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Inventor(s)	Rogus; John M.

EXERCISE MACHINES HAVING DAMPENER FOR REDUCING ACTUATOR BACKLASH

Abstract

An exercise machine has a frame, a rocker arm operable to perform a striding exercise motion relative to the frame, an actuator coupling the rocker arm to the frame, the actuator being configured to adjust a position of the rocker arm relative to the frame to adjust an incline of the striding exercise motion, and a dampener configured to apply a preload force on the actuator to dampen reversing loads from the rocker arm and reduce backlash in the actuator.

Inventors:	**Rogus; John M. (Northbrook, IL)**
Applicant:	**Life Fitness, LLC** (Rosemont, IL)
Family ID:	**1000008434391**
Assignee:	**Life Fitness, LLC (Rosemont, IL)**
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Background/Summary

CROSS REFERENCE TO RELATED APPLICATION [0001] This application claims the benefit of U.S. Provisional Patent Application No. 63/553,865, filed Feb. 15, 2024, which application is incorporated herein by reference in its entirety.

FIELD
[0002] The present disclosure relates to exercise equipment, for example personal exercise machines.
BACKGROUND
[0003] U.S. Pat. Pub. No. 2023/0025399 is incorporated herein by reference and discloses an exercise machine for performing a striding exercise motion. The exercise machine has a frame, first and second pedal members, first and second foot pads on the first and second pedal members, respectively, wherein the first and second foot pads are configured to move in respective elliptical paths during the striding exercise motion, and first and second rocker arms. The first and second pedal members are pivotably coupled to the first and second rocker arms and move with the first and second rocker arms relative to the frame. An adjustment device pivotably couples the first and second rocker arms to the frame. The adjustment device is configured to actively adjust and set a position of the first and second rocker arms relative to the frame, respectively, which thereby changes an incline shape of the elliptical paths, respectively, during the striding exercise motion.
SUMMARY
[0004] This Summary is provided to introduce a selection of concepts which are further described below in the Detailed Description. This Summary is not intended to identify key or essential features of the claimed subject matter, nor is it intended to be used as an aid in limiting the scope of the claimed subject matter.
[0005] In non-limiting examples disclosed herein, an exercise machine comprises a frame, a rocker arm operable to perform a striding exercise motion relative to the frame, and an actuator coupling the rocker arm to the frame. The actuator is configured to adjust a position of the rocker arm relative to the frame to adjust an incline of the striding exercise motion. A dampener is configured to apply a preload force on the actuator that dampens reversing loads from the rocker arm to thereby reduce backlash in the actuator.
[0006] In independent examples, the preload force may comprise a tension force. In independent examples, the preload force may comprise a compression force. The dampener may comprise a spring. The spring may comprise an elastomer. The spring may comprise a first spring member and a second spring member that is coupled to the first spring member.
[0007] In independent examples, the preload force may comprise at least one of a tension force and a compression force. The dampener may be configured to apply the at least one of the tension force and the compression force on the actuator. The actuator may be configured to extend and retract, and the dampener may be configured to apply the compression force when the actuator is extended and to apply the tension force when the actuator is retracted. The dampener may configured to apply the preload force via at least one of the tension force and the compression force throughout movement of the exercise machine into and between a low-incline configuration and a high-incline configuration. The dampener may comprise a first spring configured to apply the tension force on the actuator and a second spring configured to apply the compression force on the actuator.
[0008] In independent examples, the actuator may comprise a linear actuator having a first end pivotably coupled to the frame and a second end pivotably coupled to the rocker arm. An incline link may pivotably couple the rocker arm to the frame, the second end of the linear actuator being pivotably coupled to the rocker arm via the incline link. The dampener may comprise a spring configured to bias the incline link relative to the frame to apply said preload force as a tension force

on the actuator. The dampener may comprise a spring configured to bias the incline link relative to the frame to apply said preload force as a compression force on the actuator.

[0009] In independent examples, the dampener may comprise a first spring and a second spring, said first spring and said second spring being configured to abut each other to apply the preload force. In independent examples, one of the first spring and the second spring travels along a non-linear path relative to the other one of the first spring and the second spring, and at least one of the first spring and the second spring has a shape configured to generally maintain alignment between the first spring and the second spring as the first spring and the second spring arc compressed along the non-linear path.

[0010] In non-limiting examples disclosed herein, an exercise machine comprises a frame, a rocker arm operable to perform a striding exercise motion relative to the frame, and an incline link pivotably coupling the rocker arm to the frame. A linear actuator has a first end pivotably coupled to the frame and a second end pivotably coupled to the incline link, and the linear actuator is extendible and retractable to adjust a position of the rocker arm relative to the frame. A dampener is configured to apply at least one of a tension force and a compression force on the linear actuator that dampens reversing loads from the rocker arm to thereby reduce backlash in the linear actuator.

[0011] In independent examples, the dampener may be configured to apply both the tension force and the compression force on the linear actuator. The linear actuator may be configured to extend and retract, and said dampener configured to apply the compression force when the linear actuator is extended and to apply the tension force when the linear actuator is retracted. The dampener may comprise a first spring configured to apply the tension force on the linear actuator and a second spring configured to apply the compression force on the linear actuator. The dampener may comprise a spring that is compressed between the incline link and the frame upon retraction of the linear actuator, which applies the tension force on the linear actuator.

[0012] In independent examples, a pivot linkage may be coupled to the frame and to the incline link, and the dampener may comprise a spring that is compressed between the pivot linkage and the frame upon extension of the linear actuator, which applies the compression force on the linear actuator. The pivot linkage may comprise a spring arm and a connecting link that are pivotably coupled together.

[0013] In independent examples, the dampener may comprise a spring that is compressed between the incline link and the frame upon retraction of the linear actuator, which applies the tension force on the linear actuator, and a pivot linkage may be coupled to the frame and to the incline link. The dampener may comprise a spring that is compressed between the pivot linkage and the frame upon extension of the linear actuator, which applies the compression force on the linear actuator.

[0014] In independent examples, the dampener may comprise a low-incline dampener configured to dampen the reversing loads when the exercise machine is in a low-incline configuration and a high-incline dampener configured to dampen the reversing loads when the exercise machine is in a high-incline configuration. The low-incline dampener may be configured to apply the tension force and said high-incline dampener being configured to apply the compression force.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The present disclosure is described with reference to the following Figures. The same numbers are used throughout the Figures to reference like features and like components. Unless otherwise specifically noted, articles illustrated in the drawings are not necessarily drawn to scale.

[0016] FIG. **1** is a side perspective view of a first non-limiting example of an exercise machine having certain features removed such as support column, base member and stabilizer covers.

[0017] FIG. **2** is a rear view thereof having a front stabilizer covers removed.

[0018] FIG. **3** is a side view thereof having front and rear covers and stabilizer covers removed.
[0019] FIG. **4** is an opposite side view thereof having front and rear covers and stabilizer covers removed.
[0020] FIG. **5** is a top view thereof having base member and stabilizer covers removed.
[0021] FIG. **6** is an exploded view of portions of the front of the machine.
[0022] FIG. **7** is another exploded view of the portions illustrated in FIG. **6**.
[0023] FIG. **8** is a schematic view showing a low-incline elliptical path of travel of foot pads on the machine.
[0024] FIG. **9** is a schematic view showing a medium-incline elliptical path of travel of foot pads on the machine.
[0025] FIG. **10** is a schematic view showing a high-incline elliptical path of travel of foot pads on the machine.
[0026] FIG. **11** is a perspective view of an embodiment of the bridge of an exercise machine according to the present disclosure.
[0027] FIG. **12** is a perspective view of an adjustment device located in the bridge of FIG. **11**, the adjustment device including a dampener.
[0028] FIG. **13** is a view of section **13-13**, taken in FIG. **12**.
[0029] FIG. **14** is an exploded perspective view of the dampener and portions of the adjustment device of FIG. **12**.
[0030] FIG. **15** is a view of section **15-15**, taken in FIG. **12**.
[0031] FIG. **16** is a view of section **16-16**, taken in FIG. **12**.
[0032] FIG. **17** is a side elevation view of the bridge of FIG. **12** in which the exercise machine is in a low-incline configuration, wherein a bridge arm members are removed to expose the dampener and portions of the adjustment device.
[0033] FIG. **18** is the side elevation view of the bridge of FIG. **17**, wherein the exercise machine is in a medium-incline configuration.
[0034] FIG. **19** is the side elevation view of the bridge of FIG. **18**, wherein the exercise machine is in a high-incline configuration.
[0035] FIG. **20** is a perspective view of the bridge of an exercise machine having another embodiment of a dampener.
[0036] FIG. **21** is an exploded perspective view of the dampener and portions of an adjustment device of FIG. **20**.
[0037] FIG. **22** is a view of section **22-22**, taken in FIG. **20**.
[0038] FIG. **23** is a view of section **23-23**, taken in FIG. **20**.
[0039] FIG. **24** is a side elevation view of the bridge of FIG. **20** in which the exercise machine is in a low-incline configuration, wherein a bridge arm members are removed to expose the dampener and portions of an adjustment device.
[0040] FIG. **25** is the side elevation view of the bridge of FIG. **24**, wherein the exercise machine is in a medium-incline configuration.
[0041] FIG. **26** is the side elevation view of the bridge of FIG. **25**, wherein the exercise machine is in a high-incline configuration.
[0042] FIG. **27** is a perspective view of the bridge of an exercise machine with another embodiment of a dampener.
[0043] FIG. **28** is an exploded perspective view of the dampener and portions of an adjustment device of FIG. **27**
[0044] FIG. **29** is a view of section **29-29**, taken in FIG. **27**.
[0045] FIG. **30** is a view of section **30-30**, taken in FIG. **27**.
[0046] FIG. **31** is a side elevation view of the bridge of FIG. **27** in which the exercise machine is in a low-incline configuration, wherein a bridge arm members are removed to expose the dampener and portions of an adjustment device.

