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PEDAL ASSEMBLY FOR HUMAN POWERED VEHICLE

Abstract

A pedal assembly is provided for a human powered vehicle. The pedal assembly includes a pedal axle and a pedal body. The pedal axle has a rotational center axis defining an axial direction. The pedal body has a first shoe-disposing surface and a second shoe-disposing surface opposite to the first shoe-disposing surface. Both of the first shoe-disposing surface and the second shoe-disposing surface are configured so that a plurality of pedal components different from each other are selectively attachable to each of the first shoe-disposing surface and the second shoe-disposing surface. The plurality of pedal components includes at least a cleat coupling unit.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a continuation of U.S. application Ser. No. 18/374,775, filed on Sep. 29, 2023, and claims priority to U.S. application Ser. No. 18/374,775 under 35 U.S.C. § 120. The entire disclosure of U.S. application Ser. No. 18/374,775 is hereby incorporated herein by reference.

BACKGROUND

Technical Field

[0002] This disclosure generally relates to a pedal assembly for a human powered vehicle. More specifically, the present disclosure relates to a pedal assembly that is configured to have at least one pedal component coupled thereto.

Background Information

[0003] Basically, a pedal typically includes a pedal axle and a pedal body. The pedal axle is configured to be attached to a crank of a human-powered vehicle. The pedal body is rotatably supported on the pedal axle. Often, pedals are designed for a specific purpose such as for comfort, recreational biking, off-road biking, road racing, exercising, etc., or designed for a user's preference. Some pedals are provided with a pedal component for keep a rider's foot from slipping off the pedal and/or improve pedaling efficiency. For example, some pedals are provided with a cleat coupling unit that is configured to releasably engage a cleat that is secured to the sole of a user's shoe. Some pedals are provided with a toe-clip. In other pedals, the pedal body is provides with a friction pad and/or spike pins.

SUMMARY

[0004] Generally, the present disclosure is directed to various features of a pedal assembly for a human-powered vehicle. The term “human-powered vehicle” as used herein refers to a vehicle that can be propelled by at least human driving force to produce propulsion, but does not include a vehicle using only a driving power other than human power. In particular, a vehicle solely using an internal combustion engine as a driving power is not included in the human-powered vehicle. The human-powered vehicle is generally assumed to be a compact, light vehicle that sometimes does not require a license for driving on a public road. The number of wheels on the human-powered vehicle is not limited. The human-powered vehicle includes, for example, a monocycle and a vehicle having three or more wheels. The human-powered vehicle includes, for example, various types of bicycles such as a mountain bike, a road bike, a city bike, a cargo bike, and a recumbent bike, and an electric assist bicycle (E-bike).

[0005] In view of the state of the known technology and in accordance with a first aspect of the present disclosure, a pedal assembly is provided for a human powered vehicle. The pedal assembly basically comprises a pedal body and a pedal axle. The pedal axle has a rotational center axis defining an axial direction. The pedal body has a first shoe-disposing surface and a second shoe-disposing surface opposite to the first shoe-disposing surface. Both of the first shoe-disposing surface and the second shoe-disposing surface are configured so that a plurality of pedal components different from each other are selectively attachable to each of the first shoe-disposing surface and the second shoe-disposing surface. The plurality of pedal components includes at least a cleat coupling unit.

[0006] With the pedal assembly according to the first aspect, it is possible to customize the pedal body to a user's preference.

[0007] In accordance with a second aspect of the present disclosure, the pedal assembly according to the first aspect is configured so that the pedal body includes a plurality of fastening holes

extending through the pedal body from the first shoe-disposing surface to the second shoe-disposing surface.

[0008] With the pedal assembly according to the second aspect, the structure for attaching the pedal components to either the first shoe-disposing surface or the second shoe-disposing surface can be simplified.

[0009] In accordance with a third aspect of the present disclosure, the pedal assembly according to the first aspect or the second aspect is configured so that the pedal body includes an inner body portion, an outer body portion, a first body portion extending in the axial direction, a second body portion extending in the axial direction and an intermediate body portion configured to receive the pedal axle and extending in the axial direction. The intermediate body portion is positioned between the outer body portion and the inner body portion and between the first body portion and the second body portion. The first shoe-disposing surface and the second shoe-disposing surface are defined by the outer body portion, the inner body portion, the first body portion, the second body portion and the intermediate body portion.

[0010] With the pedal assembly according to the third aspect, the pedal body can be configured with a sufficient shoe supporting surface for supporting a user's shoe.

[0011] In accordance with a fourth aspect of the present disclosure, the pedal assembly according to the third aspect is configured so that the first body portion and the second body portion are free from a cleat engagement portion.

[0012] With the pedal assembly according to the fourth aspect, the cleat coupling unit can be relatively compact and lightweight.

[0013] In accordance with a fifth aspect of the present disclosure, the pedal assembly according to the third aspect or the fourth aspect is configured so that the outer body portion, the inner body portion, the first body portion, and the intermediate body portion define a first opening. The outer body portion, the inner body portion, the second body portion, and the intermediate body portion define a second opening. The first opening is opposite to the second opening with respect to the intermediate body portion.

[0014] With the pedal assembly according to the fifth aspect, the pedal body can be relatively lightweight.

[0015] In accordance with a sixth aspect of the present disclosure, the pedal assembly according to any one of the third aspect to the fifth aspect is configured so that the intermediate body portion includes the plurality of fastening holes extending through the pedal body from the first shoe-disposing surface to the second shoe-disposing surface.

[0016] With the pedal assembly according to the sixth aspect, the pedal components can be reliably supported on the pedal body.

[0017] In accordance with a seventh aspect of the present disclosure, the pedal assembly according to the sixth aspect is configured so that the plurality of fastening holes includes a pair of first fastening holes on a first side of the intermediate body portion.

[0018] With the pedal assembly according to the seventh aspect, the pedal components can be at least partly positioned on a first side of the intermediate body portion.

[0019] In accordance with an eighth aspect of the present disclosure, the pedal assembly according to the seventh aspect is configured so that the plurality of fastening holes includes a pair of second fastening holes on a second side of the intermediate body portion. The second side is opposite to the first side.

[0020] With the pedal assembly according to the eighth aspect, the pedal components can be at least partly positioned on a second side of the intermediate body portion.

[0021] In accordance with a ninth aspect of the present disclosure, the pedal assembly according to the eighth aspect is configured so that the first fastening holes are spaced apart from each other in the axial direction by a first distance. The second fastening holes are spaced apart from the first fastening holes in a direction perpendicular to the axial direction by a second distance different

from the first distance.

[0022] With the pedal assembly according to the ninth aspect, the pedal components can be securely attached to the pedal body in the axial direction and a direction perpendicular to the axial direction.

[0023] In accordance with a tenth aspect of the present disclosure, the pedal assembly according to the ninth aspect is configured so that the second distance is smaller than the first distance.

[0024] With the pedal assembly according to the tenth aspect, the pedal components can be securely attached to the pedal body near the pedal axle.

[0025] In accordance with an eleventh aspect of the present disclosure, the pedal assembly according to the ninth aspect or the tenth aspect is configured so that the second fastening holes are spaced apart from each other in the axial direction by the first distance.

[0026] With the pedal assembly according to the eleventh aspect, the pedal components can further be securely attached to the pedal body in the axial direction.

[0027] In accordance with a twelfth aspect of the present disclosure, the pedal assembly according to any one of the third aspect to the eleventh aspect is configured so that at least one of the outer body portion, the inner body portion, the first body portion, the second body portion includes at least one third fastening hole formed to the pedal body from the first shoe-disposing surface toward the second shoe-disposing surface.

