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### Wheel assembly for track system, wheel assembly for track system of light-heavy duty vehicle and track system for light-heavy duty vehicle

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#### Abstract

A wheel assembly for a track system of a light heavy-duty vehicle is disclosed. The track system has a frame and an elastomeric endless track. The wheel assembly includes a wheel, an axle and first and second bearings. The wheel defines a wheel cavity in which the axle is receivable. The first and second bearing assemblies are disposed in the wheel cavity. The first bearing assembly is at a first end portion of the axle, and the second bearing assembly is at the second end portion of the axle. The wheel assembly is removable connectable to the frame of the track system. A track system and a light heavy-duty vehicle are also disclosed.

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## Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION (1) The present application claims priority to U.S. Provisional Patent Application No. 63/216,081, filed Jun. 29, 2021 entitled “Wheel Assembly for Track System, Wheel Assembly for Track System of Light-Heavy Duty Vehicle and Track System for Light-Heavy Duty Vehicle”, which is incorporated by reference herein in its entirety.

### TECHNICAL FIELD

(1) The present technology relates to wheel assemblies for track systems, wheel assemblies for track systems of light-heavy duty vehicles, track systems for light heavy-duty vehicles, and light-heavy duty vehicles having the track systems and the wheel assemblies.

### BACKGROUND

(2) Certain vehicles, such as, for example, agricultural vehicles (e.g., harvesters, combines, tractors, etc.) and construction vehicles (e.g., bulldozers, front-end loaders, etc.) are used on ground surfaces that are soft, slippery and/or uneven (e.g., soil, mud, sand, ice, snow, etc.).

(3) Conventionally, such vehicles have had large wheels with tires on them to move the vehicle along the ground surface. Under certain conditions, such tires may have poor traction on some kinds of ground surfaces, and as these vehicles are generally heavy, the tires may compact the ground surface in an undesirable way owing to the weight of the vehicle.

(4) In order to reduce the aforementioned drawbacks, to increase traction and to distribute the weight of the vehicle over a larger area on the ground surface, track systems were developed to be used in place of at least some of the wheels and tires on the vehicles. For example, under certain conditions, track systems enable construction vehicles to be used in wet field conditions as opposed to its wheeled counterpart.

(5) Conventional track systems, especially those used with light and medium duty vehicles, do, however, present some inconveniences. Such vehicles are typically equipped with track systems having a metallic track made of linked metallic segments or an elastomeric track with embedded reinforcing members typically made of steel. Such tracks can have low operational top speeds, can be noisy, can have high vibration and can have a low ride quality.

(6) In addition, conventional track systems are equipped with track wheels that are connected to axles by bushings. This can also contribute to low operational speeds, can be noisy, can have high vibration and can have a low ride quality.

(7) Therefore, there is a desire for a track system and wheel assemblies that could mitigate at least some of the above-mentioned issues.

### SUMMARY

(8) It is therefore an object of the present technology to ameliorate the situation with respect to at least one of the inconveniences present in the prior art.

(9) It is also an object of the present technology to provide an improved track system and support wheel assemblies at least in some instances as compared with some of the prior art.

(10) The present technology relates to wheel assemblies removably connectable to a track system. The wheel assembly has a wheel that defines a cavity in which an axle can be received. Bearings rotationally connect the axle to the wheel.

(11) In the context of the following description, “outwardly” or “outward” means away from a longitudinal center plane of the track system, and “inwardly” or “inward” means toward the longitudinal center plane. In addition, in the context of the following description, “longitudinally” means in a direction parallel to the longitudinal center plane of the track system in a plane parallel

to flat level ground, “laterally” means in a direction perpendicular to the longitudinal center plane in a plane parallel to flat level ground, and “generally vertically” means in a direction contained in the longitudinal center plane along a height direction of the track system generally perpendicular to flat level ground. Also, the term “wheel assemblies” include all the necessary structure (bearing structures, pins, axles and other components) to permit a structure/wheel to pivot/rotate about an axis, as the case may be.

(12) According to an aspect of the present technology, there is provided a wheel, an axle and first and second bearing assemblies. The wheel defines a wheel cavity. The axle is receivable in the wheel cavity, and has a first end portion and a second end portion. The first and second bearing assemblies are configured to rotationally connect the axle to the wheel. The first bearing assembly is disposed in the wheel cavity proximate to the first end portion of the axle, and the second bearing assembly is disposed in the wheel cavity proximate to the second end portion of the axle. The wheel assembly is removably connectable to the frame of the track system.

(13) In some embodiments, the wheel has a first side and a second side opposite to the first side, and a portion of the first end portion of the axle extends from the first side of the wheel and a portion of the second end portion of the axle extends from the second side of the wheel.

(14) In some embodiments, the wheel assembly further includes a first seal and a second seal. The first seal is disposed in the wheel cavity, outwardly to the first bearing assembly and in contact with the wheel and the axle, the first seal is configured to seal one side of the wheel cavity. The second seal is disposed in the wheel cavity, outwardly to the second bearing assembly and in contact with the wheel and the axle, the second seal is configured to seal another side of the wheel cavity.

(15) In some embodiments, the first bearing assembly includes a first seal integrated to the first bearing assembly and the second bearing assembly includes a second seal integrated to the second bearing assembly.

(16) In some embodiments, the wheel assembly further includes a first fastener connectable to the first end portion of the axle and a second fastener connectable to the second end portion of the axle, the first and second fasteners removably connecting the wheel assembly to the frame of the track system.