[0047] FIG. **32** is the side elevation view of the bridge of FIG. **31**, wherein the exercise machine is in a medium-incline configuration.
[0048] FIG. **33** is the side elevation view of the bridge of FIG. **32**, wherein the exercise machine is in a high-incline configuration.
[0049] FIG. **34** is a partial side elevation view of an embodiment of a high-incline dampener having spring members in which the exercise machine is in a low-incline configuration.
[0050] FIG. **35** is the partial side elevation view of FIG. **34** in which the exercise machine is in a medium-incline configuration.
[0051] FIG. **36** is the partial side elevation view of FIG. **35** in which the exercise machine is in a high-incline configuration.
[0052] FIG. **37** is a partial side elevation view of an embodiment of a low-incline dampener having spring members in which the exercise machine is in a high-incline configuration.
[0053] FIG. **38** is the partial side elevation view of FIG. **37** in which the exercise machine is in a medium-incline configuration.
[0054] FIG. **39** is the partial side elevation view of FIG. **38** in which the exercise machine is in a low-incline configuration.
[0055] FIG. **40** is a side schematic view comparing embodiments of a spring member for a dampener.

DETAILED DESCRIPTION OF THE DRAWINGS

[0056] FIGS. **1-5** illustrate a personal exercise machine **20** for performing a striding exercise motion. The machine **20** extends from front to back in a longitudinal direction L, from top to bottom in a vertical direction V, and from side to opposite side in a lateral or horizontal direction H. The machine **20** is generally symmetrical in the horizontal direction H, so that the components on one side of the machine **20** are the same as or are mirror images of the components on the opposite side of the machine **20**. As such, the descriptions provided below regarding components on one side of the machine **20** equally apply to the components on the opposite side of the machine **20**.
[0057] The machine **20** has a frame **22** including a longitudinally extending base member **24**. Horizontally extending stabilizer members **26** extend from the front and rear of the base member **24** and prevent the machine **20** from tipping over in the horizontal direction H. Each stabilizer member **26** has feet **28** for supporting the frame **22** above the ground. The frame **22** has a forward support column **30** which extends vertically upwardly from the front of the base member **24**. An angular gusset **32** braces and supports the forward support column **30** relative to the base member **24**. A bridge **34** is mounted on top of the forward support column **30**. The bridge **34** has a horizontally extending body **36** with opposing first and second arms **38** extending rearwardly therefrom. As such, the bridge **34** generally has a U-shape and defines an “activity zone” between the arms **38** for the user's body and/or arms during performance of the striding exercise motion. A generally trapezoidal-shaped stationary handlebar **42** is rigidly mounted on the body **36** between the arms **38** and is for manually grasping by a user operating the machine **20**.
[0058] A user console **44** is mounted to and extends generally upwardly from the bridge **34**. The console **44** includes a display screen **46** oriented towards the user operating the machine **20**. As conventional, the console **44** can include a processor and memory and be configured for controlling various devices associated with the machine **20**, including for control of resistance and/or incline as for example will be further described herein below. The display screen **46** optionally can be a touch screen wherein the user operating the machine **20** can manually touch the screen to input commands to the console **44** for controlling the machine **20**. Optionally, input buttons **48** are located on the stationary handlebar **42** and are for manually inputting commands to the console **44**. Optionally, input buttons can be located elsewhere such as on the upper ends of hand grips **127**, described herein below. Input commands entered via the display screen **46** and/or input buttons **48** can for example include an increase or decrease in resistance of the machine **20** and/or increase or decrease in incline of the machine **20**, and/or the like. Optionally biomechanical sensors **45** can be

provided on the stationary handlebar **42** and/or on hand grips **127** for sensing heart rate of the user when the user manually grasps the stationary handlebar **42** and/or the hand grips **127**.

[0059] At the rear of the machine **20**, the frame **22** further includes a rear support column **50** which extends angularly upwardly and rearwardly from the rear of the base member **24**. A resistance mechanism **52** is mounted to the rear support column **50**, including for example via a rear frame plate (not illustrated in FIG. **4**) mounted to the rear support column **50** and/or the base member **24**. The type and configuration of the resistance mechanism **52** is conventional and can vary from what is illustrated and described. In the illustrated example the resistance mechanism **52** is a hybrid generator-brake configured to provide a resistance to a striding motion performed on the machine **20**, as will be further described herein below, and also configured to generate power based upon the striding motion, for example for powering the console **44**. A suitable resistance mechanism is the “FB Six Series” sold by Chi Hua. The resistance mechanism **52** is connected to a pulley wheel **56** by a belt **58** and is configured so that rotation of the pulley wheel **56** rotates the resistance mechanism **52**. The pulley wheel **56** is connected to the rear support column **50** by a center shaft **60** (see FIG. **8**). The pulley wheel **56** and center shaft **60** are fixed relative to each other such that these components rotate together.

[0060] At the rear of the machine **20**, radially opposed crank arms **62** have radially inner ends keyed to (fixed to) the center shaft **60** so that the crank arms **62** remain radially opposed to each other (i.e., 180 degrees apart) and so that rotation of the crank arms **62** and center shaft **60** causes rotation of the pulley wheel **56** about a pulley wheel pivot axis **64** defined by the center shaft **60**. Rotation of the pulley wheel **56** is resisted by the resistance mechanism **52** via an electro magnet **66**, as is conventional and well known in the art.

[0061] The machine **20** further has first and second pedal members **68** centrally located on opposite sides of the frame **22**. The pedal members **68** are elongated in the longitudinal direction L, each having a central portion **70**, a front portion **72** which extends generally forwardly and upwardly from the central portion **70**, and a rear portion **74** which extends generally rearwardly and upwardly from the central portion **70** to a tail portion **76** which extends rearwardly from the rear portion **74** and generally but not necessarily parallel to the central portion **70**.

[0062] At the rear of the machine **20**, first and second elongated stride links **78** are freely rotatably (pivotably) coupled to the radially outer ends of the opposed crank arms **62**, by for example bearings, at a stride link-crank arm pivot axis **80**. Each stride link **78** has a first end which is pivotably coupled to a respective tail portion **76** of a pedal member **68** at a stride link-pedal member pivot axis **82**. Each stride link **78** has an opposite, second end which is pivotably coupled to a distal or rear end of an elongated idler link **84** at a stride link-idler link pivot axis **86**. The opposite, proximal or front end of the idler link **84** is pivotably coupled to the base member **24** at an idler link-base member pivot axis **88**. As illustrated in the figures, the stride link-crank arm pivot axis **80** is located along the stride link **78** between the stride link-pedal member pivot axis **82** and stride link-idler link pivot axis **86** and in particular is closer to the stride link-pedal member pivot axis **82** than the stride link-idler link pivot axis **86**. In other examples, the pivot axis **80** is at the center of the stride link **78** or closer to the pivot axis **86**.

[0063] First and second foot pads **90** are supported on the central portions **70** of the first and second pedal members **68**. The foot pads **90** are for supporting the user's feet during performance of the elliptical striding motion and travel along an elliptical path which is incline adjustable, as will be further described herein below.

[0064] The machine **20** further has first and second rocker arms **92** which are pivotably coupled to the frame **22** by an adjustment device **94**, which will be further described herein below. The type and configuration of the adjustment device **94** can vary. The rocker arms **92** have an upper end portion **96**, a lower end portion **98**, and an elbow portion **100** located between the upper end portion **96** and the lower end portion **98** so that the upper end portion **96** and lower end portion **98** extend at an angle relative to each other. The lower end portions **98** are pivotably coupled to the front portion **72** of the pedal members **68** at a rocker arm-pedal member pivot axis **102** so that the pedal members **68** are pivotably movable relative to the rocker arms **92** and also so that pivoting of the rocker arms **92** relative to the frame **22** causes commensurate pivoting and/or translating of the pedal members **68** relative to the frame **22**, i.e., so that these components pivot and/or translate together relative to the frame **22**.

[0065] Referring to FIGS. **3**, **4**, **6** and **7**, the adjustment device **94** is located in the bridge **34** and extends into the noted arms **38** on both sides of the activity zone. The adjustment device **94** is specially configured to facilitate selective adjustment and setting of a position of the rocker arms **92** relative to the frame **22**, respectively, specifically the position of pivot axis **108**, which thereby changes an incline shape of elliptical paths of travel of the foot pads **90**, respectively, during the striding exercise motion, as will be further described herein below. The adjustment device **94** can be controlled by the noted controller based upon a stored exercise program or based upon an input by the operator to the console **44**. For example this can be controlled via touch screen, input buttons **48** on the stationary handlebar **42** and/or input buttons on the upper ends of hand grips **127**. As will be evident from the illustrated examples and the following description, the type and configuration of the adjustment device **94** can vary.

