The cross-grouser is disposed in perpendicular relationship relative to primary grouser 32*e* and extends fully across surface portion 36*e*. A link 25*e* may be suitably attached to each of the track shoes by suitable bolts or the like (not shown).

FIG. 14 illustrates a support means 30*f* attached to flat surface portion 36*f* of a track shoe 23*f* by suitable inertia welding techniques or the like. A cross-grouser 31*f* is disposed in perpendicular relationship relative to primary grouser 32*f*. The cross-grouser is intersected by an integrally formed third grouser 31*f'*, disposed in parallel relationship with respect to grouser 32*f* at right angles relative to the cross-grouser. The cross-shaped grouser arrangement 31*f*-31*f'* presents a substantial side area to resist lateral movement of the cushioned track regardless of the degree of rotation afforded to the one-piece grouser unit during securance thereof to the track shoe by weld means.

The FIG. 15 embodiment comprises two ninety degree angles welded together at their corners and further welded at their bottom support portions to surface 36g of track shoe 23g. The cross-grouser thus comprises the two substantially aligned portions 31g whereas a third grouser, disposed perpendicularly relative to the cross-grouser, comprises aligned angle portions 31g'.

What is claimed is:

1. A cushioned track comprising
 an annular resilient spacer means mounted for rotation about a central axis thereof, and
 an endless track assembly mounted separately around said spacer means, said track assembly comprising
 a plurality of closely coupled ground-engaging shoes circumferentially surrounding said spacer means and
 an annular articulated link assembly positioned on each side of said spacer means and connected to said shoes to closely couple them together, each of said link assemblies comprising a plurality of links and
 pivot means pivotally connecting each circumferentially adjacent pair of links together,
 at least some of said shoes having at least one primary grouser secured to outer surface portions thereof to extend radially outwardly therefrom and laterally in the direction of said central axis substantially fully across the width of said shoe,
 at least one removable secondary grouser secured to each shoe having a primary grouser secured thereto, said secondary grouser positioned adjacent to at least one lateral end of said shoe and on said shoe to extend radially outwardly therefrom and approximately perpendicular relative to a respective primary grouser to define substantial surface area means on said secondary grouser extending at least one-half of the distance across the circumferential length of a respective shoe, for resisting lateral movement of said cushioned track in the direction of its central axis during rotation and operation thereof, and
 common bolt means extending through an integral portion of each one of said secondary grousers and a respective shoe releasably attaching such secondary grouser and shoe to a respective link.

2. The invention of claim 1 wherein said pivot means comprises a pin pivotally connecting each adjacent pair of said links together, the longitudinal axis of each pin is positioned substantially parallel relative to said central axis and further positioned substantially intermediate a pair of adjacent shoes and further comprising curved and complementary lug means formed on each length-wise end of each shoe to be at least substantially

parallel with respect to said central axis and positioned thereon to continuously and completely overlap a lug means of an adjacent shoe whereby the entire periphery of said spacer means is completely masked during rotation thereof.

3. The invention of claim 1 wherein said shoes have widths defining outboard portions extending a substantially equal lateral distance beyond a respective one of the side walls of said spacer means, each of said link assemblies connected to a respective one of said shoe's outboard portions closely adjacent to a respective one of said side portions of said spacer means and wherein inner surface portions of each of said shoes are substantially flat and uninterrupted and only one primary grouser is secured to each shoe and positioned radially outwardly from and closely adjacent to the pivot means for each connected, adjacent pair of links.

4. The invention of claim 1 wherein said primary grouser is at least slightly higher in a radial outward direction than said secondary grouser.

5. The invention of claim 1 wherein only one of said primary grousers and only one of said secondary grousers are secured to each of said shoes.

6. The invention of claim 1 wherein only one of said primary grousers and only two of said secondary grousers are secured to each shoe, each secondary grouser of each pair of secondary grousers positioned adjacent to a respective width-wise end of each shoe.

7. The invention of claim 1 further comprising support means and wherein said bolt means attaches said support means to a respective one of said shoes, said secondary grouser formed as an integral part of said support means.

8. The invention of claim 7 wherein said bolt means secures said support means and one of said links to a respective shoe.

9. The invention of claim 7 wherein said securing means secures said support means only to a respective shoe.

10. The invention of claim 7 wherein said securing means comprises three of said bolt means disposed in triangular relationship with respect to each other.

11. The invention of claim 7 wherein outer surface portions of said shoe are flat and said support means comprises a flat plate portion abutting and secured to said outer surface portions.

12. The invention of claim 11 wherein said plate portion is triangular and a bolt means is located at each corner of said plate portion for securing said plate portion and one of said links to a respective shoe.

13. The invention of claim 11 wherein two aligned bolt means are disposed substantially perpendicular relative to said primary grouser and secure said plate portion and one of said links to a respective shoe.

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