[0028] With the pedal assembly according to the twelfth aspect, it is possible to attach a pedal component to at least one of the outer body portion, the inner body portion, the first body portion, the second body portion.

[0029] In accordance with a thirteenth aspect of the present disclosure, the pedal assembly according to the twelfth aspect is configured so that the at least one third fastening hole includes a plurality of third fastening holes.

[0030] With the pedal assembly according to the thirteenth aspect, the pedal component can be easily and reliably attached to the pedal body.

[0031] In accordance with a fourteenth aspect of the present disclosure, the pedal assembly according to any one of the third aspect to the thirteenth aspect is configured so that at least one of the outer body portion, the inner body portion, the first body portion and the intermediate body portion includes a first positioning profile disposed on the first shoe-disposing surface and a second positioning profile disposed on the second shoe-disposing surface.

[0032] With the pedal assembly according to the fourteenth aspect, the pedal component can be easily and correctly positioned on the pedal body.

[0033] In accordance with a fifteenth aspect of the present disclosure, the pedal assembly according to the fourteenth aspect is configured so that at least one of the outer body portion, the inner body portion, the second body portion and the intermediate body portion includes a third positioning profile disposed on the first shoe-disposing surface and a fourth positioning profile disposed on the second shoe-disposing surface.

[0034] With the pedal assembly according to the fifteenth aspect, the pedal component can be easily and correctly positioned on the pedal body.

[0035] In accordance with a sixteenth aspect of the present disclosure, the pedal assembly according to any one of the first aspect to the fifteenth aspect further comprises the plurality of pedal components.

[0036] With the pedal assembly according to the sixteenth aspect, the pedal components can be selectively attached to the pedal body as needed and/or desired in accordance with a user's preference.

[0037] In accordance with a seventeenth aspect of the present disclosure, the pedal assembly according to any one of the first aspect to the sixteenth aspect is configured so that the cleat coupling unit includes a first coupling member, a second coupling member and a biasing member, the second coupling member is pivotable between a cleat holding position and a cleat non-holding

position. The biasing member biases the second coupling member towards the cleat holding position.

[0038] With the pedal assembly according to the seventeenth aspect, a cleat can be easily and reliably attached to the pedal body via the cleat coupling unit.

[0039] In accordance with an eighteenth aspect of the present disclosure, the pedal assembly according to the sixteenth aspect is configured so that the plurality of pedal components includes a toe-clip.

[0040] With the pedal assembly according to the eighteenth aspect, a toe-clip can be attached to the pedal body.

[0041] In accordance with a nineteenth aspect of the present disclosure, the pedal assembly according to the sixteenth aspect or the eighteenth aspect is configured so that the plurality of pedal components includes a friction pad.

[0042] With the pedal assembly according to the nineteenth aspect, a friction pad can be attached to the pedal body.

[0043] In accordance with a twentieth aspect of the present disclosure, the pedal assembly according to the nineteenth aspect is configured so that the friction pad includes a first pad part and a second pad part. The second pad part is a separate piece from the first pad part.

[0044] With the pedal assembly according to the twentieth aspect, the friction pad can be easily attached to the pedal body.

[0045] In accordance with a twenty-first aspect of the present disclosure, the pedal assembly according to the sixteenth aspect and any one of the eighteenth aspect to the twentieth aspect is configured so that the plurality of pedal components includes a plurality of spike pins.

[0046] With the pedal assembly according to the twenty-first aspect, it is possible to attach spike pins to the pedal body for improving a grip of the pedal to a sole of a shoe.

[0047] In accordance with a twenty-second aspect of the present disclosure, the pedal assembly according to the twenty-first aspect is configured so that each of the spike pins includes a projection portion and an attachment portion.

[0048] With the pedal assembly according to the twenty-second aspect, the spike pins can be easily attached to the pedal body.

[0049] In accordance with a twenty-third aspect of the present disclosure, the pedal assembly according to the twenty-first aspect or the twenty-second aspect is configured so that each of the spike pins includes a first projection portion, a second projection portion and an attachment portion. The attachment portion has a first axial end portion and a second axial end portion opposite to the first axial end portion. The first projection portion is coupled to the first axial end portion of the attachment portion. The second projection portion is coupled to the second axial end portion of the attachment portion.

[0050] With the pedal assembly according to the twenty-third aspect, the spike pins provide projections on each side of the pedal body.

[0051] In accordance with a twenty-fourth aspect of the present disclosure, the pedal assembly according to the sixteenth aspect and any one of the eighteenth aspect to the twenty-third aspect is configured so that the plurality of pedal components includes at least a pair of the cleat coupling units, a toe-clip, a friction pad and a plurality of spike pins.

[0052] With the pedal assembly according to the twenty-fourth aspect, it is possible to selectively couple one or more of a cleat coupling units, a toe-clip, a friction pad and a plurality of spike pins to the pedal body in accordance with a user's preference.

[0053] Also, other objects, features, aspects and advantages of the disclosed pedal assembly will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses preferred embodiments of the pedal assembly.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0054] Referring now to the attached drawings which form a part of this original disclosure.

[0055] FIG. 1 is a side elevational view of a human-powered vehicle (e.g., a bicycle) equipped a pair of pedal assemblies including a pair of coupling units in accordance with a first embodiment of the present disclosure.

[0056] FIG. 2 is an outline of the human-powered vehicle (e.g., a bicycle) equipped with the pedal assembly illustrated in FIG. 1 as viewed from in front of the human-powered vehicle and along a longitudinal direction to show a center plane vertically bisecting a frame of the human-powered vehicle.

[0057] FIG. 3 is a perspective view of the pedal assembly including a plurality of pedal components such as a cleat coupling unit, a toe-clip, a friction pad and a plurality of spike pins which can be interchanged and selectively attached to the pedal by a dealer and/or user to customize the pedal in accordance with the first embodiment of the present disclosure.

[0058] FIG. 4 is a top plan view of the pedal of the pedal assembly illustrated in FIG. 3 where the adapters have omitted.

[0059] FIG. 5 is a top plan view of the pedal illustrated in FIGS. 3 and 4 where the adapters have been installed.

[0060] FIG. 6 is a perspective view of the pedal assembly illustrated in FIG. 1 where a pair of cleat coupling units have been attached to the pedal, the pedal is coupled to one of the crank arm, and a cleat is coupled to a cycling shoe.

[0061] FIG. 7 is a top plan view of the pedal assembly having the cleat coupling units illustrated in FIG. 6.

[0062] FIG. 8 is a bottom plan view of the pedal assembly illustrated in FIGS. 6 and 7.

[0063] FIG. 9 is a partial cross-sectional view of the pedal assembly illustrated in FIG. 4 as seen along section line 9-9 of FIG. 7.

[0064] FIG. 10 is a partial cross-sectional view of the pedal assembly illustrated in FIG. 4 as seen along section line 10-10 of FIG. 7.

[0065] FIG. 11 is a perspective view of the pedal assembly illustrated in FIGS. 6 to 8 where one of the coupling units is arranged to be attached to the pedal body.

[0066] FIG. 12 is a top side perspective view of the pedal assembly where the toe-clip has been attached to the pedal body illustrated in FIG. 5 by the adapters.

[0067] FIG. 13 is a top plan view of the pedal assembly illustrated in FIG. 12.

[0068] FIG. 14 is a bottom plan view of the pedal assembly illustrated in FIGS. 12 and 13.

[0069] FIG. 15 is an exploded perspective view of the pedal assembly illustrated in FIGS. 12 to 14.

[0070] FIG. 16 is a top side perspective view of the pedal assembly where a friction pad has been attached to the pedal body illustrated in FIG. 5 by the adapters.

[0071] FIG. 17 is a top plan view of the pedal assembly illustrated in FIG. 16.