[0066] In the first example illustrated in FIGS. **1-10**, the adjustment device **94** includes first and second incline links **104** which pivotably couple the upper end portion **96** of the rocker arms **92** to the frame **22**. More specifically, the incline links **104** have an upper portion which is pivotably coupled to the frame **22** at an incline link-frame pivot axis **106**. The incline links **104** further have a lower portion which is pivotably coupled to the upper end portion **96** of the rocker arm **92** at an incline link-rocker arm pivot axis **108** which is located generally below the incline link-frame pivot axis **106**. Conventional bearings support the noted couplings so that the incline links **104** are pivotable relative to the noted axes **106**, **108**.

[0067] The adjustment device **94** is configured to pivot the first and second incline links **104** relative to the frame **22** (i.e., about the incline link-frame pivot axis **106**) to thereby adjust and set the position of the rocker arms **92** relative to the frame **22**, in particular to adjust and set the position of the incline link-rocker arm pivot axis **108** relative to the frame **22** (i.e., about the incline link-frame pivot axis **106**). In the illustrated example, the adjustment device **94** includes first and second linear actuators **110**. Note that the type of linear actuator **110** can vary from what is illustrated and described. In the illustrated example, the linear actuator **110** includes an electro-mechanical linear actuator, which has an electric gearmotor **120**, a leadscrew assembly **121** and, a leadnut and tube assembly **125** (see FIGS. **6**, **7**, and **13**). As illustrated in FIG. **13**, the linear actuator **110** has a body **107** (i.e., the housing **119**) with a forward end **115** pivotably coupled to the bridge **34** of the frame **22** by a trunnion assembly **113**, particularly at an actuator-bridge pivot axis **114**. The linear actuator **110** has an opposite, rear end **117** at a distal end of a tube **133** of the leadnut and tube assembly **125** that is pivotably coupled to the incline link **104** at an actuator-incline link pivot axis **118** (sec FIGS. **6** and **13**). A conventional bearing, which is best seen in exploded view in FIG. **7**, supports the coupling at the actuator-incline link pivot axis **118**. The actuator-incline link pivot axis **118** is offset relative to the incline link-frame pivot axis **106** and the incline link-rocker arm pivot axis **108**. In the illustrated non-limiting example, the incline link **104** is a generally triangular plate member wherein the incline link-frame pivot axis **106**, incline link-rocker arm pivot axis **108** and actuator-incline link pivot axis **118** are located at the respective three apexes of the triangular shape.

[0068] The gearmotor **120**, leadscrew assembly **121**, and leadnut and tube assembly **125** are configured to lengthen or shorten the linear actuator **110** upon an input command from the noted controller, which can be based upon an operator input to the console **44** or based upon a program in the noted controller, as described herein above. Operation of the gearmotor **120** in a first direction rotates the leadscrew **123** of the leadscrew assembly **121** in the first direction which causes the leadnut and tube assembly **125** to travel outwardly along the leadscrew **123** and outwardly relative to the housing **119** of linear actuator **110**, thus lengthening the linear actuator **110**. Operation of the gearmotor **120** in an opposite, second direction oppositely rotates the leadscrew **123** in the second direction which cause the leadnut and tube assembly **125** to retract inwardly relative to the housing **119**, thus shortening the linear actuator **110**. Thus, the linear actuator **110** is configured to extend and retract the leadnut and tube assembly **125** relative to the actuator body **107** (i.e., the housing **119**), for example along the axis **109** and in the direction of arrows **111** in FIG. **13**. Due to the relative locations of the incline link-frame pivot axis **106**, incline link-rocker arm pivot axis **108**, actuator-bridge pivot axis **114**, and actuator-incline link pivot axis **118**, extension of the linear actuator **110** pivots the incline link **104** rearwardly along an arc relative to the bridge **34**, which moves the incline link-rocker arm pivot axis **108** rearwardly relative to the frame **22**, along an arc relative to the incline link-frame pivot axis **106**. As illustrated and described herein below, this increases or raises the incline of the elliptical path of the foot pads **90** during the striding motion. Conversely, shortening the linear actuator **110** pivots the incline link **104** forwardly along the arc relative to the bridge **34** and along an arc relative to the incline link-frame pivot axis **106**. This moves the incline link-rocker arm pivot axis **108** forwardly along the arc relative to the frame **22**. As illustrated and described herein below, this reduces or lowers the incline of the elliptical path of the foot pads **90** during the striding motion.

[0069] It is important to note that the adjustment device **94** does not need to include two actuators, as shown in the first example. In other examples, a single adjustment device connected to both of the incline links **104** is employed, via for example an electric motor, worm gears, pulleys, and/or any other conventional mechanism for causing the above-noted adjustment of the relative position of the axes.

[0070] Referring to FIGS. **1-5**, the machine **20** has movable handle members **122** which are pivotably coupled to opposite sides of the bridge **34** at a handle member-bridge pivot axis **124**. Each handle member **122** has an upper end with a hand grip **127** for manually grasping by the user performing the striding exercise motion. Each handle member **122** has a lower end which is pivotably coupled to a coupler link **126** at a handle member-coupler link pivot axis **128**. Thus, the handle member **122** and respective coupler link **126** pivot together about the handle member-bridge pivot axis **124** and the coupler link **126** is pivotable relative to the handle member **122** about the handle member-coupler link pivot axis **128**. Each coupler link **126** has a forward end portion **130** coupled to the handle member **122** at the handle member-coupler link pivot axis **128** and a rearward end portion **132** pivotably coupled to the central portion **70** of the pedal member **68** at a coupler link-pedal member pivot axis **134**. Thus, the coupler link **126** is pivotable relative to the pedal member **68** about the coupler link-pedal member pivot axis **134**. An elbow portion **136** is located between the forward and rearward end portions **130**, **132** so that the forward end portion **130** extends angularly upwardly relative to the rearward end portion **132**. As such, the user standing on the foot pads **90** and manually grasping the hand grips **127** can alternately push and pull on the hand grips **127** to thereby apply pushing and pulling forces on the pedal members **68** via the coupler links **126**, which assists the striding exercise motion, as will be further described herein below.

[0071] FIGS. **8-10** are schematic views of the machine **20** showing the paths of travel A**1**-A**3** of the foot pads **90** and the paths of travel B**1**-B**3** of the stride link-pedal member pivot axis **82** during low-incline (FIG. **8**), medium-incline (FIG. **9**), and high-incline (FIG. **10**). In each figure, the rocker arms **92** have a different position of swing range, which is determined by position of the adjustment device **94**. FIG. **8** illustrates low-incline, where the linear actuators **110** are retracted and thus the incline links **104** are pivoted about the incline link-frame pivot axis **106** towards the bridge **34** (i.e., clockwise about the incline link-frame pivot axis **106** in the side view illustrated in FIG. **8**). This moves the incline link-rocker arm pivot axis **108** along an arc towards the bridge **34** and via connection of the rocker arms **92** and pedal members **68**, positions the foot pads **90** so as to follow the low-incline elliptical path of travel A**1**. FIG. **9** illustrates medium-incline, wherein the linear actuators **110** are moderately extended and thus the incline links **104** are pivoted about the incline link-frame pivot axis **106** away from the bridge **34** (i.e., counter-clockwise about the incline link-frame pivot axis **106** from the side view illustrated in FIG. **9**). This moves the incline link-rocker arm pivot axis **108** along an arc away from the bridge **34** and via connection of the rocker arms **92** and pedal members **68**, positions the foot pads **90** to follow the medium-incline elliptical path of travel A**2**. FIG. **10** illustrates a high-incline situation, wherein the linear actuators **110** are further extended and thus the incline links **104** are pivoted about the incline link-frame pivot axis **106** away from the bridge **34** (i.e., further counter-clockwise about the incline link-frame pivot axis **106** from the side view illustrated in FIG. **10**). This moves the incline link-rocker arm pivot axis **108** along the arc further away from the bridge **34** and via connection of the rocker arms **92** and pedal members **68**, positions the foot pads **90** to follow the high-incline elliptical path of travel A**3**. It is important to understand that the three positions illustrated in FIGS. **8-10** are exemplary and other positions are possible via operation of the adjustment device **94**, which can be automatically controlled by programming of the console **44** and/or by inputs to the console **44** and/or input buttons **48** and/or other input buttons such as on the upper ends of hand grips **127**.

[0072] By comparison of FIGS. **8-10**, it can be seen that the machine **20** is advantageously configured to maintain a substantially compact and constant length (in the length direction L) of the paths of travel A**1**-A**3** throughout the adjustments made by the adjustment device **94**. The configurations of the various components advantageously take up a relatively small footprint. The ends of the rocker arms **92** advantageously do not swing beyond the front of the frame **22**, thus maintaining a small footprint. The paths of travel B**1**-B**3** are also substantially constant, due to the stride link configuration illustrated and described herein above. The rear linkage including the stride links **78** advantageously does not swing beyond the rear portion of the frame **22**, thus maintaining a small footprint. The configuration of the movable handle members **122** and the coupler link **126** is advantageous in that the overall path of movement (i.e., swing range of the handle members **122** about the handle member-bridge pivot axis **124**) is substantially constant despite changes in incline via the adjustment device **94**.