(17) In some embodiments, the first and second bearing assemblies are connected to the axle by one of an interference fit, a clearance fit, and a transition fit.

(18) In some embodiments, the wheel assembly further includes a first retaining ring connected to the axle proximate to the first end portion, and a second retaining ring connected to the axle proximate to the second end portion.

(19) In some embodiments, the wheel assembly includes the first and second seals, and a laterally inward portion of the first seal contacts a laterally outward portion of the first retaining ring, and a laterally inward portion of the second seal contacts a laterally outward portion of the second retaining ring.

(20) In some embodiments, a laterally inward portion of the first retaining ring contacts a laterally outward portion of the first bearing assembly, and a laterally inward portion of the second retaining ring contacts a laterally outward portion of the second bearing assembly.

(21) In some embodiments, the wheel cavity has an inner cylindrical wall and the first and second bearing assemblies are connected to the inner cylindrical wall by one of an interference fit, a clearance fit, and a transition fit.

(22) In some embodiments, each of the first and second bearing assemblies includes a tapered roller bearing.

(23) In some embodiments, the wheel has a first track-engaging portion, a second track-engaging portion, and a central portion defined between the first and second track engaging portions.

(24) In some embodiments, the elastomeric track is a polymeric elastomeric track.

(25) In some embodiments, the elastomeric track is laterally deformable.

(26) In some embodiments, the elastomeric track is laterally deformable along an entire width of

the elastomeric track.

(27) In some embodiments, wherein the elastomeric track is longitudinally reinforced.

(28) In some embodiments, the elastomeric track is longitudinally reinforced with longitudinal reinforcing members.

(29) In some embodiments, the longitudinally reinforced elastomeric track is non-reinforced laterally.

(30) In some embodiments, the light heavy-duty vehicle is one of a compact track loader and tracked skid-steer.

(31) In some embodiments, the wheel assembly is at least one of a support wheel assembly and an idler wheel assembly.

(32) In another aspect of the present technology, there is provided a track system operatively connectable to a light heavy-duty vehicle. The track system includes a frame, a sprocket wheel assembly, at least one idler wheel assembly, at least one support wheel assembly and an elastomeric endless track. The sprocket wheel assembly and the at least one idler wheel assembly are rotationally connected to the frame. The at least one support wheel assembly is removably connected to the frame. The at least one support wheel assembly includes a wheel defining a wheel cavity, an axle and first and second bearing assemblies. The axle is receivable in the wheel cavity, and has a first end portion and a second end portion. The first and second bearing assemblies are configured to rotationally connect the axle to the wheel. The first bearing assembly is disposed in the wheel cavity proximate to the first end portion of the axle, and the second bearing assembly is disposed in the wheel cavity proximate to the second end portion of the axle. The elastomeric endless track surrounds the frame, the sprocket wheel assembly, the idler wheel assembly and the at least one support wheel assembly.

(33) In some embodiments, the wheel has a first side and a second side opposite to the first side, and a portion of the first end portion of the axle extends from the first side of the wheel and a portion of the second end portion of the axle extends from the second side of the wheel.

(34) In some embodiments, the at least one support wheel assembly further includes a first seal and a second seal. The first seal is disposed in the wheel cavity, outwardly to the first bearing assembly and in contact with the wheel and the axle, the first seal is configured to seal one side of the wheel cavity. The second seal is disposed in the wheel cavity, outwardly to the second bearing assembly and in contact with the wheel and the axle, the second seal is configured to seal another side of the wheel cavity.

(35) In some embodiments, the first bearing assembly includes a first seal integrated to the first bearing assembly and the second bearing assembly includes a second seal integrated to the second bearing assembly.

(36) In some embodiments, the at least one support wheel assembly further includes a first fastener connectable to the first end portion of the axle and a second fastener connectable to the second end portion of the axle, the first and second fasteners removably connecting the wheel assembly to the frame of the track system.

(37) In some embodiments, the first and second bearing assemblies are connected to the axle by one of an interference fit, a clearance fit, and a transition fit.

(38) In some embodiments, the wheel assembly further includes a first retaining ring connected to the axle proximate to the first end portion, and a second retaining ring connected to the axle proximate to the second end portion.

(39) In some embodiments, the wheel assembly includes the first and second seals, and a laterally inward portion of the first seal contacts a laterally outward portion of the first retaining ring, and a laterally inward portion of the second seal contacts a laterally outward portion of the second retaining ring.

(40) In some embodiments, a laterally inward portion of the first retaining ring contacts a laterally outward portion of the first bearing assembly, and a laterally inward portion of the second retaining

ring contacts a laterally outward portion of the second bearing assembly.

(41) In some embodiments, the wheel cavity has an inner cylindrical wall and the first and second bearing assemblies are connected to the inner cylindrical wall by one of an interference fit, a clearance fit, and a transition fit.

(42) In some embodiments, each of the first and second bearing assemblies includes a tapered roller bearing.

(43) In some embodiments, the wheel has a first track-engaging portion, a second track-engaging portion, and a central portion defined between the first and second track engaging portions.

(44) In some embodiments, the elastomeric track is a polymeric elastomeric track.

(45) In some embodiments, the elastomeric track is laterally deformable.

(46) In some embodiments, the elastomeric track is laterally deformable along an entire width of the elastomeric track.

(47) In some embodiments, wherein the elastomeric track is longitudinally reinforced.