[0072] FIG. 18 is a bottom plan view of the pedal assembly illustrated in FIGS. 16 and 17.

[0073] FIG. 19 is an exploded perspective view of the pedal assembly illustrated in FIGS. 16 to 18.

[0074] FIG. 20 is a top side perspective view of the pedal assembly where a plurality of spike pins been attached to the pedal body illustrated in FIGS. 4 and 5.

[0075] FIG. 21 is a bottom side perspective view of the pedal assembly having the spike pins attached to the pedal body as illustrated in FIGS. 19 and 20.

[0076] FIG. 22 is a cross-sectional view of the pedal body illustrated in FIGS. 17 and 18 as seen along section line 22-22 of FIG. 20 where the spike pin is shown in elevation.

[0077] FIG. 23 is a cross-sectional view, similar to FIG. 22, of the pedal body but where the spike pin is shown in cross-section.

[0078] FIG. **24** is a cross-sectional view, similar to FIG. **22**, of the pedal body but where a single side spike pin is install and shown in elevation.

[0079] FIG. **25** is a cross-sectional view, similar to FIG. **24**, of the pedal body but where the single side spike pin is shown in cross-section.

DETAILED DESCRIPTION

[0080] Selected embodiments will now be explained with reference to the drawings. It will be apparent to those skilled in the human-powered vehicle field (e.g., the bicycle field) from this disclosure that the following descriptions of the embodiments are provided for illustration only and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

[0081] Referring initially to FIG. **1**, a human-powered vehicle V (e.g., a bicycle) is illustrated that is equipped with a pedal assembly **10** in accordance with a first embodiment. In other words, the pedal assembly **10** is provided for the human-powered vehicle V. For example, the human-powered vehicle V is a bicycle. In the illustrated embodiment, for example, the human-powered vehicle V is an electric assist mountain bike (i.e., an off-road bicycle). Alternatively, the human-powered vehicle V can be a road bicycle, a city bike, a cargo bike, and a recumbent bike, or another type of off-road bicycle such as a cyclocross bicycle. The number of wheels on the human-powered vehicle V is not limited. The human-powered vehicle V includes, for example, a monocycle and a vehicle having three or more wheels. Here, the human-powered vehicle V is a bicycle that at least partially uses human power as a driving power for traveling and includes an electric drive unit assisting the human power. In particular, a vehicle using solely an internal combustion engine as driving power is not included in the human-powered vehicle of this disclosure. More specifically, in the embodiments described below, the human-powered vehicle V is an electric assist bicycle (E-bike).

[0082] As seen in FIG. **1**, the human-powered vehicle V includes a vehicle body VB that is equipped with a plurality of vehicle components. As seen in FIG. **1**, the vehicle body VB has a front frame body FB and a rear frame body RB (a swing arm) swingably mounted to a rear section of the front frame body FB such that the rear frame body RB can pivot with respect to the front frame body FB. A rear wheel RW is mounted to the rear frame body RB and a front wheel FW is mounted to the front frame body FB via a front suspension FS. A bicycle seat or saddle S is adjustably mounted to the front frame body FB by an adjustable seatpost SP. A rear suspension RS is provided between the front frame body FB and the rear frame body RB to control the movement of the rear frame body RB with respect to the front frame body FB. Namely, the rear suspension RS is configured to absorb a shock imparted to the rear wheel RW. The front suspension FS is pivotally mounted to a head tube of the front frame body FB. A handlebar H is mounted to an upper end of a steering column steerer tube of the front suspension FS. The front suspension FS is configured to absorb a shock imparted to the front wheel FW. The front wheel FW is mounted to a lower end of the front suspension FS. The rear wheel RW is mounted to a rear end of the rear frame body RB.

[0083] The human-powered vehicle V further includes a drivetrain DT and a drive unit DU operatively coupled to the drivetrain DT. The drive unit DU is also referred to as an electric assist unit. Here, for example, the drivetrain DT is a chain-drive type that includes a crank C, a front sprocket FSP, a plurality of rear sprockets RSP and a chain CN. The crank C includes a crank axle CA1 and a pair of crank arms CA2. The crank axle CA1 is rotatably supported to the front frame body FB via the electric assist unit DU. The crank arms CA2 are provided on opposite ends of the crank axle CA1.

[0084] A pedal **12A** is rotatably coupled to the distal end of one of the crank arms CA2, and a pedal **12B** is rotatably coupled to the distal end of the other one of the crank arms CA2. The pedal assembly **10** basically comprises the pedals **12A** and **12B**. The drivetrain DT can be selected from any type, and can be a belt-drive type or a shaft-drive type. Here, the human-powered vehicle V further includes a front derailleur FD that is attached to the front frame body FB for shifting the chain CN between the front sprockets FSP, and a rear derailleur RD that is attached to the rear

frame body RB for shifting the chain CN between the rear sprockets RSP. The front derailleur FD and the rear derailleur RD are one type of gear changing device or transmission device for change a gear ratio of the drivetrain DT.

[0085] The front sprocket FSP is provided on the crank C to rotate integrally with the crank axle CA1. The rear sprockets RSP are provided on a hub HR of the rear wheel RW. The chain CN runs around the front sprocket FSP and the rear sprockets RSP. A human driving force is applied to the pedals **12A** and **12B** by a rider or user of the human-powered vehicle V such that the driving force is transmitted via the front sprocket FSP, the chain CN and the rear sprockets RSP to the rear wheel RW.

[0086] The drive unit DU is actuated to assist in propulsion of the human-powered vehicle V in a conventional manner. The drive unit DU is actuated, for example, in accordance with a human driving force applied to the pedals **12A** and **12B**. The drive unit DU includes an electric motor that is operatively coupled to the front sprocket FSP. The drive unit DU is actuated by electrical power that is supplied from a power supply PS.

[0087] Referring to FIG. 2, an outline of the human-powered vehicle V is illustrated as viewed from in front of the human-powered vehicle V and along a longitudinal direction to show a center plane CP vertically bisecting the frame F of the human-powered vehicle V. The center plane CP passes through a center of the frame F in a width direction of the frame F. The center plane CP separates a left side from a right side of the human-powered vehicle V. The following directional terms “front,” “rear,” “forward,” “rearward,” “left,” “right,” “lateral,” “longitudinal”, “upward,” and “downward,” as well as any other similar directional terms, refer to those directions which are determined on the basis of a rider sitting upright on the seat S of the human-powered vehicle V while facing the handlebar H of the human-powered vehicle V.

[0088] Referring back to FIG. 1, in the illustrated embodiment, the pedal **12A** of the pedal assembly **10** is a left pedal. The pedal **12B** of the pedal assembly **10** is a right pedal. Thus, the pedal **12A** is attached to the crank arm CA2 provided on the left side of the human-powered vehicle V, and the pedal **12B** is attached to the crank arm CA2 provided on the right side of the human-powered vehicle V.

[0089] Referring to now FIG. 3 and as described below, the pedal **12A** is configured so that a dealer and/or user can easily customize the pedal **12A**. Thus, the pedal assembly **10** further comprises a plurality of pedal components. More specifically, the pedal **12A** is configured so that the plurality of pedal components can be selectively coupled thereto as needed and/or desired to customize the pedal **12A**. For example, the plurality of pedal components includes at least a cleat coupling unit **14**. The one or two cleat coupling units **14** can be attached to the pedal **12A** to form a step-in pedal. Also, for example, the plurality of pedal components includes a toe-clip **15**. The toe-clip **15** can be attached to the pedal **12A** to form a clip-in pedal. Also, for example, the plurality of pedal components includes a friction pad **16**. The friction pad **16** can be attached to one or both sides of the pedal **12A** to form a flat pedal. Also, for example, the plurality of pedal components includes a plurality of spike pins **17**. The spike pins **17** can be attached to the pedal **12A** to form a spiked flat pedal.