[0073] Advantageously, the foot pads **90** are located on the pedal members **68** at a distance rearward of the rocker arm-pedal member pivot axis **102** to create a more natural, vertical height of the paths of travel A**1**-A**3**. This feature in combination with the path of travel B**1**-B**3** yields a more natural, and smooth path of travel A**1**-A**3** in all incline settings. Also, the path of travel (arc) along which the incline link travels, as described herein above, is tilted upward towards the rear portion of travel, towards high-incline. This tailors/blends some additional vertical height to the overall ellipse height as it adjusts to a high-incline setting.

[0074] During research and development, the present inventor determined that performance of an exercise motion on an exercise machine, for example the machine **20** of FIGS. **1-10**, may apply a reversing load on the actuator **110** as the user moves the foot pads **90** along their travel paths A**1**-A**3** (FIGS. **8-10**). When the direction of travel of the foot pads **90** switches from a forward direction to a reverse direction, a load applied on the actuator **110** by the rocker arm **92** also reverses, thereby switching between applying a compressive load and a tensile load onto the actuator **110**. Reversing the load on the actuator **110** may cause actuator backlash as relative movement occurs between components of the actuator **110** and between the actuator **110** and the mounting locations/hardware for the actuator **110** due to the clearances that must be present between the various components. For example, referring to FIG. **13**, reversing loads may cause relative motion between at least one of the actuator **110** and the actuator-bridge pivot axis **114**; the actuator **110** and the actuator-incline link pivot axis **118**; the leadscrew **123** and bearing supports and/or gears in a gearset **129** connecting the leadscrew **123** to the gearmotor **120**; the leadscrew **123** and the leadnut **131** of the leadnut and tube assembly **125**; the incline link **104** and the actuator; the incline link **104** and the rocker arm; and any other connected components which have a clearance between each other.

[0075] The present inventor determined that the actuator backlash may create an undesirable noise and/or an undesirable jerk or jolt that may be felt by a user. Additionally or alternatively, when the actuator backlash occurring on one side of an exercise machine differs from the actuator backlash occurring on the other side of the machine, a user may feel an unbalanced, undesirable backlash feeling between the two sides of the machine. For these reasons, the present inventor determined that reversing loads on known exercise machines may cause actuator backlash that can result in an undesirable feeling and/or noise for a user. The present inventor thus have realized a need in the art to provide dampening to reduce the actuator backlash and/or reduce the effects of the actuator backlash on an exercise machine. The present disclosure is a result of these efforts.
[0076] FIGS. **11** and **12** illustrate an embodiment of a bridge **34** for an exercise machine, for example the machine **20** of FIGS. **1-10**, that includes a dampener **200** configured to apply a preload force on the actuator **110** that dampens reversing loads from the rocker arm **92** to thereby reduce backlash in the actuator **110**. The bridge **34** of FIGS. **11** and **12** is mounted on top of the forward support column **30** of the frame **22** and has a horizontally extending body **36** with opposing first and second arms **38** extending rearwardly from the body **36**. In the illustrated embodiments, each arm **38** includes a dampener **200** configured to dampen actuator backlash on the corresponding side of the machine **20**. Each arm **38** includes two rearwardly extending bridge arm members **39** that are spaced laterally apart from each other such that the adjustment devices **94** and the dampeners **200** are supported on the corresponding arm **38** between the opposing bridge arm members **39**.
[0077] As previously mentioned, the machine **20** is generally symmetrical in the horizontal direction H, so that the components on one side of the machine **20** are the same as or are mirror images of the components on the opposite side of the machine **20**. As such, the descriptions provided below regarding a dampener **200** on one side of the bridge **34** equally apply to the components on the opposite side of the bridge **34**.
[0078] With continued reference to FIGS. **11** and **12**, the incline link **104** of the adjustment device **94** is pivotably coupled on the frame **22** by the incline link-frame pivot axis **106**, which extends through a hub portion **99** of the body **97** of the incline link **104**. Opposing lateral ends of the incline link-frame pivot axis **106** are supported on support portions **23** of the bridge arm members **39**, and respective clamp members **103** couple the incline link-frame pivot axis **106** to the support portions **23**. The second end **117** (FIG. **13**) of the linear actuator **110** is pivotably coupled to the body **97** of the incline link **104** by an actuator-incline link pivot axis **118**, which is coupled to the incline link **104** by a trunnion assembly **213**. The upper end portion **96** of the rocker arm **92** is pivotably coupled to the incline link **104** by incline link-rocker arm pivot axis **108**. The incline link-rocker arm pivot axis **108** is supported on the incline link **104** by bracket plates **105** coupled to opposing lateral surfaces of the incline link body **97**, and clamp members **103** clamp opposing ends of the incline link-rocker arm pivot axis **108** to the bracket plates **105**. Thus, the second end **117** of the actuator **110** is coupled to the rocker arm **92** via the incline link **104**, and the incline link **104** pivotably couples the rocker arm **92** to the frame **22**.
[0079] Referring to FIGS. **12**, **14**, and **18**, the illustrated dampener **200** is configured as a dual preload dampener system that includes two dampener sub-assemblies **250**, **252** that are each configured to apply a preload force on the actuator **110** that dampens reversing loads from the rocker arm **92**. A low-incline dampener **250** (see also FIG. **15**) is configured to dampen the reversing loads when the machine **20** is in a low-incline configuration (FIG. **8**), and a high-incline dampener **252** (see also FIG. **16**) is configured to dampen the reversing loads when the machine **20** is in a high-incline configuration (FIG. **10**). The dampener **200** includes a mounting plate **202** that is configured to support the dampener **200** on the arm **38** between the two bridge arm members **39** and a pivot linkage **220** that extends between, and operatively couples, the mounting plate **202** to the incline link **104**. The mounting plate **202** has a generally planar body **204** that is coupled to an upper surface of the bridge arm members **39**, for example with mechanical fasteners. Upper mounting brackets **206** extend upwards from the planar body **204** and are positioned over openings

210 formed through the planar body **204**. As discussed in greater detail below, the upper mounting brackets **206** are configured to support at least a portion of the low-incline dampener **250**, which extend through a corresponding one of the openings **210**.

[0080] With continued reference to FIGS. **12**, **14**, and **18**, the pivot linkage **220** (FIG. **18**) is coupled to the frame **22** (via the mounting plate **202**) and the incline link **104**. The pivot linkage **220** includes a spring arm **222** and connecting links **224** that are pivotably coupled together by a pivot linkage pivot axis **236**. The spring arm **222** has a body that extends between a first end **228** and an opposite second end **230**. The first end **228** of the spring arm **222** is pivotably coupled to an upper surface of the mounting plate **202** by a spring arm-plate axis **226**, about which the spring arm **222** can pivot relative to the mounting plate **202**. The body of the spring arm **222** extends through an opening **208** formed through the planar body **204** of the mounting plate **202**.

[0081] The connecting links **224** are pivotably coupled to opposing lateral sides of the second end **230** of the spring arm **222** by the pivot linkage pivot axis **236** such that the spring arm **222** and the connecting links **224** may pivot relative to each other about a pivot linkage pivot axis **236**. The connecting links **224** each extend from the first end **232** to a second end **234** that is pivotably coupled to a corresponding lateral side of the incline link **104** such that the connecting links **224** may pivot relative to the incline link **104** about a connecting link-incline link pivot axis **238**. In some embodiments, bushings **237** may support at least one of the spring arm-plate axis **226**, the pivot linkage pivot axis **236**, and the connecting link-incline link pivot axis **238** in the corresponding component(s). Some embodiments, however, may omit at least one of the bushings **237**.

[0082] As previously mentioned, the dampener **200** is configured as dual preload dampeners with a low-incline dampener **250** and a high-incline dampener **252** that each apply a preload force on the actuator **110** (e.g., via the incline link **104** and/or pivot linkage **220**) to dampen the reversing loads and reduce backlash in the actuator **110**. In the illustrated embodiments, the low-incline dampener **250** includes at least one spring **262**, **264** configured to apply a tension preload force on the actuator **110** and the high-incline dampener **252** includes at least one spring **262**, **264** configured to apply a compression preload force on the actuator **110**.