(48) In some embodiments, the elastomeric track is longitudinally reinforced with longitudinal reinforcing members.

(49) In some embodiments, the longitudinally reinforced elastomeric track is non-reinforced laterally.

(50) In some embodiments, the support wheel assembly is an idler wheel assembly.

(51) In some embodiments, the at least one idler wheel assembly includes a wheel, an axle and first and second bearing assemblies. The wheel defines a wheel cavity. The axle is receivable in the wheel cavity, and has a first end portion and a second end portion. The first and second bearing assemblies rotationally connect the axle to the wheel. The first bearing assembly is disposed in the wheel cavity proximate to the first end portion of the axle, and the second bearing assembly being disposed in the wheel cavity proximate to the second end portion of the axle.

(52) In another aspect of the present technology, there is provided a light heavy-duty vehicle. The light heavy-duty vehicle includes at least two axles and at least two track systems. Each one of the at least two track systems is operatively connected to one of the at least two axles. Each of the at least two track systems has a frame, a sprocket wheel assembly, at least one idler wheel assembly, at least one support wheel assembly and an elastomeric endless track. The sprocket wheel assembly is rotationally connected to the frame. The at least one idler wheel assembly is rotationally connected to the frame. The at least one support wheel assembly is removably connected to the frame. The at least one support wheel assembly has a wheel, an axle and first and second bearing assemblies. The wheel defines a wheel cavity. The axle is receivable in the wheel cavity, and has a first end portion and a second end portion. The first and second bearing assemblies are configured to rotationally connect the axle to the wheel. The first bearing assembly is disposed in the wheel cavity proximate to the first end portion of the axle, and the second bearing assembly being disposed in the wheel cavity proximate to the second end portion of the axle. The elastomeric endless track surrounding the frame, the sprocket wheel assembly, the idler wheel assembly and the at least one support wheel assembly.

(53) In some embodiments, the wheel has a first side and a second side opposite to the first side, and a portion of the first end portion of the axle extends from the first side of the wheel and a portion of the second end portion of the axle extends from the second side of the wheel.

(54) In some embodiments, the at least one support wheel assembly further includes a first seal and a second seal. The first seal is disposed in the wheel cavity, outwardly to the first bearing assembly and in contact with the wheel and the axle, the first seal is configured to seal one side of the wheel cavity. The second seal is disposed in the wheel cavity, outwardly to the second bearing assembly and in contact with the wheel and the axle, the second seal is configured to seal another side of the wheel cavity.

(55) In some embodiments, the first bearing assembly includes a first seal integrated to the first bearing assembly and the second bearing assembly includes a second seal integrated to the second

bearing assembly.

(56) In some embodiments, the at least one support wheel assembly further includes a first fastener connectable to the first end portion of the axle and a second fastener connectable to the second end portion of the axle, the first and second fasteners removably connecting the wheel assembly to the frame of the track system.

(57) In some embodiments, the first and second bearing assemblies are connected to the axle by one of an interference fit, a clearance fit, and a transition fit.

(58) In some embodiments, the wheel assembly further includes a first retaining ring connected to the axle proximate to the first end portion, and a second retaining ring connected to the axle proximate to the second end portion.

(59) In some embodiments, the wheel assembly includes the first and second seals, and a laterally inward portion of the first seal contacts a laterally outward portion of the first retaining ring, and a laterally inward portion of the second seal contacts a laterally outward portion of the second retaining ring.

(60) In some embodiments, a laterally inward portion of the first retaining ring contacts a laterally outward portion of the first bearing assembly, and a laterally inward portion of the second retaining ring contacts a laterally outward portion of the second bearing assembly.

(61) In some embodiments, the wheel cavity has an inner cylindrical wall and the first and second bearing assemblies are connected to the inner cylindrical wall by one of an interference fit, a clearance fit, and a transition fit.

(62) In some embodiments, each of the first and second bearing assemblies includes a tapered roller bearing.

(63) In some embodiments, the wheel has a first track-engaging portion, a second track-engaging portion, and a central portion defined between the first and second track engaging portions.

(64) In some embodiments, the elastomeric track is a polymeric elastomeric track.

(65) In some embodiments, the elastomeric track is laterally deformable.

(66) In some embodiments, the elastomeric track is laterally deformable along an entire width of the elastomeric track.

(67) In some embodiments, wherein the elastomeric track is longitudinally reinforced.

(68) In some embodiments, the elastomeric track is longitudinally reinforced with longitudinal reinforcing members.

(69) In some embodiments, the longitudinally reinforced elastomeric track is non-reinforced laterally.

(70) In some embodiments, the light heavy-duty vehicle is a compact track loader or a tracked skid-steer.

(71) In some embodiments, the support wheel assembly is an idler wheel assembly.

(72) In some embodiments, the at least one idler wheel assembly includes a wheel, an axle and first and second bearing assemblies. The wheel defines a wheel cavity. The axle is receivable in the wheel cavity, and has a first end portion and a second end portion. The first and second bearing assemblies rotationally connect the axle to the wheel. The first bearing assembly is disposed in the wheel cavity proximate to the first end portion of the axle, and the second bearing assembly being disposed in the wheel cavity proximate to the second end portion of the axle.

(73) Embodiments of the present technology each have at least one of the above-mentioned objects and/or aspects, but do not necessarily have all of them. It should be understood that some aspects of the present technology that have resulted from attempting to attain the above-mentioned object may not satisfy this object and/or may satisfy other objects not specifically recited herein.