[0090] In the illustrated embodiment, as seen in FIGS. 3, 6, 12, 16 and 20, the plurality of pedal components includes at least a pair of the cleat coupling units **14**, the toe-clip **15**, the friction pad **16** and the plurality of spike pins **17**. For example, as illustrated in FIGS. 6 to 8, the plurality of pedal components includes the cleat coupling unit **14**. For example, as illustrated in FIGS. 12 to 15, the plurality of pedal components includes the toe-clip **15**. Also, for example, as illustrated in FIGS. 16 to 18, the plurality of pedal components includes the friction pad **16** (see FIGS. 11 to 18). Moreover, for example, as illustrated in FIGS. 19 to 25, the plurality of pedal components includes the spike pins **17**.

[0091] While only one of the plurality of pedal components **14**, **15**, **16** and **17** is illustrated as being attached to the pedal **12A** at a time, it will be apparent to those skilled in the art from this disclosure

that two or more of the plurality of pedal components **14**, **15**, **16** and **17** can be simultaneously attached to the pedal **12A**. For example, the cleat coupling unit **14** can be attached to one side of the pedal **12A**, while the toe-clip **15** or the friction pad **16** is attached to the other side of the pedal **12A**. Also, for example, the friction pad **16** and the spike pins **17** can both be attached to one and/or both sides of the pedal **12A**.

[0092] The pedal **12B** is also configured so that a dealer and/or user can easily customize the pedal **12B** in the same manner as the pedal **12A**. More specifically, the pedal **12B** is configured so that a plurality of pedal components can be selectively coupled thereto as needed and/or desired. The pedal **12B** are identical to each other except for as explained below. Thus, the description of the pedal **12A** applies to the pedal **12B** unless stated otherwise. For the sake of brevity, only the pedal **12A** will be described and illustrated in detail herein.

[0093] Here, as illustrated in FIG. **1**, the pedal **12A** and the pedal **12B** are configured as step-in pedals. However, as explained below, the pedal **12A** and the pedal **12B** are modular pedals that can be customized by a dealer or a user to a variety of configurations. In the case where the pedal **12A** and the pedal **12B** are configured as step-in pedals, the pedal assembly **10** comprises a cleat coupling unit **14**. The cleat coupling unit **14** is configured to releasably engage a cleat **18** attached to a bottom of a shoe **S** in a conventional manner such as using a plurality of fasteners (e.g., screws). Here, the pedal **12A** and the pedal **12B** are configured as double-sided step-in pedals. Thus, each of the pedal **12A** and the pedal **12B** includes a pair of the cleat coupling units **14** where the pedal **12A** and the pedal **12B** are configured as double-sided step-in pedals. However, as explained below, the cleat coupling units **14** can be selectively removed from the pedal **12A** and the pedal **12B** as needed and/or desired. The cleat coupling units **14** can be replaced with other pedal components or used in conjunction with one or more pedal components as needed and/or desired.

[0094] Basically, referring to FIGS. **3** to **5**, the pedal **12A** of the pedal assembly **10** comprises a pedal body **20**. The pedal **12A** of the pedal assembly **10** further comprises a pedal axle **22**. The pedal axle **22** has a rotational center axis **RA**. The pedal body **20** is rotatably supported with respect to the pedal axle **22** to rotate around the rotational center axis **RA**. The plurality of pedal components are configured to be selectively attached to the pedal body **20**. For example, as seen in FIGS. **3** to **5**, the plurality of pedal components includes at least the cleat coupling unit **14**. In a first configuration of the pedal **12A**, two of the cleat coupling units **14** are attached to the pedal body **20**. However, it will be apparent from this disclosure that one or both of the cleat coupling units **14** can be detached and replaced with a different pedal component. As explained later, the plurality of pedal components can include one or two of the cleat coupling units **14** (see FIGS. **6** to **8**), the toe-clip **15** (see FIGS. **11** to **15**), one or two the friction pad **16** (see FIGS. **16** to **19**) and one or more of the spike pins **17** (see FIGS. **20** to **25**).

[0095] The pedal axle **22** is a rigid member that rotatably supports the pedal body **20** in a conventional manner. The pedal axle **22** is preferably made of a hard rigid material such as a metallic material or a fiber reinforced material. The pedal axle **22** has an externally threaded section **22a** and a support section **22b**. The externally threaded section **22a** includes a left-hand thread that is configured to be screwed into the crank arm **CA2** on the left side of the human-powered vehicle **V**. The support section **22b** serves to rotatably support the pedal body **20** via one or more bearings. In the case of the pedal axle of the pedal **12A**, the pedal axle has an externally threaded section having a right-hand thread.

[0096] The pedal body **20** is a rigid member that is rotatably supported on the pedal axle **22**. The pedal body **20** is preferably made of a hard rigid material such as a metallic material or a fiber reinforced material. The pedal body **20** has a first shoe-disposing surface **24** and a second shoe-disposing surface **26** opposite to the first shoe-disposing surface **24**. As described below, both of the first shoe-disposing surface **24** and the second shoe-disposing surface **26** are configured so that a plurality of pedal components different from each other are selectively attachable to each of the first shoe-disposing surface **24** and the second shoe-disposing surface **26**. Here, the first shoe-

disposing surface **24** and the second shoe-disposing surface **26** are substantially identical. [0097] Preferably, as seen in FIGS. **4** and **5**, the pedal body **20** includes at least one adapter receiving portion **28**. The pedal assembly **10** further comprises at least one adapter **30**. Basically, the at least one adapter receiving portion **28** is configured to receive the at least one adapter **30** engaging with at least one fastening member **32** so that a plurality of pedal components different from each other can be mounted to the pedal body **20** through the at least one adapter **30**. In other words, the pedal assembly **10** further comprises the at least one adapter **30**. The at least one adapter **30** non-rotatably coupled to the at least one adapter receiving portion **28**. In particular, the at least one adapter receiving portion **28** has a non-circular shape corresponding to an external shape of the at least one adapter **30**. In this way, the at least one adapter **30** is non-rotatably coupled to the at least one adapter receiving portion **28**. Preferably, the non-circular shape includes one of an oval shape, a D shape, a polygon shape and a quadrant shape. In the illustrated embodiment, the non-circular shape of the at least one adapter receiving portion **28** is a D shape, and the non-circular shape of the at least one adapter **30** is a D shape. Moreover, the pedal assembly **10** further comprises the at least one fastening member **32** detachably coupled to the at least one adapter **30**. In this way, the plurality of pedal components are configured to be selectively coupled to the at least one adapter receiving portion **28** of the pedal body **20** using the at least one fastening member **32**.

[0098] Preferably, the at least one adapter receiving portion **28** includes a plurality of adapter receiving portions **28**. Thus, the at least one adapter **30** includes a plurality of adapters **30**. Each of the plurality of adapter receiving portions **28** is configured to receive at least one of the plurality of adapters **30**. Preferably, the adapters **30** are press fitted into the adapter receiving portions **28**. The adapters **30** can be made of the same material as the adapter receiving portions **28**, or can be made of a different material as the adapter receiving portions **28**. In the illustrated embodiment, the at least one adapter receiving portion **28** includes a first adapter receiving portion **28A** and a second adapter receiving portion **28B**. The first adapter receiving portion **28A** is configured to receive at least one first adapter **30A** of the at least one adapter **30**. The second adapter receiving portion **28B** is configured to receive at least one second adapter **30B** of the at least one adapter **30**.