[0083] Referring to FIGS. **14**, **15**, and **18**, the low-incline dampener **250** includes two first dampener assemblies **254** and two second dampener assemblies **256** to apply the tension preload force on the actuator **110**. In the illustrated embodiment, (FIGS. **15** and **18**), each one of the second dampener assemblies **256** corresponds to (e.g., abuts, interfaces, aligns with, etc.) one of the first dampener assemblies **254**. Each one of the first dampener assemblies **254** includes the spring **262** that is configured as a (flat metal) leaf spring **262** supported on a lower surface of one of the upper mounting brackets **206** on the mounting plate **202**. Referring to FIG. **15**, the leaf springs **262** of the first dampener assemblies **254** have a mounting side **274** that is clamped between a clamp member **266** and the corresponding upper mounting bracket **206** and an abutting side **276** which abuts a portion of the corresponding second dampener assembly **256**. The leaf springs **262** include a bend to join the mounting and abutting sides **274**, **276**. The leaf springs **262** may be compressed by pressing the abutting side **276** towards the mounting side **274**, thereby bending or deflecting the spring **262**. Thus the abutting side **276** is biased apart from the mounting side **274** due to the resiliently deformable nature of the leaf spring **262**. In some examples, the bend of the leaf spring **262** is configured based on an orientation of the corresponding elastomer spring **264** to reduce bending (e.g., deformation in the longitudinal direction L of FIG. **11**) of the elastomer spring **264**. That is, an angle (e.g., uncompressed angle) between the mounting and abutting sides **274**, **276** of the leaf spring **262** enables contact between the elastomer spring **264** to compress (deform) substantially linearly while reducing horizontal or longitudinal deformation of the elastomer spring **264**. Furthermore, the bend of the leaf spring **262** is configured such that the mounting and abutting sides **274**, **276** are substantially aligned (e.g., parallel) when the first and second dampener assemblies **254**, **256** are in fully compressed states (FIGS. **17** and **19**), which further reduces horizontal bending of the corresponding elastomer spring **264**. In the illustrated embodiments, the leaf springs **262** are formed from a rigidly or elastically deformable metal material. Some embodiments, however, may include at least one leaf spring formed from a different material.

[0084] With continued reference to FIGS. **14**, **15**, and **18**, the second dampener assemblies **256** of the low-incline dampener **250** each include a first spring **262** (i.e., a first spring member) and a second spring **264** (i.e., a second spring member) that is coupled to the first spring **262**. In the illustrated embodiments, the first springs **262** of the second dampener assemblies **256** are configured as leaf springs **262** and the second springs **264** are configured as elastomeric springs **264**. Each elastomeric spring **264** is formed from a resiliently deformable material that has an annular body that deforms when compressed between two objects/surfaces. The resiliently deformable nature of the elastomeric springs **264** biases the body back into its annular form, thereby biasing the objects/surfaces apart from each other.

[0085] Referring to FIG. **15**, the mounting side **274** of the leaf springs **262** are coupled to the mounting surface **270** of the incline link **104**, for example with mechanical fasteners. The elastomeric springs **264** are each coupled to the abutment side **276** of the corresponding leaf spring **262**. In the illustrated embodiments, the elastomeric springs **264** are clamped onto the leaf springs **262** between a clamp member **268** and the abutment side **276**, for example with a mechanical fastener. As the linear actuator **110** is retracted, for example when the machine **20** is moved into the low-incline configuration (FIGS. **8** and **17**), the elastomeric springs **264** of the second dampener assemblies **256** are configured to abut the abutting sides **276** of the leaf springs **262** of the first dampener assemblies **254**. Thus, as discussed in greater detail below, the spring **262** of the first dampener assembly **254** and the springs **262**, **264** of the second dampener assembly **256** of the low-incline dampener **250** are configured to be compressed between the mounting plate **202** and the incline link **104** when the actuator **110** is retracted, thereby applying a tensile preload force onto the actuator **110**.

[0086] Referring to FIGS. **14**, **16**, and **18**, the high-incline dampener **252** includes a first dampener assembly **258** and a second dampener assembly **260** (FIGS. **16** and **18**) that each include at least one spring **262**, **264**, and which are configured to apply a compression preload force on the actuator **110**. The first dampener assembly **258** of the high-incline dampener **252** includes a spring **262** configured as a leaf spring **262**, and the second dampener assembly **260** includes an elastomeric spring **264**. Referring to FIG. **16**, the leaf spring **262** of the first dampener assembly **258** has a mounting side **274** that is clamped between a clamp member **266** and a rear surface **221** of the spring arm **222**, for example using mechanical fasteners, thereby coupling the leaf spring **262** to the spring arm **222**. The elastomeric spring **264** of the second dampener assembly **260** is coupled to a lower mounting bracket **212** of the mounting plate **202**. More specifically, the elastomeric spring **264** is clamped between a forward-facing mounting surface **214** of the lower mounting bracket **212** and a clamp member **268**, thereby coupling the elastomeric spring **264** to the lower mounting bracket **212** of the mounting plate **202**.

[0087] As the linear actuator **110** is extended, for example when the machine **20** is moved into the high-incline configuration (FIGS. **10** and **19**), the leaf spring **262** of the first dampener assembly **258** is moved into abutment with the elastomeric spring **264** of second dampener assembly **260** as the spring arm **222** pivots rearwardly about the spring arm-plate axis **226**. Thus, as discussed in greater detail below, the springs **262**, **264** of the first and second dampener assemblies **258**, **260** of the high-incline dampener **252** are configured to be compressed between the lower mounting bracket **212** of the mounting plate **202** and spring arm **222** when the actuator **110** is extended, thereby applying a compressive preload force onto the actuator **110**. As the first and second dampener assemblies **258**, **260** are compressed between the lower mounting bracket **212** of the mounting plate **202** and the spring arm **222**, the leaf spring **262** and the elastomeric spring **264** of the first and second dampener assemblies **258**, **260** are simultaneously compressed, thereby gradually increasing the compressive preload force onto the actuator **110**.

[0088] As previously mentioned, the illustrated dampener **200** is configured to apply at least one preload force on the actuator **110** to reduce the actuator backlash feel and noise experience by a user when operating the machine **20** in any incline configuration (low-incline (FIG. **17**), high-incline (FIG. **19**), and any intermediate, i.e., medium, incline (FIG. **18**).
[0089] When the actuator **110** of the adjustment device **94** moves to a retracted position and forwardly rotates the incline link **104** such that the machine **20** is in a low-incline configuration, the dampener **200** applies a tensile preload force on the linear actuator **110**. For example, referring to FIG. **17**, the springs of the low-incline dampener **250** are compressed between the incline link **104** and the frame **22**. In particular, the elastomer spring **264** of the second low-incline dampener assembly **256** is compressed between the abutment sides **276** of the leaf springs **262** of the first and second low-incline dampener assemblies **254**, **256**. Furthermore, the leaf spring **262** of the first low-incline dampener assembly **254** are compressed between the upper mounting brackets **206** of the mounting plate **202** on the frame **22** and the elastomer springs **264**, and the leaf spring **262** of the second low-incline dampener assembly **256** are compressed between the elastomer springs **264** and the mounting surface **270** of the incline link **104**.
[0090] With continued reference to FIG. **17**, the compressed springs **262**, **264** of the low-incline dampener **250** bias the incline link **104** to pivot about the incline link-frame pivot axis **106** to move away from the mounting plate **202**. This creates a tensile force that is exerted on the actuator **110** by the springs **262**, **264** of the low-incline dampener **250**. This tensile preload force acts to pull the second end **117** of the actuator **110** away from the first end **115** thereof (FIG. **13**). By biasing the ends **115**, **117** of the actuator **110** apart from each other to hold the actuator **110** in tension, the reversing loads from the cyclical movement of the rocker arm **92** are dampened by the low-incline dampener **250**, thereby reducing actuator backlash in the low-incline configuration.
[0091] As the actuator **110** extends to increase the incline level of the machine **20**, the incline link **104** moves away from the springs **262**, **264** of the low-incline dampener **250**, and said springs **262**, **264** therefore become less compressed (e.g., when in a medium-incline configuration as illustrated in FIG. **18**) until they are at a "free" state in which the springs **262**, **264** are not compressed (FIG. **19**). At the same time, the springs **262**, **264** of the high-incline dampener **252** are increasingly compressed. For example, when then machine **20** is in a medium-incline configuration, as illustrated in FIG. **18**, the leaf spring **262** and the elastomeric spring **264** of the high-incline dampener **252** are simultaneously compressed,
[0092] When the actuator **110** of the adjustment device **94** moves to an extended position and rearwardly rotates the incline link **104** such that the machine **20** is in a high-incline configuration, the dampener **200** applies a compressive preload force on the linear actuator **110**. For example, referring to FIGS. **16** and **19**, the springs **262**, **264** of the high-incline dampener **252** are compressed between the pivot linkage **220** and the frame **22**. In particular, the elastomer spring **264** of the second high-incline dampener assembly **260** is compressed between the mounting surface **214** of the lower mounting bracket **212** and the abutment side **276** of the leaf spring **262** of the first high-incline dampener assembly **258**. The leaf spring **262** of the first high-incline dampener assembly **258** is compressed between the body of the spring arm **222** of the pivot linkage **220** and the elastomer spring **264** of the second high-incline dampener assembly **260**.
[0093] With continued reference to FIG. **19**, the compressed springs **262**, **264** of the high-incline dampener **252** bias the spring arm **222** to pivot about the spring arm-plate axis **226** away from the lower mounting bracket **212**. Pivoting movement of the spring arm **222** relative to the frame **22** transmits the preload force from the springs **262**, **264** to the incline link **104** via the connecting links **224** such that the pivot linkage **220** biases the incline link **104** towards the front of the machine **20**. This creates a compressive force that is exerted on the actuator **110** by the springs **262**, **264** of the high-incline dampener **250** via the spring arm **222**, the connecting links **224**, and the incline link **104**. This compressive preload force acts to push the second end **117** of the actuator **110** towards the first end **115** thereof (FIG. **13**). By biasing the ends **115**, **117** of the actuator **110**

towards each other to hold the actuator **110** in compression, the reversing loads from the cyclical movement of the rocker arm **92** are dampened by the high-incline dampener **252**, thereby reducing actuator backlash in the high-incline configuration.

