Dec. 12, 1944. J. A. LAW 2,364,857

CRAWLER TRACK

Filed March 1, 1943 2 Sheets-Sheet 1

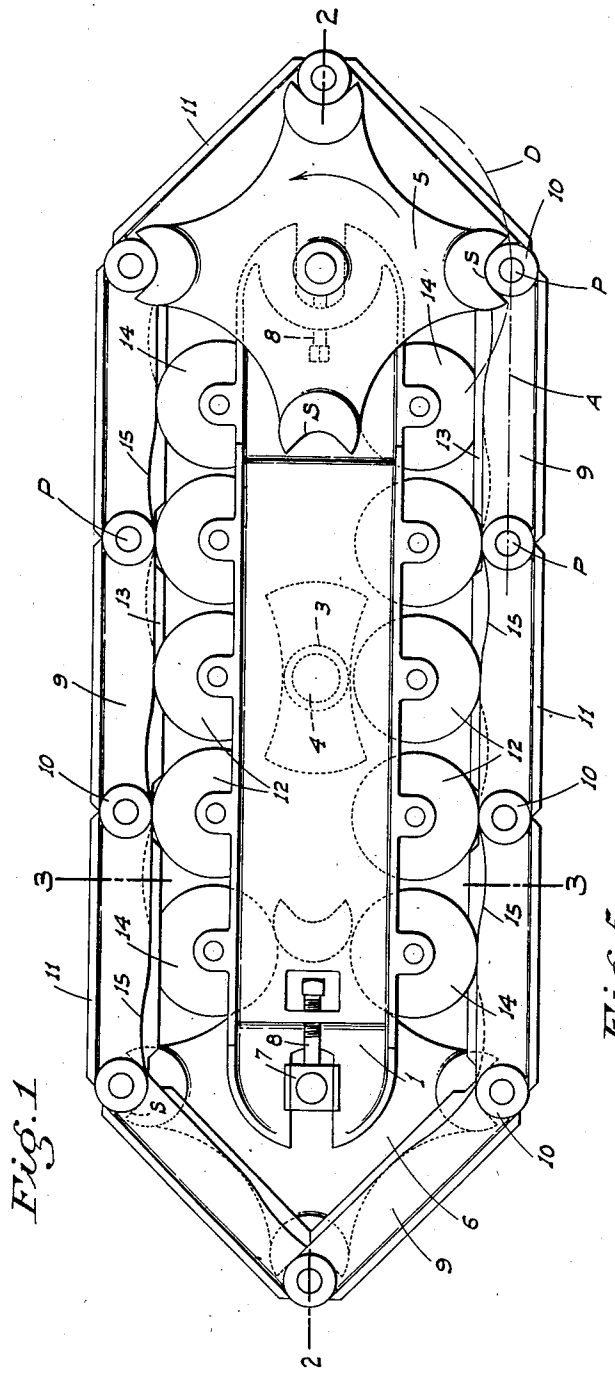


Fig. 1

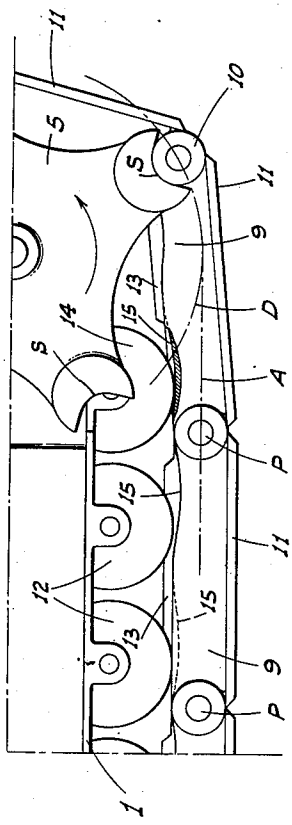


Fig. 5

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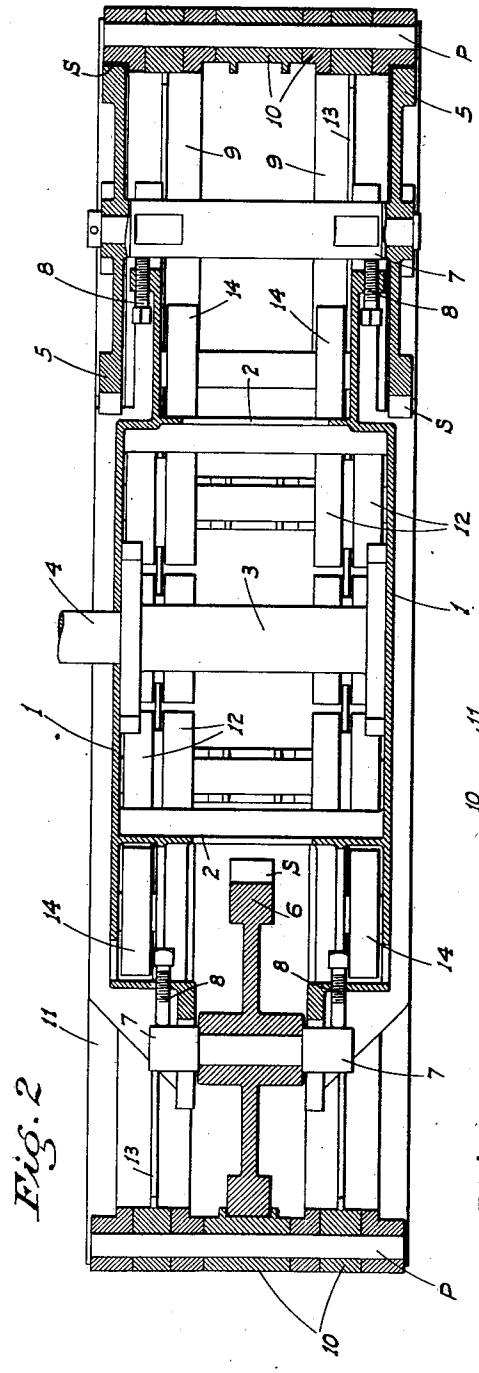


Fig. 2

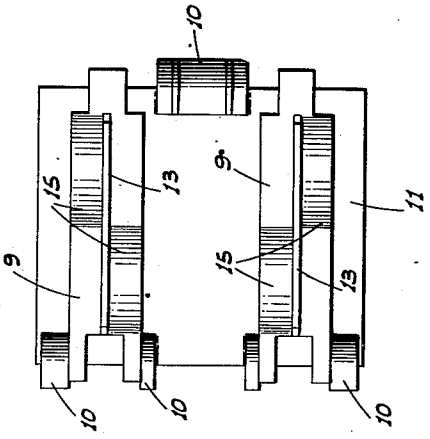


Fig. 4

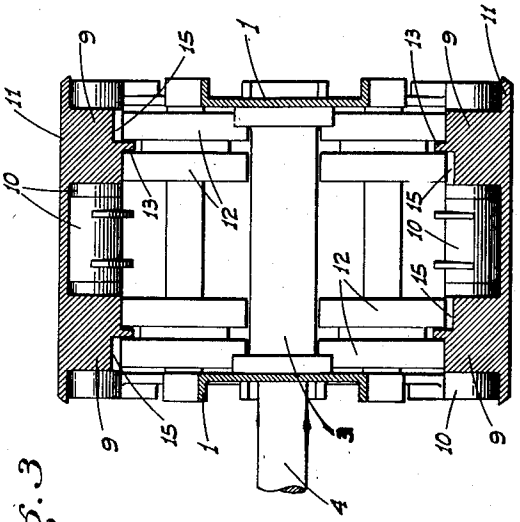


Fig. 3

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UNITED STATES PATENT OFFICE

2,364,857

CRAWLER TRACK

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11 Claims. (Cl. 305—9)

This invention relates to endless or crawler track units, either of the self-powered or idler type.

In units of this character it is desirable that the shoes of the track links shall have a maximum ground engaging length between the end sprockets or the like, and that the shoe shall follow a definite straight path between their limits of ground engagement in order to travel smoothly, lessen vibration and avoid the formation of pockets between the track links or their shoes at the ends.

It is also desirable to use the fewest possible links in order to cut down the number of joints and the accompanying number of parts and wearing elements.

However, even with the relatively short links ordinarily used, their mounting is such that as one link starts to climb about a sprocket, said sprocket imparts a downward blow to the adjacent links not yet engaged and climbing. This causes a pounding or binding of the links against the sprocket, with the resultant bumping action and uneven travel and excessive wear. This is especially evident at the rear end of the track.