(74) Additional and/or alternative features, aspects, and advantages of embodiments of the present technology will become apparent from the following description, the accompanying drawings, and the appended claims.

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# Description

## BRIEF DESCRIPTION OF THE DRAWINGS

- (1) For a better understanding of the present technology, as well as other aspects and further features thereof, reference is made to the following description which is to be used in conjunction with the accompanying drawings, where:
- (2) FIG. 1 is a perspective view taken from a top, front, left side of a compact track loader with track systems according to an embodiment of the present technology;
- (3) FIG. 2 is a perspective view taken from a top, front, right side of the track system of the compact track loader of FIG. 1;
- (4) FIG. 3 is a right side elevation view of the track system of FIG. 2;
- (5) FIG. 4 is a cross-sectional view of the track system of FIG. 2 taken along the lines 4-4 of FIG. 3;
- (6) FIG. 5 is a perspective view taken from a top, front, right side of a support wheel assembly of the track system of FIG. 2; and
- (7) FIG. 6 is a perspective cross-sectional view taken from a top, front, right side of the support wheel assembly of FIG. 5 taken along the plane 6-6 of FIG. 5.

## DETAILED DESCRIPTION

(8) The present detailed description is intended to be a description of illustrative examples of the present technology. This description is not intended to define the scope or set forth the bounds of the present technology. In some cases, what are believed to be helpful examples of modifications or alternatives to apparatus may also be set forth below. This is done merely as an aid to understanding, and, again, not to define the scope or set forth the bounds of the present technology. These modifications are not an exhaustive list, and, as a person skilled in the art would understand, other modifications are likely possible. Further, where this has not been done (i.e., where no examples of modifications have been set forth), it should not be interpreted that no modifications are possible and/or that what is described is the sole manner of implementing or embodying that element of the present technology. As a person skilled in the art would understand, this is likely not the case. In addition, it is to be understood that the apparatus may provide in certain aspects a simple embodiment of the present technology, and that where such is the case it has been presented in this manner as an aid to understanding. As persons skilled in the art would understand, various embodiments of the present technology may be of a greater complexity than what is described herein.

(9) As used herein, the singular form “a,” “an” and “the” include plural referents unless the context clearly dictates otherwise.

(10) The recitation herein of numerical ranges by endpoints is intended to include all numbers subsumed within that range (e.g., a recitation of 1 to 5 includes 1, 1.5, 2, 2.75, 3, 3.80, 4, 4.32, and 5).

(11) The term “about” is used herein explicitly or not, every quantity given herein is meant to refer to the actual given value, and it is also meant to refer to the approximation to such given value that would reasonably be inferred based on the ordinary skill in the art, including equivalents and approximations due to the experimental and/or measurement conditions for such given value. For example, the term “about” in the context of a given value or range refers to a value or range that is within 20%, preferably within 15%, more preferably within 10%, more preferably within 9%, more preferably within 8%, more preferably within 7%, more preferably within 6%, and more preferably within 5% of the given value or range.

(12) The expression “and/or” where used herein is to be taken as specific disclosure of each of the two specified features or components with or without the other. For example, “A and/or B” is to be taken as specific disclosure of each of (i) A, (ii) B and (iii) A and B, just as if each is set out



individually herein.

(13) As used herein, the term “comprise” is used in its non-limiting sense to mean that items following the word are included, but items not specifically mentioned are not excluded.

(14) The present technology relates to a wheel assembly, which is removably connectable to a frame of a track system. The track system has a wheel, an axle and bearing assemblies rotationally connecting the axle to the wheel. The wheel assembly will be described with reference to a compact track loader. However, it is contemplated that the wheel assembly could be used with other types of light heavy-duty vehicle such as, but not limited to, tracked skid-steers, and mini excavators.

(15) Referring to FIG. 1, an embodiment of the compact track loader **50** will be described. The compact track loader **50** has a body **52**. A cab **54** extends upwardly from the body **52**. The compact track loader **50** also has loader arms **55a**, **55b** pivotally and operationally connected to the body **52**. A bucket **56** is connected at a front end of the loader arms **55a**, **55b**. Thus, when the loader arms **55a**, **55b** are operated, the bucket **56** can be moved. The compact track loader **50** also has a right track system **60a** disposed on the right side of the body **52** (only partially shown in FIG. 1), and a left track system **60b** disposed on the left side of the body **52**. The left and right track systems **60a**, **60b** are operationally connected to the compact track loader **50**. The compact track loader **50** is a light heavy-duty vehicle, such that the compact track loader **50** weighs approximately 10,000 lbs. It is contemplated that in other embodiments, the compact track loader **50** could weigh more or less than about 10,000 lbs. For instance, the compact track loader could weigh about 8,000 lbs, about 9,000 lbs, about 11,000 lbs or about 12,000 lbs. As mentioned above, it is understood that the compact track loader **50** could be other types of light heavy-duty vehicles.

(16) With reference to FIGS. 2 to 4, the left and right track systems **60a**, **60b**, which are generally symmetric, will now be described. As the track systems **60a**, **60b** are generally symmetric, only the right track system **60a** will be described in detail.

(17) The track system **60a** has a frame **62** that has an upper frame section **63** and a lower frame section **64** that generally extends in the longitudinal direction. The lower frame section **64** has a top frame portion **65**, a lateral frame portion **66a** extending downwardly to the left from the top frame portion **65** and a lateral frame portion **66b** extending downwardly to the right from the top frame portion **65**.