[0094] As the actuator **110** retracts to decrease the incline level of the machine **20**, the spring arm **222** moves away from the lower mounting bracket **212** of the mounting plate **202**, and the springs **262**, **264** of the high-incline dampener **252** becomes less compressed until the springs **262**, **264** are closer to their "free" state (FIG. **17**), or, in some embodiments, until said springs **262**, **264** are in their "free" state. At the same time, the springs **262**, **264** of the low-incline dampener **250** move into abutment with each other and are increasingly compressed as the machine **20** is returned to the low-incline configuration by the adjustment device **94**.

[0095] Advantageously, the preload forces exerted on the actuator **110** by the low-incline dampener **250** and the high-incline dampener **252** dampen reversing external loads that occur when operating the machine **20**, for example the loads from the user applied via the rocker arm **92**. As a result of the applied preload forces, the low-incline dampener **250** and the high-incline dampener **252** enhance the stiffness of the adjustment device **94** and reduces noise levels during operation of the machine **20**. The preload force(s) are internal to the machine **20** and do not require the direct or indirect application of an external force by a user, thereby enhancing the user experience without requiring input from the user.

[0096] Referring to FIG. **18**, the low and high-incline dampeners **250**, **252** of the dampener **200** are configured to have some overlap in the application of their respective preload forces. As the springs **262**, **264** of the low-incline dampener **250** or the high-incline dampener **252** move toward disengagement and the compression of said springs **262**, **264** is reduced, the preload force applied by the said springs **262**, **264** is reduced. At the same time, as the springs **262**, **264** of the other of the low-incline dampener **250** or the high-incline dampener **252** move towards engagement and/or are increasingly compressed, the preload force applied by said springs **262**, **264** is increased. When in a medium or intermediate incline configuration (FIG. **18**), the springs **262**, **264** of the low-incline dampener **250** are compressed between the frame **22** and the incline link **104** and the springs **262**, **264** of the high-incline dampener **252** are compressed between the frame **22** and the pivot linkage **220**. Thus, the dampener **200** simultaneously applies compressive preload forces and a tensile preload forces on the liner actuator **110** in intermediate incline configurations.

[0097] Advantageously, the dual preload configuration of the dampener **200** consistently/constantly provides at least one preload force that act on the actuator **110** via the incline link **104** to dampen the reversing loads when the machine **20** is in a low-incline configuration, a high-incline configuration, or any intermediate incline configuration between the high and low-incline configurations (i.e., a medium-incline configuration). While the low-incline dampener **250** and the high-incline dampener **252** advantageously target the incline ranges of the machine **20** in which the user experiences the most actuator backlash feel and noise, the low and high-incline dampeners **250**, **252** also work in conjunction to reduce actuator backlash by dampening externally applied reversing loads when the machine **20** is in any intermediate incline configuration. Furthermore, because the dampener **200** includes the springs **262**, **264**, the preload force is variable through the range of incline settings of the machine **20**. That is, the preload force of the dampener **200** is higher in magnitude when the machine **20** is at the high-incline and low-incline configurations. More specifically, the tension preload force of the low-incline dampener **250** is higher when the machine **20** is in the low-incline configuration (FIG. **17**) relative to another incline configuration of the machine **20**. Likewise, the compression preload forced of the high-incline configuration (FIG. **19**) is higher relative to another incline configuration of the machine **20** (e.g., the medium-incline configuration of FIG. **18**).

[0098] In the embodiments of FIGS. **11-19**, the dampener **200** includes a low-incline dampener **250** and a high-incline dampener **252** that both include at least one leaf spring **262** and at least one elastomeric spring **264**. The magnitude of the applied spring forces may be adjusted to a desired level by selecting at least one of the shape, size, material, and any other property of the leaf springs **262** and the elastomer springs **264**. Advantageously, the use of two different types of springs **262**, **264** allow for greater customization of the preload forces due to the variations in possible spring configurations available due to the difference in possible properties of the leaf spring **262** and the elastomer spring **264**. Furthermore, use of at least one elastomer spring **264** may reduce or eliminate an undesirable noise that might occur due to the contact between two metal components. Some embodiments of a dampener, however, may be configured with a low-incline dampener and/or a high-incline dampener that have a different spring configuration than those of FIGS. **11-19**.

[0099] For example, FIGS. **20-26** illustrate another embodiment of a dampener **300** that includes a low-incline dampener **350** and a high-incline dampener **352** that are respectively configured to exert a tensile preload force and a compressive preload force onto the liner actuator **110** to reduce actuator backlash caused by reversing loads from the rocker arm **92**. Similar to the embodiments of FIGS. **11-19**, an incline link **104** operatively links the rocker arm **92**, the actuator **110**, and the frame together. Additionally, the dampener **300** of FIGS. **20-26** includes a mounting plate **302** configured to support the dampener **300** on the arms **38** of the frame **22** and a pivot linkage **320** that couples the mounting plate **302** to the incline link **104**.

[0100] In the embodiments of FIGS. **20-26**, various components of the machine **20**, for example components of the bridge **34**, components of the adjustment device **94**, certain components of the dampener **300** (e.g., the mounting plate **302** and the pivot linkage **320**), and other related support components are similar to or the same as those described with respect to the exercise machine and dampener **200** of FIGS. **10-19** and will not be described in detail again. However, as noted above, like reference numbers are used throughout FIGS. **20-26** to reference like features and like components discussed with respect to FIGS. **11-19**.

[0101] Referring to FIGS. **20**, **21**, and **25**, the illustrated dampener **300** is configured as a dual preload dampener system that includes two dampener sub-assemblies **350**, **352** that are each configured to apply a preload force on the actuator **110** that dampens reversing loads from the rocker arm **92**. A low-incline dampener **350** (see also FIG. **22**) is configured to dampen the reversing loads when the machine **20** is in a low-incline configuration (FIG. **8**), and a high-incline dampener **352** (see also FIG. **23**) is configured to dampen the reversing loads when the machine **20** is in a high-incline configuration (FIG. **10**). The low-incline dampener **350** includes at least one spring **364** configured to apply a tension preload force on the actuator **110** and the high-incline dampener **352** includes at least one spring **364** configured to apply a compression preload force on the actuator **110**.

[0102] Referring to FIGS. **21**, **22**, and **25**, the low-incline dampener **350** includes two first low-incline dampener sub-assemblies **354** and two second low-incline dampener sub-assemblies **356** (FIGS. **22** and **25**). In the illustrated examples, each one of the second dampener assemblies **356** corresponds to (e.g., abuts, interfaces, aligns with, etc.) one of the first dampener assemblies **354**. The first dampener assemblies **354** of the low-incline dampener **350** include springs **364** configured as annular elastomer springs **364** that are clamped onto a lower surface of one of the upper mounting brackets **306** with a clamping member **368** (configured as a nut in the illustrated embodiments), and which extend downward therefrom through a corresponding opening **310** through the body **304** of the mounting plate **302**. The second dampener assemblies **356** of the low-incline dampener **350** each include a spring **364** configured as an elastomeric spring **364** and a mounting member **369**. The mounting members **369** are positioned on the mounting surface **270** of the incline link **104** and are clamped between the elastomeric spring **364** and the mounting surface **270**. Each of the elastomeric springs **364** is clamped onto a corresponding mounting member **369** by a clamping member **368** (configured as a spacer in the illustrated embodiments). As illustrated in FIG. **23**, the elastomeric springs **364** include at least one locating protrusion **365** that engages openings on the respective one of the upper mounting bracket **306** and the mounting member **369**.

This may be useful, for example, to retain the elastomeric springs **364** in a desired position. In some embodiments, at least one of the mounting members **369** may be formed as an integral part of the incline link **104**. Additionally or alternatively, a clamping member **368** of one of the first dampener assemblies **354** and/or a clamping member **368** of one of the second dampener assemblies **356** may be differently configured than those of the illustrated embodiments.

[0103] Referring to FIG. **24**, as the linear actuator **110** is retracted, for example when the machine **20** is moved into the low-incline configuration (FIGS. **8** and **24**), the elastomeric springs **364** of the first and second low-incline dampener assemblies **354**, **356** are configured to move into abutment with each other. When the machine **20** is in the low-incline configuration the elastomeric springs **364** of the low-incline dampener **350** are compressed between the mounting plate **302** on the frame **22** and the mounting surface **270** of the incline link **104**. The compressed springs **364** of the low-incline dampener **350** bias the incline link **104** to pivot about the incline link-frame pivot axis **106** to move away from the mounting plate **302**. This creates a tensile force that is exerted on the actuator **110** by the springs **364** of the low-incline dampener **350** via the incline link **104**. This tensile preload force pulls the second end **117** of the actuator **110** away from the first end **115** thereof (FIG. **13**). By biasing the ends **115**, **117** of the actuator **110** apart from each other to hold the actuator **110** in tension, the reversing loads from the cyclical movement of the rocker arm **92** are dampened by the low-incline dampener **350**, thereby reducing actuator backlash in the low-incline configuration.