With the above facts in mind the objects of my invention are to provide a crawler track unit which has a minimum of links; one in which each link is well supported while in ground engagement, so as to be very rigid and stable and thus making the structure a very effective load carrier; and one in which there is no knocking or pounding action, kinking or oscillation of the links, and the links travel smoothly and through a predetermined fixed path at all times from one end of the unit to the other.

At the same time these advantages are obtained with the use of a short track unit combined with long links, which is favored for certain types of service.

Essentially the invention consists in arranging and supporting the track links in connection with the end sprockets or similar members of the unit in such a manner that the axis of the pivot pins of the links follow a straight line between the sprockets and said line is tangent to the pitch diameter of the sprockets for the full distance between the points of tangency.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a side elevation of my improved crawler track unit showing one sprocket and link roller supporting arrangement and with the links symmetrically positioned relative to the sprockets.

Figure 2 is a sectional plan on line 2—2 of Fig. 1.

Figure 3 is a transverse section on the line 3—3 of Fig. 1.

Figure 4 is a plan view of a link detached.

Figure 5 is a fragmentary side elevation of the unit showing a link as initially moving up about the adjacent sprocket wheel.

Referring now more particularly to the characters of reference on the drawings, the crawler track unit in the embodiment here shown, comprises a pair of spaced side frames 1 connected at intervals by cross bars 2 so as to form a rigid structure, and having a central transverse support or bearing member 3 for the mounting axle 4 about which the unit swivels.

Turnably supported by the frames at one end on the outside is a pair of transversely spaced sprocket or track link engaging wheels 5, while a similar single centrally disposed wheel 6 is supported between the frames at the opposite end. The bearing blocks 7 for the wheels are engaged by conventional tightening or take-up devices 8.

If the track structure is driven, the single sprocket wheel would preferably be the drive sprocket at the rear; the dual sprocket wheels being at the front end. This arrangement maintains the track links against possible lateral deflection and binding as they contact the ground, while keeping the wear on the drive sprocket and links to a minimum.

An endless track extends between and about the wheels, said track including relatively long links, each of which comprises transversely spaced rails 9 having cooperating bosses 10 at their ends and preferably flush therewith, and ground engaging shoes 11 rigid with the rails and bosses. The bosses serve as supports for the connecting hinge pins P of the links and also as wheel engaging members, said wheels, having boss engaging seats or recesses S rather than teeth of the normal form. These seats are spaced apart the length of the links, and are of course all disposed so as to travel in circular paths concentric with the axis of rotation of the wheels.

Journaled on the frames 1 are rows of rollers 12, one row for the upper run of the track and the other row for the lower run of the track; the latter being the most important. These rollers are spaced transversely to correspond to the spacing of the link rails 9 and extend along the frames, especially at the bottom, in a sufficient number to provide for the engagement of each link not actually engaged with one of the end wheels, with at least a pair of longitudinally spaced rollers.

In the arrangement here shown each rail is divided by a guide flange 13 into a pair of transversely separated portions, the rollers for the most part being dual and straddling the guide flanges 13 so as to engage the rails on opposite sides of said flange, as shown in Fig. 3, so that each dual roller is always engaged with the flat surface of a rail portion. The endmost rollers 14, however, are single and engage only one rail portion, and as here shown each endmost roller is disposed, at some point in the length of a link back from the lowest point of the adjacent wheel seat S, a distance less than the length of a link. Any location of such rollers which accomplishes the same results, however, may be used.

In order to insure that each link as it approaches a wheel will continue to travel in a straight line until the relatively trailing end of such link (or the leading end of the following link) is engaged by a sprocket seat, or so that the axial line A of the link pins remains tangent to the pitch diameter line D of the wheel, the roller engaging face of each rail portion is formed with a depressed graduated curvature as at 15. This curvature extends from one end for a certain distance along the rail and is plotted by a template to such a length and depth relative to the position of the corresponding end roller 14 and the wheel, as to cause the roller to ride the bottom of the curved rail portion and support the corresponding link as it is being lifted by the wheel until said relatively trailing end of such link passes under the roller and the latter supports the rail of the link beyond to maintain the link pins in such straight path.

By reason of this feature, which is the heart of the invention, the descending boss-engaging element S of a wheel does not contact with a link already tending to lift, as is otherwise the case, and hence a pounding and other objectionable action is eliminated.

A similar link engaging action takes place at the opposite end of the track unit as the links enter and leave the corresponding wheel and assume a straight line position.