(18) The track system **60a** also has a sprocket wheel assembly **70** that is rotationally connected to the frame **62**. More precisely, the sprocket wheel assembly is rotationally connected to the upper frame section **63**. The sprocket wheel assembly **70** is also operatively connected to a driving axle (not shown) of the compact track loader **50**. The sprocket wheel assembly **70** defines recesses **74** that are longitudinally spaced on a circumference thereof. As will be described in greater detail below, the recesses **74** are configured to receive lugs **202** of an endless track **200**.

(19) The track system **60a** has a front idler wheel assembly **80** and a rear idler wheel assembly **82**, both of which are rotationally connected to the frame **62**. More precisely, the front and rear idler wheel assemblies are rotationally and removably connected to the lower frame section **64**. It is contemplated that in other embodiments, there could be more or less than two idler wheel assemblies. In the present embodiment, the front and rear idler wheel assemblies **80**, **82** aid in distributing borne load to the ground, and as such are support wheel assemblies **80**, **82**. It is contemplated that in some embodiments, the front and rear idler wheel assemblies could not be support wheel assemblies. The track system **60a** also includes a tensioner **84** operatively connected to the front idler wheel assembly **80**. The tensioner **84** is operable to change the tension in the endless track **200** by moving the front idler wheel assembly **80**. It is contemplated that in some embodiments, the tensioner **84** could be connected to the rear idler wheel assembly **82**. It is also contemplated that in some embodiments, the tensioner **84** could be omitted. The front and rear idler wheel assemblies **80**, **82** will be described in greater detail below.

(20) The track system **60a** also has four support wheel assemblies **100**, **101**, **102**, **103** that are

removably connected to the frame **62**. More precisely, the four support wheel assemblies **100**, **101**, **102** **103** are removably and rotationally connected to the lower frame section **64**. It is contemplated that in some embodiments, there could be more or less than four support wheel assemblies. In the illustrated embodiment, the support wheel assemblies **100**, **101**, **102**, **103** are disposed between the lateral frame portions **66a**, **66b**. The support wheel assemblies **100**, **101**, **102**, **103** will be described in greater detail below.

(21) The track system **60a** also includes the endless track **200**, which surrounds the frame **62**, the sprocket wheel assembly **70**, the front and rear idler wheel assemblies **80**, **82** and the support wheel assemblies **100**, **101**, **102**, **103**. The endless track **200** is an elastomeric track. In the present embodiment, the endless track **200** is a polymeric track. The endless track **200** has an inner surface **210** and an outer surface **220**.

(22) The inner surface **210** of the endless track **200** has a set of lugs **202**. The set of lugs **202** is positioned at a central portion of the inner surface **210**. The lugs **202**, which are longitudinally spaced, are configured to engage with the recesses **74** of the sprocket wheel assembly **70**. The outer surface **220** of the endless track **200** has a tread (not shown) defined thereon. It is contemplated that the tread could vary from one embodiment to another. In some embodiments, the tread could depend on the type of ground surface on which the compact track loader **50** is destined to travel.

(23) The endless track **200** is longitudinally reinforced. More precisely, the endless track is longitudinally reinforced with longitudinal reinforcing members **204**. The longitudinal reinforcing members **204** are longitudinal cables **204**. It is contemplated that the longitudinal reinforcing members **204** could be replaced with other forms of longitudinal reinforcing members without departing from the present technology.

(24) The endless track **200** is laterally deformable. In the present embodiment, the endless track **200** is laterally deformable along an entire width of the endless track **200**. Thus, the endless track **200** is non-reinforced laterally. In some embodiments, the endless track **200** could have reinforcing members that span a portion of the width of the endless track **200**.

(25) Referring to FIGS. **4** to **6**, the front and rear idler wheel assemblies **80**, **82** and the support wheel assemblies **100**, **101**, **102**, **103** will now be described. As the front and rear idler wheel assemblies **80**, **82** and the support wheel assemblies **100**, **101**, **102**, **103** are generally similar, only the support wheel assembly **100** will be described in detail.

(26) The support wheel assembly **100** includes a wheel **120**, an axle **140** and, bearings **160a**, **160b** and seals **170a**, **170b**. As will become apparent from the description below, the support wheel assembly **100** is not unitary with the frame **62**.

(27) The wheel **120**, which has a lateral side **121a** and a lateral side **121b**, has a track-engaging portion **122a** proximate to the lateral side **121a** and a track-engaging portion **122b** proximate to the lateral side **121b**. A central portion **124** is defined between the track-engaging portions **122a**, **122b**. The central portion **124** is configured to receive the lugs **202** thereinbetween, without interference. The track engaging portions **122a**, **122b** engage the inner surface **210** of the endless track **200**. The wheel **120** defines a wheel cavity **126** that extends through an entire width of the wheel **120**. It is contemplated that in some embodiments, the wheel cavity **126** could extend along a portion of the width of the wheel **120**. Thus, the wheel **120** has an inner wall **128**. In the present embodiment, the inner wall **128** is cylindrical. Within the wheel cavity **126**, the wheel **120** has a projecting portion **130** that projects radially away the inner wall **128**. The projecting portion **130** is centrally disposed within the wheel cavity **126**, and has lateral abutting surfaces **132a**, **132b**.