[0104] Referring to FIGS. **21**, **23**, and **25**, the high-incline dampener **352** includes a first high-incline dampener sub-assembly **358** and a corresponding second high-incline dampener sub-assembly **360** (FIGS. **23** and **25**), both of which include a spring **364** configured as an elastomeric spring **364** with a resiliently deformable annular body. Referring to FIGS. **23** and **25**, the elastomeric spring **364** of the first dampener assembly **358** is clamped between a clamp member **368** and a rear surface **321** of the spring arm **322**, thereby coupling said spring **364** to the spring arm **322** of the pivot linkage **320**. The elastomeric spring **364** of the second dampener assembly **360** is clamped between a forward-facing mounting surface **314** of the lower mounting bracket **312** and a clamp member **368**, thereby coupling the elastomeric spring **364** to the lower mounting bracket **312** of the mounting plate **302**. As with the elastomeric springs **364** of the low-incline dampener **350**, the elastomeric springs **364** of the high-incline dampener **352** include locating protrusions **365** which engage openings on the corresponding surface **314**, **321** to which each spring **364** is attached.

[0105] Referring to FIG. **26**, as the linear actuator **110** is extended, for example when the machine **20** is moved into the high-incline configuration (FIGS. **10** and **26**), the elastomeric spring **364** of the first high-incline dampener assembly **358** is moved towards and pressed into the elastomeric spring **364** of second dampener assembly **360** as the spring arm **322** pivots about the spring arm-plate axis **326**. When the actuator **110** of the adjustment device **94** has been extended to move the incline link **104** such that the machine **20** is in a high-incline configuration, springs **364** of the high-incline dampener **352** are compressed between the spring arm **322** and the lower mounting bracket **312**. The compressed springs **364** of the high-incline dampener **352** bias the spring arm **322** to pivot about the spring arm-plate axis **326** away from the lower mounting bracket **312**. Pivoting movement of the spring arm **322** relative to the frame **22** transmits the preload force from the springs **364** to the incline link **104** via the connecting links **324** such that the pivot linkage **320** biases the incline link **104** towards the front of the machine **20**. This creates a compressive force that is exerted on the actuator **110** by the springs **364** of the high-incline dampener **352** via the spring arm **322**, the connecting links **324**, and the incline link **104**. This compressive preload force pushes the second end **117** of the actuator **110** towards the first end **115** thereof (FIG. **13**). By biasing the ends **115**, **117** of the actuator **110** towards each other to hold the actuator **110** in compression, the reversing loads from the cyclical movement of the rocker arm **92** are dampened by the high-incline dampener **352**, thereby reducing actuator backlash in the high-incline configuration.

[0106] Referring to FIG. **25**, low and high-incline dampeners **350**, **352** of the dampener **300** are configured to have some overlap in the application of their respective preload forces. As the springs **364** of one of the low-incline dampener **350** and the high-incline dampener **352** move toward disengagement and the compression of said springs **364** is reduced, the preload force applied by the said springs **364** is reduced. At the same time, as the springs **364** of the other one of the low-incline dampener **350** and the high-incline dampener **352** move towards engagement and/or are increasingly compressed, the preload force applied by said springs **364** is increased. When in a medium-incline configuration (FIG. **25**), the springs **364** of the low-incline dampener **350** are compressed between the frame **22** and the incline link **104** and the springs **364** of the high-incline dampener **352** are compressed between the frame **22** and the pivot linkage **320**. Thus, the dampener **300** simultaneously applies a compressive preload force and a tensile preload force on the liner actuator **110** in intermediate incline configurations.

[0107] As explained herein above, performance of a striding exercise motion causes the elastomeric springs **364** in the low-incline dampener **350** and the high-incline dampener **352** to be pressed together along a non-linear, arc-shaped path based on the pivoting movement of the incline link **104** and spring arm **322**, respectively. For example, referring to FIG. **22**, pivoting movement of the incline link **104** about the incline link-frame pivot axis **106** causes the elastomeric spring **364** of the second low-incline dampener assembly **356** to move towards and away from the mounting plate **302** along an arc-shaped path exemplarily indicated by arrow **391**. Similarly, referring to FIG. **23**, pivoting movement of the spring arm **322** about the spring arm-plate axis **326** causes the elastomeric spring **364** of the first high-incline dampener assembly **358** to move towards and away from the mounting plate **302** along an arc-shaped path exemplarily indicated by arrow **392**.

[0108] During research and experimentation, the present inventor determined that the above-described non-linear compression of the elastomeric springs **364** may cause the elastomeric springs **364** to deform unevenly such that they do not remain centered relative to each other. Referring now to FIG. **40**, the above-described elastomeric spring **364** is shown in dashed lines. The elastomeric spring **364** includes a resiliently deformable body **376** having a generally flat lower inner surface **372** that transitions into a curved radially inner surface **379**. Relative to this embodiment, the present inventor determined that when the body **376** is not compressed in a consistent linear direction (i.e., non-linear compression) it tends to deform or move more in one horizontal direction **395** relative to the surface **380** to which it is attached than in the opposite horizontal direction **396** based on the angle at which the compressive force **394** is applied.

[0109] FIG. **40** also depicts an alternate embodiment of a deformable spring member **570** in solid lines. The deformable spring member **570** has a different shape than the spring **364** shown in dashed lines. Like the spring **364**, the spring member **570** has an annular body **576** and at least one locating protrusion **574** configured to engage a corresponding opening to secure the spring member **570** to the corresponding mounting surface/location **380**. The body **576** has a generally oval shape and has a radially inner surface **579** that is generally elliptical. Through research and experimentation, the present inventor determined that the depicted shape of the deformable spring member **570** is such that it advantageously self-corrects against the above-described tendency of the elastomeric spring **364** to move horizontally relative to the surface **380** to which it is attached. For example, the thickness of a lower portion **578** of the spring member body **576** is greater than at other locations around the annular body **576**, which provides increased resistance to lateral forces which might otherwise cause asymmetric bulging of the spring members **570**. Additionally, when compared to the abrupt changes in curvature of the elastomeric spring **364** between the flat inner surface **372** and the curved inner surface **379**, the smooth, generally continuous curvature around the entire radially inner surface **579** of the body **576** resists undesirable asymmetric bulging of the spring member **570**.

[0110] FIGS. **34-36** illustrate an embodiment of a high-incline dampener **552** that includes a first high-incline dampener **562** and a second high-incline dampener **564** that each have spring members **570** configured, as explained above, to self-correct for non-linear compression of the spring members **570** resulting from the pivoting movement of the spring arm **522** about the spring arm-plate axis **526**. Embodiments of the spring member **570** may be mounted on their respective mounting surfaces using a clamp member (e.g., any of the illustrated clamp members **268**, **368**, **468**), a screw, bolt, and/or other mechanical fastener, an adhesive, and/or another fastening arrangement. Similar to the above-described embodiments, when the machine **20** is moved from the low-incline configuration (FIG. **34**) into the high-incline configuration (FIG. **36**), the elastomeric spring member **570** of the first high-incline dampener **562** is moved towards the lower mounting bracket **512** along the arc-shaped path indicated by arrow **589** and pressed against the spring member **570** of the second high-incline dampener **564**.

[0111] Referring to FIG. **35**, continued pivoting movement of the spring arm **522** causes the two spring members **570** to be non-linearly compressed, for example along the compression path indicated by arrow **590**. As each spring member **570** is compressed and deformed, their bodies **576** are squashed in a normal direction (vertically) relative to their respective supporting surface **514**, **521**, (for example as indicated by arrows **593**) and tend to be pushed or squeezed outward or expanded in a parallel direction (horizontally) relative to their respective supporting surface **514**, **521** (for example as indicated by arrows **594**). The collective result of the forces exerted on the spring members **570** is a tendency for their bodies **576** to bulge outward and away from the spring arm-plate axis **526**. However, advantageously, the shape of the spring member **570** is configured to self-correct for the non-linear compression of said spring members **570** by causing the spring bodies **576** to deform such that the two spring members **570** remain relatively centered relative to each other. For example, the shape of the illustrated spring members **570** promotes deformation of said spring members **570** towards the pivot axis **526** of the spring arm **522**, as exemplarily indicated by arrows **592**. As illustrated in FIG. **36**, this correction for non-linear compression of the spring members **570** counters the tendency of the spring members **570** to asymmetrically bulge outward and results in the spring members **570** remaining generally centered on a shared centerline **580** in the high-incline configuration. Some embodiments, however, may be differently configured.

[0112] Referring to FIGS. **37-39**, embodiments of a low-incline dampener **550** may be configured with first and second low-incline dampeners **566**, **568** that each include at least one spring member **570** with a shape that is configured to self-correct for non-linear compression of the spring members **570** resulting from the pivoting movement of the incline link **104** about the incline link-frame pivot axis **106** (FIG. **22**). Embodiments of the spring member **570** may mounted on their respective mounting surfaces using a clamp member (e.g., any of the illustrated clamp members **268**, **368**, **468**), a screw, bolt, and/or other mechanical fastener, an adhesive, and/or another fastening arrangement. When the machine **20** is moved from the high-incline configuration (FIG. **37**) into the low-incline configuration (FIG. **39**), the spring member **570** of the second low-incline dampener **568** is moved towards the upper mounting bracket **506** along the arc-shaped path indicated by arrow **596** and is pressed against the spring member **570** of the first low-incline dampener **566**.