It will be noted that the roller engaging curvature 15 of the rails extends along the leading or front half of one rail portion, and along the trailing or back half of the other remaining portion; the remaining roller engaging faces of the rails being flat or straight.

The endmost rollers 14 are disposed in proper transverse planes so as to engage corresponding concavities, such rollers at one end being on the inside and at the other end on the outside. Also, the rollers 14 at the top are disposed in the reverse relation to those at the bottom.

Provision is thus made for properly guiding the links onto or off of the wheels irrespective of the direction of travel of the track, and also supporting the links so that binding strains are taken off the boss engaging elements of the wheels. At the same time the straight track linkage, between the turning points or between the points of tangency of the wheels with the pin axis line A, will always be firmly engaged by one or the other of each roller of the dual sets. This feature of course is most necessary on the lower run of the track, since a certain slack along the upper run in relatively immaterial.

It will be noted that the rollers are spaced apart a distance equal to half the length of a link between pins P, so that each link on the straight-away is engaged by at least two rollers, and it is therefore impossible for the linkage to shift from a straight line position, regardless of inequalities in the surface engaged.

It may also be noted that while I have illustrated and described a certain definite arrangement of wheels, link rails, and rail engaging rollers, such arrangement may obviously be altered considerably as individual installations may justify without departing from the spirit of the invention, which, as stated, is the provision of a means to maintain the link pins in a straight line, the full distance between and tangent to the pitch diameter line of the end wheels about which the linkage travels.

While I have here shown dual-purpose rails having a combination of flat and curved roller engaging faces, it is obvious that a rail arrangement could be provided wherein one rail is utilized solely for engagement by the endmost rollers, and another rail is engaged solely by the intermediate rollers.

It is also possible to use a single dual-purpose rail instead of the two shown.

As previously stated, the sprocket wheels engage the link bosses at the trailing rather than at the leading end of the links. In other words, if the lower run of the track in Fig. 1 is moving toward the right (as indicated by the arrow) the recesses S of wheels 5 engage the outer or trailing end bossses 10 of the links ahead or which are already lifted and passing about the wheels. If, on the other hand, the track is traveling toward the left, then the central wheel 6 engages the central bosses 10 of the links, which are then at the trailing end of the links. In either case, the result is that once a link boss becomes so engaged, there is and can be no turning of the boss in its wheel-recess, as the sprocket rotates and drives the track. Friction and wear are thus avoided.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. An endless track structure including a supporting frame, rotary members turnably mounted on the frame at its ends, an endless track unit extending about and between the members and comprising a plurality of individual links and pivot pins connecting the links at adjacent ends for relative flexing in a vertical plane, the members including elements engaging the links passing about said members adjacent the link pins and moving in circular paths concentric with the axes of rotation of the members, the links being relatively long and each including a longitudinal rail unit projecting radially inward, and means engaging the rails of the links of the lower run of the track to hold the same against upward deflection from a predetermined path; said means and the rails being arranged to cause the link pins to travel along a straight line tangent to the circular paths of

the members for the full distance between the points of tangency and supporting a link during a predetermined portion of its upward movement about one of the members after the relatively leading end of such link has been engaged by an element of said one member at the lowest point of its movement along its circular path.

2. An endless track structure including a supporting frame, wheels turnably mounted on the frame at its ends, an endless track unit extending about and between the wheels and comprising a plurality of links, cooperating bosses at the ends of the links and pivot pins connecting the bosses and a longitudinal full-length rail unit on each link projecting radially inward, the wheels including boss engaging elements movable through circular paths concentric with the axes of rotation of the wheels, and rollers mounted on the frame and engaging the rails of the lower run of the track; the rollers and rails being arranged relative to the wheels to cause the pins of the links of said lower run to travel in a straight line tangent to the circular paths of the wheel elements for the full distance between the points of tangency.

3. An endless track structure including a supporting frame, wheels turnably mounted on the frame at its ends, an endless track unit extending about and between the wheels and comprising a plurality of relatively long links, cooperating bosses at the ends of the links and pivot pins connecting the bosses and a longitudinal full-length rail unit on each link projecting radially inward, the wheels including boss engaging elements movable through circular paths concentric with the axes of rotation of the wheels, and rollers mounted on the frame and engaging the rails of the lower run of the track and extending in a row for the major distance between the vertical central plane of the wheels; the endmost rollers being disposed a distance from said planes less than the length of a link and the adjacent rollers being located from said planes a distance substantially equal to the length of a link; each rail being formed on the surface engageable by an endmost roller so as to hold the corresponding link, when initially engaged at its relatively leading end and raised at said end by a wheel element upon rotation of the corresponding wheel, in such position that the relatively trailing end of said link remains in a plane on a line tangent to said circular paths until said trailing end reaches the vertical central plane of said wheel.

