The present invention provides track assemblies and a method that allow bringing the contact patch towards the inside (the outside) of the suspension arm, by providing an asymmetric track assembly, either by lowering at least one inside (outside) support wheel relative to the remaining support wheels, or by using a belt that comprises, transversally, at least one first profile on the outer (inner) side thereof lower than a second profile on an inner side thereof.
TRACK ASSEMBLY FOR AN ALL-TERRAIN VEHICLE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority on Canadian application no. 2,606,039, filed on Oct. 3, 2007. All documents above are herein incorporated by reference with a track assembly for an all-terrain vehicle.

FIELD OF THE INVENTION

[0002] The present invention relates to ATVs. More specifically, the present invention is concerned with a track assembly for an all-terrain vehicle.

BACKGROUND OF THE INVENTION

[0003] As well known in the art, a track system may be installed on a wheeled ATV (or other wheeled recreational, industrial or agricultural vehicles), to provide an—at least partly—temporarily, tracked ATV.

[0004] The resulting contact area between an endless belt of the tracked vehicle and the underlying ground surface, referred to as patch, is larger than the contact area, or patch, of a corresponding wheel of the vehicle when wheeled on the underlying ground surface, thereby increasing flotation of the vehicle, over smooth terrains such as snow for example.

[0005] A drawback is that, generally, this increased contact patch involves an increased area of friction, which needs to be opposed for steering. As a result, it is increasingly harder to rotate the patch around a pivot steering point and steering effort submitted to such a tracked vehicle is higher than to a corresponding wheeled vehicle, i.e. the ATV on its wheels for example.

[0006] Using endless belts having a curved transverse geometry allows reducing this problem by allowing an increased contact surface when needed, while maintaining a reduced contact surface on hard surfaces for example.

[0007] However, there is still a need in the art for a track assembly for an all-terrain vehicle.

SUMMARY OF THE INVENTION

[0008] More specifically, there is provided a vehicle having a main frame and supported on the ground by at least two track assemblies, each track assembly comprising a longitudinal endless belt tensioned around corner wheels and a sprocket wheel, and support wheels provided on a lower run of the longitudinal endless belt, on each side of a suspension arm of the main frame, wherein each track assembly comprises a laterally asymmetric structure comprising at least one of: i) at least one of the support wheels, on one of: i) an inward side and ii) an outward side of the suspension arm, located at a lower position in relation to remaining support wheels; and ii) the belt laterally comprising regions of different profiles.

[0009] There is provided a drive system for a vehicle having a main frame supporting an engine and a body of the vehicle and steering device connected to the main frame, a longitudinal endless belt, disposed on the frame of the drive system and connected to the engine to propel the vehicle, being tensioned around corner wheels and a sprocket wheel, support wheels being provided on a lower run of the longitudinal endless belt, on each side of a suspension arm of the main frame, the drive system comprising a first lateral region and a second lateral region, the lateral regions being defined by at least one of: i) the endless belt laterally comprising regions of different profiles; and ii) at least one of the support wheels, on one of: i) an inward side and ii) an outward side of the suspension arm, being located at a lower position in relation to remaining support wheels.

[0010] There is further provided a track assembly for a wheeled vehicle, comprising a longitudinal endless belt tensioned around corner wheels and a sprocket wheel, and support wheels provided on a lower run of the longitudinal endless belt, on each side of a suspension arm of the main frame, wherein each track assembly comprises a laterally asymmetric structure comprising at least one of: i) at least one of the support wheels, on one of: i) an inward side and ii) an outward side of the suspension arm, located at a lower position in relation to remaining support wheels; and ii) the belt laterally comprising regions of different profiles.

[0011] Other objects, advantages and features of the present invention will become more apparent upon reading of the following non-restrictive description of embodiments thereof, given by way of example only with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] In the appended drawings:

[0013] FIG. 1 is a front left-elevation view a vehicle according to an embodiment of an aspect of the present invention.

[0014] FIG. 2 is a partial top-elevation view a vehicle according to an embodiment of an aspect of the present invention;

[0015] FIG. 3 is a side view of a track assembly according to an embodiment of an aspect of the present invention;

[0016] FIG. 4 is a cross section of the track assembly of FIG. 2;

[0017] FIG. 5 illustrates a belt of a track assembly according to a further embodiment of the present invention;

[0018] FIG. 6 are upper partial perspective views of: a) an asymmetric belt and b) an asymmetric belt having a generally convex transverse profile, for a track assembly according to a further embodiment of the present invention;

[0019] FIG. 7 is a cross section of a belt having a generally convex transverse profile.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0020] As illustrated in FIG. 1, a vehicle 10 according to an embodiment of an aspect of the present invention generally comprises a body 12 with a seat 13 for accommodating a rider (not shown) who uses handlebars 14, for example, to steer the vehicle. The body 12 is supported by track assemblies 16 in the front and track assemblies 18 in the back, in place of front and rear wheels respectively in the case of a wheeled vehicle, symmetrically about a vertical axis 20.