[0099] In the illustrated embodiment, the at least one adapter receiving portion **28** includes a plurality of fastening holes **34**. The plurality of fastening holes **34** extend completely through the pedal body **20** from the first shoe-disposing surface **24** of the pedal body **20** to the second shoe-disposing surface **26** of the pedal body **20**. Each of the plurality of fastening holes **34** is configured to receive an adapter of the at least one adapter **30**. More specifically, in the illustrated embodiment, the first adapter receiving portion **28A** has a pair of first fastening holes **34A** of the plurality of fastening holes **34**. The second adapter receiving portion **28B** has a pair of second fastening holes **34B** of the plurality of fastening holes **34**. Thus, here, the first adapter receiving portion **28A** is configured to receive a pair of the first adapters **30A**, and the second adapter receiving portion **28B** is configured to receive a pair of the second adapters **30B**.

[0100] In the illustrated embodiment, each of the at least one adapter **30** has a first shoe-disposing side opening **36A** configured to receive a first fastening member **32A** of the least one fastening member **32** and a second shoe-disposing side opening **36B** configured to receive a second fastening member **32B** of the least one fastening member **32**. The first shoe-disposing side opening **36A** is positioned at the first shoe-disposing surface **24**. The second shoe-disposing side opening **36B** is positioned at the second shoe-disposing surface **26**.

[0101] As seen in FIGS. **9** and **10**, the first fastening holes **34A** extend completely through the pedal body **20** from the first shoe-disposing surface **24** to the second shoe-disposing surface **26**. The second fastening holes **34B** extend completely through the pedal body **20** from the first shoe-disposing surface **24** to the second shoe-disposing surface **26**. One of the plurality of adapters **30** is disposed in each of the pair of first fastening holes **34A** and the pair of second fastening holes **34B**. Here, the first fastening holes **34A** receive the first adapters **30A**, and the second fastening holes

34B receive the second adapters **30B**.

[0102] In the illustrated embodiment, the at least one fastening member **32** includes the plurality of fastening members **32**. In particular, as mentioned above, the fastening members **32** include the first fastening member **32A** and the second fastening member **32B**. The first fastening member **32A** and the second fastening member **32B** are all identical and can be interchanged. Also, depending on the pedal component being attached to the pedal body **20**, some of the first fastening member **32A** and/or the second fastening member **32B** may not be used.

[0103] Referring to FIGS. **9** and **10**, the plurality of fastening members **32** include a first protrusion **32a1** and a second protrusion **32b1**. The first protrusion **32a1** is configured to restrict movement of the at least one adapter **30** in a first direction **Z1** with respect to the at least one adapter receiving portion **28**. The second protrusion **32b1** is configured to restrict movement of the at least one adapter **30** in a second direction **Z2** with respect to the at least one adapter receiving portion **28**. The second direction **Z2** is different from the first direction **Z1**. Here, the first protrusion **32a1** are provided by the first fastening members **32A** and the second protrusion **32b1** are provided by the second fastening member **32B**. More specifically, the first fastening members **32A** are each screws in which the first protrusion **32a1** corresponds to a head portion of the screw. Likewise, the second fastening member **32B** are each screws in which the second protrusion **32b1** corresponds to a head portion of the screw.

[0104] Referring to FIGS. **9** and **10**, the adapter **30** comprises an adapter body **38**. The adapter body **38** has at least one threaded hole **38a**. The at least one threaded hole **38a** is configured to engage with at least one fastening member **32**. The adapter body **38** has a non-circular shape in a cross-section view. The non-circular shape of the adapter body **38** corresponds to a non-circular shape of the adapter receiving portion **28** of the pedal body **20** of the pedal assembly **10**. Specifically, as seen in FIG. **11**, in the illustrated embodiment, the threaded hole **38a** have a D-shape in a cross-section view, and the fastening holes **34** of the adapter receiving portion **28** also each have a D-shape in a cross-section view.

[0105] In the illustrated embodiment, the pedal assembly **10** comprises the plurality of adapters **30**. Also, the pedal body **20** includes the plurality of fastening holes **34**. Preferably, the plurality of fastening holes **34** extend through the pedal body **20** from the first shoe-disposing surface **24** to the second shoe-disposing surface **26**. The plurality of adapters **30** are disposed inside the plurality of fastening holes **34** so that at least one pedal component can be mounted to the pedal body **20** through the plurality of adapters **30**. The adapter **30** is provided for the pedal assembly **10** that is configured to be used with a human powered vehicle **10**. The adapter **30** is configured to be received in the adapter receiving portion **28** of the pedal body **20** of the pedal assembly **10**.

[0106] Referring back to FIGS. **4** and **5**, the pedal body **20** includes an outer body portion **40**, an inner body portion **41**, a first body portion **42**, a second body portion **43** and an intermediate body portion **44**. The pedal first body portion **42** extends in the axial direction **X1**. The second body portion **43** extends in the axial direction **X1**. The intermediate body portion **44** is configured to receive the pedal axle **22** and extends in the axial direction **X1**. An axial direction **X1** of the pedal **12A** refers to a direction parallel to the rotational center axis **RA**. The outer body portion **40** extends in a longitudinal direction **Y1**. A longitudinal direction **Y1** of the pedal **12A** refers to a direction perpendicular to the rotational center axis **RA**, and parallel to a reference plane **PL** passing through the rotational center axis **RA** and bisecting the pedal body **20**. The inner body portion **41** extends in the longitudinal direction **Y1**. The first body portion **42** extends in the axial direction **X1**. The second body portion extends in the axial direction **X1**. The intermediate body portion **44** is configured to receive the pedal axle **22** and extends in the axial direction **X1**. The intermediate body portion **44** is positioned between the outer body portion **40** and the inner body portion **41** and between the first body portion **42** and the second body portion **43**. Here, the outer body portion **40**, the inner body portion **41**, the first body portion **42**, the second body portion **43** and the intermediate body portion **44** are integrally formed as a one-piece member. Preferably, as in

the illustrated embodiment, the outer body portion **40**, the inner body portion **41**, the first body portion **42** and the second body portion **43** are connected together to form an annular tread cage. The intermediate body portion **44** is connected to the outer body portion **40** and the inner body portion **41** to divide the pedal body **20** into a first body portion and a second body portion.

[0107] As seen in FIGS. **4** and **5**, the first shoe-disposing surface **24** and the second shoe-disposing surface **26** are defined by the outer body portion **40**, the inner body portion **41**, the first body portion **42**, the second body portion **43** and the intermediate body portion **44**. The at least one adapter receiving portion **28** is provided to the intermediate body portion **44**. Preferably, the outer body portion **40**, the inner body portion **41**, the first body portion **42**, and the intermediate body portion **44** define a first opening **46**. Also, preferably, the outer body portion **40**, the inner body portion **41**, the second body portion **43**, and the intermediate body portion **44** define a second opening **48**. The first opening **46** is opposite to the second opening **48** with respect to the intermediate body portion **44**.

[0108] In the illustrated embodiment, the plurality of fastening holes **34** includes a pair of the first fastening holes **34A** on a first side of the intermediate body portion **44**. Also, in the illustrated embodiment, the plurality of fastening holes **34** includes a pair of the second fastening holes **34B** on a second side of the intermediate body portion **44**. The second side is opposite to the first side. The first fastening holes **34A** are spaced apart from each other in the axial direction **X1** by a first distance **D1**. The second fastening holes **34B** are spaced apart from the first fastening holes **34A** in a direction perpendicular to the axial direction **X1** by a second distance **D2** different from the first distance **D1**. In this embodiment, seen in FIGS. **4** and **5**, the second distance **D2** is smaller than the first distance **D1**. The second fastening holes **34B** are spaced apart from each other in the axial direction **X1** by the first distance **D1**.