4. An endless track structure including a supporting frame, wheels turnably mounted on the frame at its ends, an endless track unit extending about and between the wheels and comprising a plurality of relatively long links, cooperating bosses at the ends of the links and pivot pins connecting the bosses and a longitudinal full-length rail on each link projecting radially inward, the wheels including boss engaging elements movable through circular paths concentric with the axes of rotation of the wheels, and means to cause the link-pins along the lower run of the track to follow and remain in a straight line tangent to said circular paths for the full distance between the points of tangency; said means comprising a row of rollers mounted on the frame and engaging the rails, the roller engaging face of each rail for a portion of its length being formed with a concave curvature of predetermined contour.

5. An endless track structure including a supporting frame, wheels turnably mounted on the frame at its ends, an endless track unit extending about and between the wheels and comprising a plurality of relatively long links, cooperating bosses at the ends of the links and pivot pins connecting the bosses and longitudinal full-length rails projecting radially inward, the wheels including boss engaging elements movable through circular paths concentric with the axes of rotation of the wheels, and means to cause the link-pins along the lower run of the track to follow and remain in a straight line tangent to said circular paths for the full distance between the points of tangency; said means comprising a row of rollers mounted on the frame and engaging the rails, the endmost rollers of the row being laterally offset from each other, each rail for a portion of its length from adjacent one end and in the transverse plane of one endmost roller being formed with a concave curvature of predetermined contour, and each rail for a portion of its length from adjacent the opposite end and in the transverse plane of the other endmost roller is formed with a similar concave curvature.

6. A structure as in claim 5 in which the rollers intermediate the endmost rollers are disposed to engage the rails for substantially their full width.

7. A structure as in claim 5, with a longitudinal guide flange projecting radially inward of the track from each rail and laterally separating the curved portions thereof; the intermediate rollers of the row being dual and straddling said flange.

8. In an endless track structure which includes a supporting frame, rotary members turnably mounted on the frame at its ends and an endless track unit extending between and about the members and including a plurality of links pivoted together; a plurality of rollers mounted on the frame and engaging the links of the lower run of the unit, said rollers being so spaced and arranged that each link not engaged by a member is engaged by at least two rollers while a link as initially engaged with a member is also engaged by at least one roller.

9. An endless track structure including a supporting frame, rotary members turnably mounted on the frame at its ends, an endless track unit extending about and between the members and comprising a plurality of individual links and pivot pins connecting the links at adjacent ends for relative flexing in a vertical plane, the members including elements engaging the links passing about said members adjacent the link pins and moving in circular paths concentric with the axes of rotation of the members, the links being relatively long and including a pair of longitudinal full-length rails projecting radially inward from each link and forming continuous rows lengthwise of the track and means to cause the link-pins along the lower run of the track to follow and remain in a straight line tangent to the circular paths of the members for the full distance between the points of tangency; said means comprising a row of roller units engaging the rails of one row, said rails having flat rail engaging faces, and endmost rollers engaging the rails of the other row; each last named rail, for each endmost roller, being formed for a portion of its length from adjacent one end with a concave curvature of predetermined contour for engagement with the corresponding roller.

10. In an endless track structure, a supporting frame, a single endless track unit comprising a

plurality of individual links, transverse bosses on the links at their ends and pivot connections between the bosses, a pair of transversely spaced sprocket wheels mounted on the frame at one end about which the unit passes and engaging the bosses adjacent the side edges of the links, and a single centrally disposed wheel mounted on the frame at its other end and about which the unit passes, and engaging the bosses at a transverse point between the side edges of the links.

11. An endless track structure including a supporting frame, an endless track unit comprising a plurality of links, a pair of transversely spaced end bosses on each link at one end, a centrally disposed boss on each link at the other end and pivot pins through corresponding bosses of adjacent links and connecting the same; a pair of transversely spaced wheels mounted on the frame and having recesses to receive the transversely spaced bosses of the links and about which the track unit passes, and a single wheel mounted on the frame in longitudinally spaced relation to the first named wheels and about which the track unit passes, and having recesses to receive the centrally disposed bosses of the links.

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