[0021] The track assemblies may be operatively connected to the engine (not shown) to propel the vehicle 10.

[0022] As best seen in FIG. 1, a track assembly typically comprises a longitudinal endless belt 22 tensioned around corner wheels 24, 26 and a sprocket wheel 28. The track assembly is removable connected to a hub 30 by a frame 32; the hub 30 corresponding to the one previously connecting a wheel of the wheeled vehicle and providing rotational motion to that wheel for example.

[0023] In FIG. 3, the hub 30 transfers its rotational motion to the sprocket wheel 28 that turns the track assembly around
the same hub axis 30 and sprocket axis 35 by contact with the endless belt 22. The sprocket 28 and frame 32 are independently rotatable about hub 30.

[0024] Support wheels 34 are provided, on a lower run of the endless belt 22, on each side of a suspension arm 36 of the main frame 32 best seen in FIGS. 2 and 4 for example.

[0025] The endless belt 22 of each track assembly is typically an endless reinforced rubber belt, having a ground engaging surface and an inner surface. The ground-engaging surface may be provided with traction lugs that engage the underlying ground surface, whereas the inner surface is provided with driving lugs that engage the wheels.

[0026] The endless belt 22 may have a generally convex transverse profile, from the outward peripheral edge to the inner peripheral edge thereof, to provide a limited contact surface with the underground when the underground is hard, as known in the art (see FIG. 7).

[0027] When replacing a tire of a vehicle by a track assembly without modification of the geometry of the vehicle, the contact area, now between the endless belt and the underground surface, is generally shifted outward relative to the contact patch previously between the tire and the underground surface. It is found that by lowering an inner support wheel, the contact patch may be repositioned.

[0028] In a first embodiment of the present invention, as illustrated in FIGS. 2 to 4, the contact patch of the track system is shifted laterally in relation to the suspension arm 36, either inwards or outwards, by providing that at least one support wheel 34 be lower that the remaining ones, on the inward side or the outward side of the suspension arm 36 respectively.

[0029] Thus, as illustrated in FIG. 3, inside support wheels 34 may be lowered slightly relative to outside support wheels 34o, so as to shift the contact patch laterally inwards, i.e. away from the outward peripheral edge 50 of the width of the belt 22 (see FIG. 1).

[0030] Providing at least one support wheel lower that the remaining support wheels, on the inside of the main suspension arm, thus allows that the contact patch, provided by this at least one lower support wheel, is positioned at the location it used to be when the vehicle, conceived for tires, was on tires.

[0031] As known in the art, support wheels 34 may further be arranged in tandem in order to alleviate the load on the contacts points created, as tandem 38 shown in FIG. 2, which frame 44 is mounted by pivot 42 to the suspension arm 36 of the main frame 32.

[0032] The frame 44 of the tandem 38 of these inside support wheels 34i, which are thus in the contact patch, being mounted on the pivot 42 (FIG. 2), is able to adapt and conform to the underground terrain.

[0033] In such an arrangement, by providing that at least one lower support wheel is mounted on a secondary frame 44 pivotally connected to the main suspension arm so that the motion of the secondary frame is relatively independent from the rest of the track assembly, the generated contact patch moves as requested by the movement of the vehicle, for instance when the track pivots around a vertical axis for the vehicle being able to turn.

[0034] As shown in FIG. 4, the axle 45 of the tandem 38 with lowered support wheels may be provided with rubber bushings 46, for a soft suspension 44 independent from the main suspension 32, by providing a further cushioning versus shocks, and further improved adaptation to the underground terrain.

[0035] In a second embodiment illustrated for example in FIGS. 5 and 6, the contact patch of the track system is shifted laterally in relation to the suspension arm 36 by providing that the belt 22 comprises, transversally, at least one first profile 22a on the outer side thereof, and a second profile 22b on an inner side thereof. By providing that the second profile 22b on an inner side is higher that the first profile 22a, the contact patch is thus brought towards the inside of the suspension arm 36.

[0036] Therefore, the contact patch of a track system may be shifted laterally in relation to the suspension arm 36, inwards (or outwards), by providing an asymmetric track assembly, either by lowering at least one inside (outside) support wheel relative to the remaining support wheels, or by using a belt that comprises, transversally, at least one first profile on the outer side thereof lower (higher) than a second profile on an inner side thereof.

[0037] As people in the art will appreciate, an asymmetric track according to the present invention may combine at least one inside support wheel lowered relative to the remaining support wheels and a varying-profile belt, as described hereinafore.