[0109] As seen in FIGS. **7** and **8**, the cleat coupling units **14** are attached to the first shoe-disposing surface **24** and the second shoe-disposing surface **26** on the intermediate body portion **44**. In particular, the intermediate body portion **44** includes the plurality of fastening holes **34** extending through the pedal body **20** from the first shoe-disposing surface **24** to the second shoe-disposing surface **26**. On the other hand, the first body portion **42** and the second body portion **43** are free from a cleat engagement portion.

[0110] As seen in FIGS. **7** and **8**, at least one of the outer body portion **40**, the inner body portion **41**, the first body portion **32** and the intermediate body portion **44** includes a first positioning profile **51** disposed on the first shoe-disposing surface **24** and a second positioning profile **52** disposed on the second shoe-disposing surface **26**. Here, the intermediate body portion **44** includes the first positioning profile **51** disposed on the first shoe-disposing surface **24**, and the second positioning profile **52** disposed on the second shoe-disposing surface **26**. Preferably, at least one of the outer body portion **40**, the inner body portion **41**, the second body portion **43** and the intermediate body portion **44** includes a third positioning profile **53** disposed on the first shoe-disposing surface **24** and a fourth positioning profile **54** disposed on the second shoe-disposing surface **26**. Here, the intermediate body portion **44** includes the third positioning profile **53** disposed on the first shoe-disposing surface **24**, and the fourth positioning profile **54** disposed on the second shoe-disposing surface **26**.

[0111] The first positioning profile **51** and the third positioning profile **53** are spaced apart in the axial direction **X1** on the intermediate body portion **44** to form a coupling unit receiving space therebetween to receive the cleat coupling unit **14**. The first positioning profile **51** and the third positioning profile **53** are configured to mate with the cleat coupling unit **14** where the cleat coupling unit **14** is attached to the first shoe-disposing surface **24**.

[0112] The second positioning profile **52** and the fourth positioning profile **54** are spaced apart in the axial direction **X1** on the intermediate body portion **44** to form a coupling unit receiving space therebetween to receive the cleat coupling unit **14**. The second positioning profile **52** and the fourth positioning profile **54** are configured to mate with the cleat coupling unit **14** where the cleat

coupling unit **14** is attached to the second shoe-disposing surface **26**.

[0113] As seen in FIGS. **4** and **5**, at least one of the outer body portion **40**, the inner body portion **41**, the first body portion **32**, the second body portion **43** includes at least one third fastening hole **58** formed to the pedal body **20** from the first shoe-disposing surface **24** toward the second shoe-disposing surface **26**. Here, the at least one third fastening hole **58** includes a plurality of third fastening holes **58**. In particular, in the illustrated embodiment, the third fastening holes **58** are formed in the outer body portion **40** and the inner body portion **41**. More specifically, the outer body portion **40** has four of the third fastening holes **58**, and the inner body portion **41** has two of the third fastening holes **58**. Of course, it will be apparent from this disclosure that the third fastening holes **58** can be provided to the first body portion **32**, the second body portion **43**. Moreover, it will be apparent from this disclosure that the third fastening holes **58** can be provided in a different pattern than the illustrated pattern.

[0114] Now, the cleat coupling unit **14** will be described in further detail with reference to FIGS. **7** to **11**. The cleat coupling unit **14** basically includes a first coupling member **60** and a second coupling member **62**. The first coupling member **60** is configured to be attached to the pedal body **20** of the pedal assembly **10**. The second coupling member **62** is coupled to the first coupling member **60**. In particular, the cleat coupling unit **14** further includes a shaft **64**. The second coupling member **62** is pivotally coupled to the first coupling member **60** by the shaft **64**. In particular, the second coupling member **62** is pivotable between a cleat holding position and a cleat non-holding position. Here, the cleat coupling unit **14** further includes a biasing member **66**. The biasing member **66** biases the second coupling member **62** towards the cleat holding position.

[0115] The first coupling member **60** is configured to releasably couple the cleat **18** to the cleat coupling unit **14**. The second coupling member **62** is configured to releasably couple the cleat **18** to the cleat coupling unit **14**. The second coupling member **62** is pivotable between a cleat holding position and a cleat non-holding position.

[0116] The cleat coupling unit **14** further comprises a biasing force adjuster **68** disposed between the biasing member **66** and the second coupling member **62**. The biasing member **66** biases the second coupling member **62** towards the cleat holding position. The biasing force adjuster **68** adjusts the biasing force applied to the second coupling member **62** by the biasing member **66**. The biasing member **66** is disposed on the shaft **64**. In the illustrated embodiment, the biasing member **66** includes a plurality of springs **66A** and **66B**. The springs **66A** and **66B** are operatively disposed between the first coupling member **60** and the second coupling member **62**. Each of the plurality of springs includes a coil portion disposed on the shaft **64**, a first leg portion extending from one end of the coil portion, and a second leg portion extending from the other end of the coil portion. The springs **66A** and **66B** are configured as that the first leg portions contact the first coupling member **60**, while the second leg portions contact the biasing force adjuster **68**.

[0117] The biasing force adjuster **68** basically includes an adjustment screw and an adjustment nut. The adjustment screw has a head portion that is engaged in an opening of the second coupling member **62** and a threaded shaft that is threadedly engaged with the adjustment nut. The second leg portions of the springs **66A** and **66B** contact the adjustment nut. By rotating the adjustment screw, the adjustment nut moves along the threaded shaft of the adjustment screw to either increase or decrease the biasing force applied to the second coupling member **62** by the springs **66A** and **66B**. Since biasing force adjusters are well known in pedals, the biasing force adjuster **68** will not be described in further detail herein.

[0118] In the illustrated embodiment, as seen in FIGS. **7** to **11**, the cleat coupling unit **14** is attached to the pedal body **20** by four of the fasteners **32** (**32A**) that are threaded into four of the adapters **30** (**30A**). In the illustrated embodiment, the cleat coupling unit **14** can be mounted to either the first shoe-disposing surface **24** of the pedal body **20**, or the cleat coupling unit **14**. Moreover, a pair of the cleat coupling units **14** can be attached to the pedal body **20**. More specifically, the first coupling member **60** includes a first pedal mounted portion **71**, a second pedal mounted portion **72**

and a cleat engagement portion **73**. Also, the first coupling member **60** includes an outer portion **74** and an inner portion **75**. Both of the outer portion **74** and the inner portion **72** curve toward each other. In particular, the outer portion **74** includes an outer engagement recess **74a** that is configured to engage with the positioning profile **51** or **52** of the pedal body **20**. The inner portion **75** includes an inner engagement recess **75a** configured to engage with the positioning profile **53** or **54** of the pedal body **20**.

[0119] The cleat engagement portion **73** connects the first pedal mounted portion **76** and the second pedal mounted portion **78**. The cleat engagement portion **73** is configured to engage a front end of the cleat **18**. Specifically, the cleat engagement portion **73** is configured to abut against the cleat **18** to restrict movement of the cleat **18** away from the pedal body **20**, and to restrict forward movement of the cleat **18** with respect to the pedal body **20**.

[0120] The second coupling member **62** is pivotable about the shaft **64**. The second coupling member **62** includes a cleat engagement portion **76**. The cleat engagement portion **76** is configured to engage a rear end of the cleat **18**. Specifically, the cleat engagement portion **76** is configured to abut against the cleat **18** to restrict movement of the cleat **18** away from the pedal body **20**, and to restrict rearward movement of the cleat **18** with respect to the pedal body **20**.