(28) The axle **140**, which is receivable in the wheel cavity **126**, has an axle end portion **142a** and an axle end portion **142b**. The axle **140** defines a groove **145a** extending on a whole circumference of the axle **140** at the axle end portion **142a**, and a groove **145b** extending on a whole circumference of the axle **140** at the axle end portion **142b**. As will be described below, the grooves **145a**, **145b** are configured to respectively receive retaining rings **165a**, **165**, therein. In some embodiments, the grooves **145a**, **145b** could be omitted. The axle **140** is removably connected to the frame **62**. More

precisely, as best seen in FIG. 4, the axle end portion **142a** is connected to the lateral frame portion **66a** by a fastener **102a** of the wheel assembly **100**, and the axle end portion **142b** is connected to the lateral frame portion **66b** by a fastener **102b** of the wheel assembly **100**. The axle **140** is sized to be contained within the frame **62**, and extends from the lateral frame portion **66a** to the lateral frame portion **66b**. Thus, when the axle **140** is received in the wheel cavity **126**, a portion of the axle end portion **142a** protrudes from the wheel cavity **126** past the lateral side **121a** (i.e., a portion of the axle end portion **142a** extends beyond the lateral side **121a**), and a portion of the axle end portion **142b** protrudes from the wheel cavity **126** past the lateral side **121b** (i.e., a portion of the axle end portion **142b** extends beyond the lateral side **121b**). The axle **140** is configured such that when the axle **140** is received in the wheel cavity **126**, the axle **140** does not contact the inner wall **128** or the projecting portion **130**.

(29) The axle **140** is rotationally connected to the wheel **120** by the bearing assemblies **160a**, **160b**. The bearing assemblies **160a**, **160b** are disposed in the wheel cavity **126**. The bearing assembly **160a** is disposed at the axle end portion **142a** and abuts the lateral abutting surface **132a**, and the bearing assembly **160b** is disposed at the axle end portion **142b** and abuts the lateral abutting surface **132b**. As will be described in greater detail below, the bearing assemblies **160a**, **160b** abutting the lateral abutting surfaces **132a**, **132b** aid in positioning the bearing assemblies **160a**, **160b** in the wheel cavity **126**. The bearing assemblies **160a**, **160b** are connected to the axle **140** by a sliding fit, and are connected to the inner wall **128** by an interference fit. In some embodiments, the bearing assemblies **160a**, **160b** could be connected to the axle **120** and/or to the inner wall **128** by clearance fits (i.e., sliding fits), interference fits (i.e., press fit) and/or transition fit (i.e., similar fit). Thus, the wheel **120** is free to rotate relative to the axle **140** due to the bearing assemblies **160a**, **160b**. The bearing assemblies **160a**, **160b** can sustain relatively high radial loads. In the present embodiment, the bearing assembly **160a** includes a tapered roller bearing **162a**, and the bearing assembly **160b** includes a tapered roller bearing **162b**. It is contemplated that in some embodiments, other types of bearings could be used such as needle bearings or ball bearings. In some embodiments, the bearing assemblies **160a**, **160b** could include unit bearings.

(30) The wheel assembly **100** also includes the retaining rings **165a**, **165b**. The retaining ring **165a** is configured to be received in the groove **145a**, and the retaining ring **165b** is configured to be received in the groove **145b**. The retaining rings **165a**, **165b** can, respectively, abut the bearing assemblies **160a**, **160b**, such that a laterally inward portion of the retaining ring **165a** can be in contact with a laterally outward portion of the bearing assembly **160a**, and a laterally inward portion of the retaining ring **165b** can be in contact with a laterally outward portion of the bearing assembly **160a**. Thus, the retaining rings **165a**, **165b** can prevent the bearing assemblies **160a**, **160b** from moving axially along the axle **140**. In some embodiments, the retaining rings **165a**, **165b** could be configured to be received in grooves defined in the inner wall **128**. In some embodiments, the retaining rings **165a**, **165b** could be omitted. It is contemplated that in such embodiments, the bearing assemblies **160a**, **160b** could be connected to the axle by an interference fit, such that the bearing assemblies **160a**, **160b** could not move axially.

(31) The wheel assembly **100** also includes the seals **170a**, **170b**. The seal **170a** is disposed in the wheel cavity **126**, laterally outwardly to the bearing assembly **160a** with reference to a longitudinal wheel assembly center plane **105**. The seal **170a** has an inward portion that is in contact with a laterally outward portion of the retaining ring **165a**. In some embodiments where the retaining ring **165a** is omitted, the inward portion of the seal **170a** is in contact with a laterally outward portion of the bearing assembly **160a**. It is also contemplated that in some embodiments, the inward portion of seal **170a** is not in contact with the laterally outward portion of the bearing assembly **160a**. The seal **170a** has a radial inner surface in contact with axle **140** at the axle end portion **142a** and a radial outer surface in contact with the inner wall **128**. The seal **170a** seals one side of the wheel cavity **126**. Similarly, the seal **170b** is disposed in the wheel cavity **126**, laterally outwardly to the bearing assembly **160b** with reference to the longitudinal wheel assembly center plane **105**. The