[0038] Therefore, the present invention provides track assemblies and a method that allow bringing the contact patch towards the inside of the suspension arm 36, thereby repositioning the normal tire contact patch, i.e. the contact patch of the vehicle when on wheels. As a result, the steering effort of the track system is reduced to a minimum in a range of conditions, including snow, dirt, asphalt, rocks, etc, for example.

[0039] Therefore, according to an aspect of the present invention, there is provided a vehicle comprising at least two asymmetric track assemblies replacing wheels of a wheeled vehicle.

[0040] A suspension as described herein may be applied to a range of wheeled vehicles, such as for example recreational vehicles, ATV, light industrial vehicles, industrial vehicles, agricultural vehicles and military vehicles.

[0041] The present invention allows reducing the steering effort in such vehicles, which geometry of the suspension is specifically designed for wheels, to a minimum in all conditions, snow, dirt, asphalt, rocks, etc.

[0042] Although the present invention has been described hereinafore by way of embodiments thereof, it may be modified, without departing from the nature and teachings of the subject invention as defined in the appended claims.

What is claimed is:

1. A vehicle having a main frame and supported on the ground by at least two track assemblies, each track assembly comprising:

   a longitudinal endless belt tensioned around corner wheels and a sprocket wheel; and

   support wheels provided on a lower run of the longitudinal endless belt, on each side of a suspension arm of the main frame,

   wherein each track assembly comprises a laterally asymmetric structure, said laterally asymmetric structure comprising at least one of:
i) at least one of said support wheels, on one of: i) an inward side and ii) an outward side of the suspension arm, located at a lower position in relation to remaining support wheels; and
ii) said belt laterally comprising regions of different profiles.

2. The vehicle of claim 1, said laterally asymmetric structure comprising at least one of:
   i) at least one support wheel located on an inward side of the suspension arm; and
   ii) a first profile in an inner lateral region of said belt higher than a second profile of an outer lateral region of said belt.

3. The vehicle of claim 1, wherein each track assembly is removably connected to a hub by the main frame, said hub transferring its rotational motion to the sprocket wheel that turns the track assembly around an axis of said hub and a sprocket axis by contact with the endless belt.

4. The vehicle of claim 17 wherein at least two support wheels are arranged in tandem on at least one side of the suspension arm of the main frame.

5. The vehicle of claim 4, wherein said tandem is located at a lower position in relation to the remaining support wheels.

6. The vehicle of claim 5, wherein said tandem is a tandem of inner support wheels.

7. The vehicle of claim 6, wherein a frame of said tandem of inner support wheels is mounted to said main frame by a pivot.

8. The vehicle of claim 7, wherein said tandem of inner support wheels is mounted about said pivot with rubber bushings.

9. The vehicle of claim 1, wherein said endless belt has a generally convex transverse profile, from an outward peripheral edge thereof to an inner peripheral edge thereof.

10. The vehicle of claim 1, selected from the group comprising recreational vehicles, ATV, light industrial vehicles, industrial vehicles, agricultural vehicles and military vehicles.

11. A drive system for a vehicle having a main frame supporting an engine and a body of the vehicle and steering device connected to said main frame, a longitudinal endless belt, disposed on said frame of said drive system and connected to the engine to propel the vehicle, being tensioned around corner wheels and a sprocket wheel, support wheels being provided on a lower run of said longitudinal endless belt, on each side of a suspension arm of the main frame, said drive system comprising a first lateral region and a second lateral region, said lateral regions being defined by at least one of:
   i) said endless belt laterally comprising regions of different profiles; and
   ii) at least one of said support wheels, on one of: i) an inward side and ii) an outward side of the suspension arm, being located at a lower position in relation to remaining support wheels.

12. The drive system of claim 11, wherein said lateral regions are defined by at least one of:
   i) said endless belt laterally comprising regions of different profiles; and
   ii) at least two of the support wheels being located at a lower position in relation to remaining support wheels, said at least two support wheels being mounted in a tandem.

13. The drive system of claim 12, wherein said lateral regions are defined by at least one of:
   i) said endless belt laterally comprising regions of different profiles; and
   ii) at least two of the support wheels being located at a lower position in relation to remaining support wheels, said at least two support wheels being mounted in a tandem having a frame pivotally connected to said main frame.

14. A track assembly for a wheeled vehicle, comprising: a longitudinal endless belt tensioned around corner wheels and a sprocket wheel; and support wheels provided on a lower run of the longitudinal endless belt, on each side of a suspension arm of the main frame, wherein each track assembly comprises a laterally asymmetric structure, said laterally asymmetric structure comprising at least one of:
   i) at least one of said support wheels, on one of: i) an inward side and ii) an outward side of the suspension arm, located at a lower position in relation to remaining support wheels; and
   iv) said belt laterally comprising regions of different profiles.

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