[0121] In the illustrated embodiment, as seen in FIGS. **11** to **15**, the toe clip **15** is attached to the pedal body **20** by two of the fasteners **32** (**32A**) that are threaded into two of the adapters **30** (**30A**). In the illustrated embodiment, the toe clip **15** is mounted to the first shoe-disposing surface **24** of the pedal body **20**. However, the toe clip **15** can alternatively be attached to the second shoe-disposing surface **26** of the pedal body **20** in the same manner. Here, the toe clip **15** includes a cage portion **80** and a mounting portion **82**. Preferably, the cage portion **80** is adjustably attached to the mounting portion **82** to adjust the position of the cage portion **80** relative to the pedal body **20**. For example, the cage portion **80** is attached to the mounting portion **82** by a fastener **84** (e.g., a bolt and a nut). As seen in FIG. **15**, the cage portion **80** is provided with an opening **80a**, and the mounting portion **82** is provided with an elongated slot **82a**. The fastener **84** passes through the opening **80a**, and the elongated slot **82a**. The position of the cage portion **80** relative to the pedal body **20** can be adjusted by sliding the cage portion **80** relative to the mounting portion **82** and then tightening the fastener **84** once the cage portion **80** is in the desired position. As seen in FIG. **14**, optionally, a plate **86** can be attached to the opposite side of the pedal body using the two of the fasteners **32** (**32B**) that are threaded into two of the adapters **30** (**30B**).

[0122] In the illustrated embodiment, as seen in FIGS. **16** to **19**, the friction pad **16** is attached to the pedal body **20** by four of the fasteners **32** (**32A**) that are threaded into four of the adapters **30** (**30A**). In the illustrated embodiment, the friction pad **16** is mounted to the first shoe-disposing surface **24** of the pedal body **20**. However, the friction pad **16** can alternatively be attached to the second shoe-disposing surface **26** of the pedal body **20** in the same manner. Here, the friction pad **16** includes a first pad part **90** and a second pad part **92**. The second pad part **92** is a separate piece from the first pad part **90**. The first pad part **90** is configured to completely cover the first opening **46** in a state where the first pad part **90** is attached to the pedal body **20**. The second pad part **92** is configured to completely cover the second opening **48** in a state where the second pad part **92** is attached to the pedal body **20**.

[0123] The first pad part **90** includes a shoe contact surface **90a** and a pedal body facing surface **90b**. The shoe contact surface **90a** is preferably provided with a plurality of protrusions for improving traction. The pedal body facing surface **90b** is provided with a retaining member **90c** (e.g., a tab) that is configured to engage an opening **42a** in the first body portion **42** of the pedal body **20**. The first pad part **90** is attached to the intermediate body portion **44** by the first fastening members **32A** by the first adapters **30A**. The retaining member **90c** is disposed in the opening **42a** and contacts the first body portion **42** of the pedal body **20** to retain the first pad part **90** to the first body portion **42**. Similarly, the second pad part **92** includes a shoe contact surface **92a** and a pedal body facing surface **92b**. The shoe contact surface **92a** is preferably provided with a plurality of

protrusions for improving traction. The pedal body facing surface **92b** is provided with a retaining member **92c** (e.g., a tab) that is configured to engage an opening **43a** in the second body portion **43** of the pedal body **20**. The second pad part **92** is attached to the intermediate body portion **44** by the first fastening members **32A** by the second adapters **30B**. The retaining member **92c** is disposed in the opening **43a** and contacts the second body portion **43** of the pedal body **20** to retain the first pad part **92** to the second body portion **43**.

[0124] In the illustrated embodiment, as seen in FIGS. **20** to **25**, the spike pins **17** include a plurality of first spike pins **17A** and a plurality of second spike pins **17B**. The first spike pins **17A** are double-sided spike pins that project from both sides of the pedal body **20**. The second spike pins **17B** are single-sided spike pins that project from only one side of the pedal body **20**. The first spike pins **17A** and the second spike pins **17B** are selectively attached to the pedal body **20** via the third holes **58**. While FIGS. **20** and **21** only show the first spike pins **17A**, the first spike pins **17A** and the second spike pins **17B** can be used together if needed and/or desired. However, typically, only the first spike pins **17A** or only the second spike pins **17B** are used with the pedal **12A**.

[0125] Preferably, each of the spike pins **17** includes a projection portion **90** and an attachment portion **92**. More preferably, in the case of the first spike pins **17A**, each of the spike pins **17A** includes a first projection portion **90a**, a second projection portion **90b** and the attachment portion **92**. On the other hand, in the case of the second spike pins **17B**, each of the second spike pins **17B** includes a first projection portion **90a** and the attachment portion **92**. Thus, the second spike pins **17B** do not have a second projection portion **90b**.

[0126] The attachment portion **92** has a first axial end portion **92a** and a second axial end portion **92b** opposite to the first axial end portion **92a**. The first projection portion **90a** is coupled to the first axial end portion **92a** of the attachment portion **92**. The second projection portion **90b** is coupled to the second axial end portion **92b** of the attachment portion **92**. In the case of the first spike pins **17A**, the first axial end portion **92a** and the second axial end portion **92b** are nuts that are threaded to the projection portion **90**. Also, in the case of the first spike pins **17A**, the attachment portion **92** includes a spacing member **92c** (e.g., a sleeve) that is disposed over a center section of the projection portion **90**. In the case of the second spike pins **17B**, the first axial end portion **92a** is a nut that is threaded to the projection portion **90**, while the second axial end portion **92b** is a head portion that is integrally formed with the projection portion **90**.

[0127] The first spike pins **17A** and the second spike pins **17B** are attached to the pedal body **20** via the third holes **58**. More specifically, each of the third holes **58** includes a first hole section **58a**, a second hole section **58b** and a third hole section **58c**. The first hole section **58a** is configured to receive the first axial end portion **92a** (e.g., a nut) in a state where the spike pin **17** is disposed in one of the third holes **58**. The third hole section **58a** is configured to receive the second axial end portion **92b** (e.g., a nut) in a state where the spike pin **17** is disposed in one of the third holes **58**. In the case of the first spike pins **17A**, the third hole section **58a** also receives the spacing member **92c** (e.g., a sleeve).

[0128] The first hole section **58a** has a hexagonal transverse cross section that is configured to engage the first axial end portion **92a** (e.g., a nut) so that the first axial end portion **92a** does not rotate in the third hole **58** in a state where the spike pin **17** is disposed in the first hole section **58a** of one of the third holes **58**. . . . On the other hand, the third hole section **58a** has a cylindrical transverse cross section that is configured to permit rotation of the second axial end portion **92b** (e.g., a nut) in a state where the spike pin **17** is disposed in the third hole section **58a** of one of the third holes **58**. The second hole section **58b** has a smaller cross sectional width than the first hole section **58a** and the third hole section **58c**. Thus, a first abutment surface is formed between the first hole section **58a** and the second hole section **58b**. In this way, inward axial movement of the first axial end portion **92a** (e.g., a nut) within the first hole section **58a** is limited by the first abutment surface. Also, a second abutment surface is formed between the second hole section **58b** and the third hole section **58c**. In this way, inward axial movement of the second axial end portion

92c (e.g., a nut) within the third hole section 58c is limited by the second abutment surface. The [0129] In understanding the scope of the present invention, the term “comprising” and its derivatives, as used herein, are intended to be open ended terms that specify the presence of the stated features, elements, components, groups, integers, and/or steps, but do not exclude the presence of other unstated features, elements, components, groups, integers and/or steps. The foregoing also applies to words having similar meanings such as the terms, “including”, “having” and their derivatives. Also, the terms “part,” “section,” “portion,” “member” or “element” when used in the singular can have the dual meaning of a single part or a plurality of parts unless otherwise stated.