seal **170b** has an inward portion that is in contact with a laterally outward portion of the retaining ring **165b**. In some embodiments, where the retaining ring **165b** is omitted, the inward portion of the seal **170b** is in contact with a laterally outward portion of the bearing assembly **160b**. It is also contemplated that in some embodiments, the inward portion of seal **170b** is not in contact with the laterally outward portion of the bearing assembly **160b**. The seal **170b** has a radial inner surface in contact with axle **140** at the axle end portion **142b** and a radial outer surface in contact with the inner wall **128**. The seal **170b** seals the other side of the wheel cavity **126**. The seals **170a**, **170b** can prevent dust or dirt from getting into the bearing assemblies **160a**, **160b**, thereby protecting the bearings assemblies **160a**, **160b**. It is contemplated that in some embodiments, the seals **170a**, **170b** could be omitted. It is contemplated that in some embodiments, the seal **170a** could be integrated to the bearing assembly **160a** and the seal **170b** could be integrated to the bearing assembly **160b** to prevent dust and debris from entering the bearing assemblies **160a**, **160b**. In some embodiments, the seals **170a**, **170b** are integrated to the bearing assemblies **160a**, **160b** such that the bearing assemblies **160a**, **160b** each have two seals disposed on either side of rolling elements, thereby sealing the bearing assemblies **160a**, **160b**.

(32) A method of assembling the support wheel assembly **100** and connecting and removing the support wheel assembly **100** to and from the frame **62** will now be described.

(33) First, the support wheel assembly **100** is assembled. The axle **140** is received in the wheel cavity **126**. Then, the bearings **160a**, **160b** are inserted in the wheel cavity **126** until the bearings **160a**, **160b** respectively abut the lateral abutting surfaces **132a**, **132b**. Then, the retaining rings **165a**, **165b** are inserted in the wheel cavity **126** until the retaining rings **165a**, **165b** are respectively received in the grooves **145a**, **145b**. Thus, the bearing assemblies **160a**, **160b** are substantially axially fixed relative to the axle **140**. Then, the seals **170a**, **170b** are inserted in the wheel cavity such that the seals **170a**, **170b** seal the wheel cavity **126**. It is understood that the order of the assembly could change.

(34) The support wheel assembly **100** is then disposed within the frame **62**, between the lateral frame portions **66a**, **66b**.

(35) The support wheel assembly **100** is then connected to the frame **62**. More precisely, the fastener **102a** is received through an aperture (not shown) defined on the lateral frame portion **66a** of the frame **62**, and is fastened to the axle end portion **142a**. Similarly, the fastener **102b** is received through an aperture (not shown) defined on the lateral frame portion **66b** of the frame **62**, and is fastened to the axle end portion **142b**, thereby fixing the axle **140** to the frame **62**.

(36) To remove the support wheel assembly **100** from the frame **62**, the fasteners **102a**, **102b** are unfastened, thereby allowing quick removal of the support wheel assembly **100**.

(37) Now describing the present technology in operation, when the sprocket wheel assembly **70** rotates, driven by the driving axle, the sprocket wheel assembly **70** engages with the lugs **202** to drive the endless track **200**, and thus the track system **60a**. When the endless track **200** is driven, the front and rear idler wheel assemblies **80**, **82** and the support wheel assemblies **100**, **101**, **102**, **103**, which engage the inner surface **210** of the endless track **200**, rotate. As the axle **140** of the front and rear idler wheel assemblies **80**, **82** and the support wheel assemblies **100**, **101**, **102**, **103** are fixed to the frame **62**, the wheels **120** of the front and rear idler wheel assemblies **80**, **82** and the support wheel assemblies **100**, **101**, **102**, **103** rotate relative to their respective axles **140**.

(38) The bearing assemblies **160a**, **160b**, by reducing friction between moving parts (i.e., between wheel **120** and axle **140**), also reduce the level of noise, the level of vibration and the level of heat that are generated. This, in turn, can enhance ride quality of the compact track loader **50** and can enable the compact track loader **50** to be operated at higher top speeds.

(39) As previously mentioned, the presence of laterally reinforcing members in conventional track systems can pose a limit to the operational top speed of its vehicle. According to the present technology, however, as the endless track **200** is made from an elastomeric material free of lateral reinforcing members, the endless track **200** is less likely to vibrate at higher speeds. Thus, the

endless track **200** can also enhance ride quality and enable the compact track loader **50** to be operated at higher speeds.

(40) Thus, the present technology can enable the compact track loader **50** to reach higher top speeds while maintaining and/or improving ride quality and durability of the track systems **60a**, **60b**. In some embodiments, the present technology could improve a top speed of the compact track loader **50** by a factor of 2, 1.8, or 1.5.

(41) The various components of the track systems **60a**, **60b** are made of conventional materials (e.g., metals and metal alloys in most cases, such as steel) via conventional manufacturing processes (e.g., casting, molding, etc.). The present technology does not require any specific materials nor methods of manufacture. The present technology merely requires that each component be suitable for the purpose for which it is intended and the use to which it is to be put. Any material(s) or method(s) of manufacture which produce such components may be used in the present technology.

(42) Modifications and improvements to the above-described embodiments of the present technology may become apparent to those skilled in the art. The foregoing description is intended to be exemplary rather than limiting.

## Claims

1. A wheel assembly for a track system of a light heavy-duty vehicle, the track system comprising a frame and an elastomeric endless track, and the wheel assembly comprising: a wheel defining a wheel cavity, the wheel having a first side and a second side opposite to the first side; an axle receivable in the wheel cavity, the axle having a first end portion and a second end portion; wherein a portion of the first end portion of the axle extends from the first side of the wheel and a portion of the second end portion of the axle extends from the second side of the wheel; a first bearing assembly and a second bearing assembly, the first and second bearing assemblies configured to rotationally connect the axle to the wheel, the first bearing assembly being disposed in the wheel cavity proximate to the first end portion of the axle; and the second bearing assembly being disposed in the wheel cavity proximate to the second end portion of the axle; and the wheel assembly being removably connectable to the frame of the track system.
2. The wheel assembly of claim 1, further comprising: a first seal disposed in the wheel cavity, outwardly to the first bearing assembly and in contact with the wheel and the axle, the first seal being configured to seal one side of the wheel cavity; and a second seal disposed in the wheel cavity, outwardly to the second bearing assembly and in contact with the wheel and the axle, the second seal being configured to seal another side of the wheel cavity.
3. The wheel assembly of claim 1, wherein the first bearing assembly includes a first seal integrated to the first bearing assembly and the second bearing assembly includes a second seal integrated to the second bearing assembly.
4. The wheel assembly of claim 1, further comprising a first fastener connectable to the first end portion of the axle and a second fastener connectable to the second end portion of the axle, the first and second fasteners removably connecting the wheel assembly to the frame of the track system.
5. The wheel assembly of claim 1, further comprising a first retaining ring connected to the axle proximate to the first end portion, and a second retaining ring connected to the axle proximate to the second end portion.
6. The wheel assembly of claim 1, wherein each of the first and second bearing assemblies includes a tapered roller bearing.
7. The wheel assembly of claim 1, wherein the wheel has a first track-engaging portion, a second track-engaging portion, and a central portion defined between the first and second track engaging portions.
8. The wheel assembly of claim 1, wherein the wheel assembly is at least one of a support wheel

assembly and an idler wheel assembly.

9. A track system operatively connectable to a light heavy-duty vehicle, the track system comprising: a frame; a sprocket wheel assembly rotationally connected to the frame; at least one idler wheel assembly rotationally connected to the frame; at least one support wheel assembly removably connected to the frame, the at least one support wheel assembly comprising: a wheel defining a wheel cavity, the wheel having a first side and a second side opposite to the first side; an axle receivable in the wheel cavity, the axle having a first end portion and a second end portion; wherein a portion of the first end portion of the axle extends from the first side of the wheel and a portion of the second end portion of the axle extends from the second side of the wheel; a first bearing assembly and a second bearing assembly, the first and second bearing assemblies configured to rotationally connect the axle to the wheel, the first bearing assembly being disposed in the wheel cavity proximate to the first end portion of the axle; and the second bearing assembly being disposed in the wheel cavity proximate to the second end portion of the axle, and an elastomeric endless track surrounding the frame, the sprocket wheel assembly, the at least one idler wheel assembly, and the at least one support wheel assembly.

10. The track system of claim 9, wherein the at least one support wheel assembly further comprises: a first seal disposed in the wheel cavity, outwardly to the first bearing assembly and in contact with the wheel and the axle, the first seal configured to seal one side of the wheel cavity; and a second seal disposed in the wheel cavity, outwardly to the second bearing assembly and in contact with the wheel and the axle, the second seal configured to seal another side of the wheel cavity.

11. The track system of claim 9, wherein the first bearing assembly includes a first seal integrated to the first bearing assembly and the second bearing assembly includes a second seal integrated to the second bearing assembly.

12. The track system of claim 9, wherein the at least one support wheel assembly further comprises a first fastener connectable to the first end portion of the axle and a second fastener connectable to the second end portion of the axle, the first and second fasteners removably connecting the wheel assembly to the frame of the track system.

13. The track system of claim 9, further comprising a first retaining ring connected to the axle proximate to the first end portion, and a second retaining ring connected to the axle proximate to the second end portion.

14. The track system of claim 9, wherein the elastomeric track is laterally deformable.

15. The track system of claim 14, wherein the elastomeric track is longitudinally reinforced, and non-reinforced laterally.

16. The track system of claim 9, wherein the at least one idler wheel assembly comprises: a wheel defining a wheel cavity; an axle receivable in the wheel cavity, the axle having a first end portion and a second end portion; a first bearing assembly and a second bearing assembly, the first and second bearing assemblies configured to rotationally connect the axle to the wheel, the first bearing assembly being disposed in the wheel cavity proximate to the first end portion of the axle, the second bearing assembly being disposed in the wheel cavity proximate to the second end portion of the axle.

17. A light heavy-duty vehicle comprising: at least two axles; at least two track systems, each one of the at least two track systems being operatively connected to one of the at least two axles, and each of the at least two track systems comprising: a frame; a sprocket wheel assembly rotationally connected to the frame; at least one idler wheel assembly rotationally connected to the frame; at least one support wheel assembly removably connected to the frame, the at least one support wheel assembly having: a wheel defining a wheel cavity, the wheel having a first side and a second side opposite to the first side; an axle receivable in the wheel cavity, the axle having a first end portion and a second end portion; wherein a portion of the first end portion of the axle extends from the first side of the wheel and a portion of the second end portion of the axle extends from the second

side of the wheel; a first bearing assembly and a second bearing assembly, the first and second bearing assemblies configured to rotationally connect the axle to the wheel, the first bearing assembly being disposed in the wheel cavity proximate to the first end portion of the axle, the second bearing assembly being disposed in the wheel cavity proximate to the second end portion of the axle; an elastomeric endless track surrounding the frame, the sprocket wheel assembly, the idler wheel assembly and the at least one support wheel assembly.

18. The light heavy-duty vehicle of claim 17, wherein the light heavy-duty vehicle is a compact track loader or a tracked skid-steer.

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