[0130] As used herein, the following directional terms “frame facing side”, “non-frame facing side”, “forward”, “rearward”, “front”, “rear”, “up”, “down”, “above”, “below”, “upward”, “downward”, “top”, “bottom”, “side”, “vertical”, “horizontal”, “perpendicular” and “transverse” as well as any other similar directional terms refer to those directions of a human-powered vehicle (e.g., bicycle) in an upright, riding position and equipped with the pedal assembly. Accordingly, these directional terms, as utilized to describe the pedal assembly, should be interpreted relative to a human-powered vehicle (e.g., bicycle) in an upright riding position on a horizontal surface and that is equipped with the pedal assembly. The terms “left” and “right” are used to indicate the “right” when referencing from the right side as viewed from the rear of the human-powered vehicle (e.g., bicycle), and the “left” when referencing from the left side as viewed from the rear of the human-powered vehicle (e.g., bicycle).

[0131] The phrase “at least one of” as used in this disclosure means “one or more” of a desired choice. For one example, the phrase “at least one of” as used in this disclosure means “only one single choice” or “both of two choices” if the number of its choices is two. For another example, the phrase “at least one of” as used in this disclosure means “only one single choice” or “any combination of equal to or more than two choices” if the number of its choices is equal to or more than three. Also, the term “and/or” as used in this disclosure means “either one or both of”. For instance, the phrase “at least one of A and B” encompasses (1) A alone, (2), B alone, and (3) both A and B. The phrase “at least one of A, B, and C” encompasses (1) A alone, (2), B alone, (3) C alone, (4) both A and B, (5) both B and C, (6) both A and C, and (7) all A, B, and C. In other words, the phrase “at least one of A and B” does not mean “at least one of A and at least one of B” in this disclosure.

[0132] Also, it will be understood that although the terms “first” and “second” may be used herein to describe various components, these components should not be limited by these terms. These terms are only used to distinguish one component from another. Thus, for example, a first component discussed above could be termed a second component and vice versa without departing from the teachings of the present invention.

[0133] The term “attached” or “attaching”, as used herein, encompasses configurations in which an element is directly secured to another element by affixing the element directly to the other element; configurations in which the element is indirectly secured to the other element by affixing the element to the intermediate member(s) which in turn are affixed to the other element; and configurations in which one element is integral with another element, i.e. one element is essentially part of the other element. This definition also applies to words of similar meaning, for example, “joined”, “connected”, “coupled”, “mounted”, “bonded”, “fixed” and their derivatives. Finally, terms of degree such as “substantially”, “about” and “approximately” as used herein mean an amount of deviation of the modified term such that the end result is not significantly changed.

[0134] While only selected embodiments have been chosen to illustrate the present invention, it will be apparent to those skilled in the art from this disclosure that various changes and modifications can be made herein without departing from the scope of the invention as defined in the appended claims. For example, unless specifically stated otherwise, the size, shape, location or orientation of the various components can be changed as needed and/or desired so long as the

changes do not substantially affect their intended function. Unless specifically stated otherwise, components that are shown directly connected or contacting each other can have intermediate structures disposed between them so long as the changes do not substantially affect their intended function. The functions of one element can be performed by two, and vice versa unless specifically stated otherwise. The structures and functions of one embodiment can be adopted in another embodiment. It is not necessary for all advantages to be present in a particular embodiment at the same time. Every feature which is unique from the prior art, alone or in combination with other features, also should be considered a separate description of further inventions by the applicant, including the structural and/or functional concepts embodied by such feature(s). Thus, the foregoing descriptions of the embodiments according to the present invention are provided for illustration only, and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

Claims

1. A pedal assembly for a human powered vehicle, the pedal assembly comprising: a pedal axle having a rotational center axis defining an axial direction; and a pedal body having a first shoe-disposing surface and a second shoe-disposing surface opposite to the first shoe-disposing surface, both of the first shoe-disposing surface and the second shoe-disposing surface being configured so that a plurality of pedal components different from each other are selectively attachable to each of the first shoe-disposing surface and the second shoe-disposing surface, the pedal body including a first plurality of fastening holes extending through the pedal body from the first shoe-disposing surface to the second shoe-disposing surface and a second plurality of fastening holes extending through the pedal body from the first shoe-disposing surface to the second shoe-disposing surface, the first plurality of fastening holes being different from the second plurality of fastening holes, the first plurality of fastening holes being arranged and configured for attaching a cleat coupling unit that is configured to releasably retain a cleat to the pedal body as one of the plurality of pedal components, and the second plurality of fastening holes being arranged and configured for attaching the plurality of spike pins to the pedal body as another of the plurality of pedal components.
2. The pedal assembly according to claim 1, wherein the pedal body and the first plurality of fastening holes are configured such that the cleat coupling unit is attachable either one of the first shoe-disposing surface and the second shoe disposing surface, and the second plurality of fastening holes are configured such that the plurality of spike pins is attachable to either one of the first shoe-disposing surface and the second shoe-disposing surface.
3. The pedal assembly according to claim 2, wherein the pedal body and the first plurality of fastening holes are configured such that another cleat coupling unit is attachable the other of the first shoe-disposing surface and the second shoe disposing surface, and the second plurality of fastening holes are configured such that the plurality of spike pins is attachable to both the first shoe-disposing surface and the second shoe-disposing surface.
4. The pedal assembly according to claim 1, further comprising: a plurality of adapters configured to fit into the first plurality of fastening holes.
5. The pedal assembly according to claim 1, wherein the first plurality of fastening holes has a D-shape as viewed along a center longitudinal axis.
6. The pedal assembly according to claim 1, wherein the pedal body includes an inner body portion, an outer body portion, a first body portion extending in the axial direction, a second body portion extending in the axial direction and an intermediate body portion configured to receive the pedal axle and extending in the axial direction, the intermediate body portion is positioned between the outer body portion and the inner body portion and between the first body portion and the second body portion, and the first shoe-disposing surface and the second shoe-disposing surface are

defined by the outer body portion, the inner body portion, the first body portion, the second body portion and the intermediate body portion.

7. The pedal assembly according to claim 6, wherein the first body portion and the second body portion are free from a cleat engagement portion.

8. The pedal assembly according to claim 6, wherein the outer body portion, the inner body portion, the first body portion, and the intermediate body portion define a first opening, the outer body portion, the inner body portion, the second body portion, and the intermediate body portion define a second opening, and the first opening is opposite to the second opening with respect to the intermediate body portion.

9. The pedal assembly according to claim 6, wherein the intermediate body portion includes the first plurality of fastening holes.

10. The pedal assembly according to claim 1, wherein the pedal assembly includes the cleat coupling unit and the at least one other pedal component.

11. The pedal assembly according to claim 10, wherein the cleat coupling unit includes a first coupling member, a second coupling member and a biasing member, the second coupling member is pivotable between a cleat holding position and a cleat non-holding position, and the biasing member biases the second coupling member towards the cleat holding position.

12. The pedal assembly according to claim 10, wherein the at least one other pedal component includes the plurality of spike pins.

13. The pedal assembly according to claim 12, wherein each of the spike pins includes a projection portion and an attachment portion.

14. The pedal assembly according to claim 12, wherein each of the spike pins includes a first projection portion, a second projection portion and an attachment portion, the attachment portion has a first axial end portion and a second axial end portion opposite to the first axial end portion, the first projection portion is coupled to the first axial end portion of the attachment portion, and the second projection portion is coupled to the second axial end portion of the attachment portion.

15. The pedal assembly according to claim 10, wherein the at least one other pedal component includes at least another the cleat coupling units, a toe-clip, a friction pad and a plurality of spike pins.

16. The pedal assembly according to claim 10, wherein the at least one other pedal component includes a toe-clip.

17. The pedal assembly according to claim 10, wherein the at least one other pedal component includes a friction pad.

18. The pedal assembly according to claim 17, wherein the friction pad includes a first pad part and a second pad part, and the second pad part is a separate piece from the first pad part.