[0113] Referring to FIG. **38**, continued pivoting movement of the incline link **104** causes the two spring members **570** to be non-linearly compressed, for example along the compression path indicated by arrow **597**. As each spring member **570** is compressed and deformed, their bodies **576** are squashed in a normal direction (vertically) relative to their respective supporting surface **507**, **270** (for example as indicated by arrows **593**) and tend to be pushed or squeezed outward or expanded in a parallel direction (horizontally) relative to their respective supporting surface **507**, **270** (for example as indicated by arrows **594**). The collective result of the forces exerted on the spring members **570** is a tendency for their bodies **576** to asymmetrically bulge outward and away from the incline link-frame pivot axis **106**. The shape of the spring member **570** advantageously self-corrects for the above-described non-linear compression of said spring members **570** along

path **597** by causing the spring bodies **576** to deform such that the two spring members **570** remain relatively centered relative to each other, thereby countering the tendency of the spring members **570** to asymmetrically bulge outward. For example, the shape of the illustrated spring members **570** promotes deformation of said spring members **570** towards the pivot axis of the incline link **104**, for example indicated by arrows **598**. As illustrated in FIG. **39**, this correction for non-linear compression of the spring members **570** results in the spring members **570** remaining generally centered relative to each other in the low-incline configuration.
[0114] In the embodiments of FIGS. **11-19** and FIGS. **20-26**, the illustrated dampener **200**, **300** includes low-incline dampeners **250**, **350** and high-incline dampeners **252**, **352** that each include a plurality of springs **262**, **264**, **364** configured to exert compressive and/or tensile preload forces onto the actuator **110**. Some embodiments of a dampener, however, may be configured with a low-incline dampener and/or a high-incline dampener that includes one spring.
[0115] For example, FIGS. **27-33** illustrate another embodiment of a dual preload dampener **400** that includes a low-incline dampener **450** and a high-incline dampener **452** with a single spring **480**, **464** configured to exert a tensile preload force and a compressive preload force, respectively, onto the liner actuator **110** to reduce actuator backlash cause by reversing loads from the rocker arm **92**. Similarly to the dampeners **200**, **300** of FIGS. **11-26**, an incline link **104** operatively links the rocker arm **92**, the actuator **110**, and the frame together. Additionally, the dampener **400** of FIGS. **27-33** includes a mounting plate **402** configured to support the dampener **400** on the arms **38** of the frame **22** and a pivot linkage **420** that couples the mounting plate **402** to the incline link **104**.
[0116] In the embodiments of FIGS. **27-33**, various components of the machine **20**, for example components of the bridge **34**, components of the adjustment device **94**, certain components of the dampener **400** (e.g., the mounting plate **402** and the pivot linkage **420**), and other related support components are similar to or the same as those described with respect to the exercise machine and dampeners **200**, **300** of FIGS. **11-26** and will not be described in detail again. However, as noted above, like reference numbers are used throughout FIGS. **27-33** to reference like features and like components discussed with respect to FIGS. **11-26**.
[0117] Referring to FIGS. **28**, **29**, and **32**, the low-incline dampener **450** includes a twin elastomer spring **480** clamped to a bottom surface of the upper mounting bracket **406** by a clamp member **468** and an abutment member **486** coupled to the mounting surface **270** of the incline link **104**. The twin elastomer spring **480** is formed from a resiliently deformable material has a first annular body portion **482** and a second annular body portion **484** that are configured to deform when the twin elastomer spring **480** is compressed. The twin elastomer spring **480** has a generally figure eight shaped body with the first annular body portion **482** including locating protrusions **465** and being configured to be coupled to the upper mounting bracket **406**. The second annular body portion **484** is formed on the first annular body portion **482** on a side opposite the locating protrusions. Advantageously, the first and second annular body portions **482**, **484** allow the twin elastomer spring **480** to function and be compressed similarly to an arrangement with two springs. The abutment member has a body that is coupled to the mounting surface **270** of the incline link **104** and a stop member **488** that projects outward from the body portion in a direction opposite the mounting surface **270**.
[0118] Referring to FIG. **31**, as the linear actuator **110** is retracted, for example when the machine **20** is moved into the low-incline configuration (FIGS. **8** and **31**), the twin elastomer spring **480** of the low-incline dampener **450** is configured to move into abutment with the abutment member **486** on the incline link **104**. When the machine **20** is in the low-incline configuration the twin elastomer spring **480** is compressed between the mounting bracket **406** on the frame **22** and the abutment member **486**. As the twin elastomer spring **480** is compressed, the first and second annular body portions **482**, **484** are correspondingly compressed. Advantageously, the stop member **488** on the abutment member **486** may limit and/or reduce horizontal deformation (e.g., the deformation along a longitudinal axis L of FIGS. **11**, **12**) of the twin elastomer spring **480** relative to the mounting

surface **270** and the abutment member **486**. The compressed annular body portions **482**, **484** of the low-incline dampener **450** bias the incline link **104** to pivot about the incline link-frame pivot axis **106** to move away from the mounting plate **402**. This creates a tensile force that is exerted on the actuator **110** by the twin elastomer spring **480** of the low-incline dampener **450** via the incline link **104**. This tensile preload force acts to pull the second end **117** of the actuator **110** away from the first end **115** thereof (FIG. **13**). By biasing the ends **115**, **117** of the actuator **110** apart from each other to hold the actuator **110** in tension, the reversing loads from the cyclical movement of the rocker arm **92** are dampened by the low-incline dampener **450**, thereby reducing actuator backlash in the low-incline configuration.

[0119] Referring to FIGS. **28**, **30**, and **32**, the high-incline dampener **452** includes a spring **464** configured as an elastomeric spring **464** with a resiliently deformable annular body. Referring to FIGS. **30** and **32**, the elastomeric spring **464** is clamped between a forward-facing mounting surface **414** of the lower mounting bracket **412** and a clamp member **468**, thereby coupling the elastomeric spring **464** to the lower mounting bracket **412** of the mounting plate **402**. As with the twin elastomer spring **480** of the low-incline dampener **450**, the elastomeric spring **464** of the high-incline dampener **452** includes locating protrusions **465** which engage openings on the mounting surface **414** of the lower mounting bracket **412**.

[0120] Referring to FIG. **33**, as the linear actuator **110** is extended, for example when the machine **20** is moved into the high-incline configuration (FIGS. **10** and **33**), the rear surface **421** of the spring arm **422** is moved towards and pressed against the elastomeric spring **464** as the spring arm **422** pivots about the spring arm-plate axis **426**. When the actuator **110** of the adjustment device **94** has been extended to move the incline link **104** such that the machine **20** is in a high-incline configuration, the spring **464** of the high-incline dampener **452** is compressed between the spring arm **422** and the lower mounting bracket **412**. The compressed spring **464** of the high-incline dampener **452** exerts a spring force that bias the spring arm **422** to pivot about the spring arm-plate axis **426** away from the lower mounting bracket **412**. Pivoting movement of the spring arm **422** relative to the frame **22** transmits the preload force from the spring **464** to the incline link **104** via the connecting links **424** such that the pivot linkage **420** biases the incline link **104** towards the front of the machine **20**. This creates a compressive force that is exerted on the actuator **110** by the springs **464** of the high-incline dampener **452** via the spring arm **422**, the connecting links **424**, and the incline link **104**. This compressive preload force acts to push the second end **117** of the actuator **110** towards the first end **115** thereof (FIG. **13**). By biasing the ends **115**, **117** of the actuator **110** towards each other to hold the actuator **110** in compression, the reversing loads from the cyclical movement of the rocker arm **92** are dampened by the high-incline dampener **452**, thereby reducing actuator backlash in the high-incline configuration.

[0121] Similarly to the dampeners **200**, **300** of FIGS. **11-26**, the low and high-incline dampeners **450**, **452** of the dampener **400** of FIGS. **27-33** are configured to have some overlap in the application of their respective preload forces. As the springs **464**, **480** of one of the low-incline dampener **450** and the high-incline dampener **452** move toward disengagement and the compression of said springs **464**, **480** is reduced, the preload force applied by the said springs **464**, **480** is reduced. Substantially simultaneously, as the springs **464**, **480** of the other one of the low-incline dampener **450** and the high-incline dampener **452** move towards engagement and/or are increasingly compressed, the preload force applied by said springs **464**, **480** is increased. When in a medium-incline configuration (FIG. **32**), the twin elastomer spring **480** of the low-incline dampener **450** is compressed between the frame **22** and the incline link **104** and the elastomer spring **464** of the high-incline dampener **452** is compressed between the frame **22** and the pivot linkage **420**. Thus, the dampener **400** simultaneously applies compressive preload forces and a tensile preload forces on the liner actuator **110** in intermediate incline configurations.

[0122] Although specific advantages have been enumerated above, various examples may include some, none, or all of the enumerated advantages. Other technical advantages may become readily apparent to one of ordinary skill in the art after review of the following figures and description. Modifications, additions, or omissions may be made to the systems, apparatuses, and methods described herein without departing from the scope of the disclosure. For example, the components of the systems and apparatuses may be integrated or separated. Moreover, the operations of the systems and apparatuses disclosed herein may be performed by more, fewer, or other components and the methods described may include more, fewer, or other steps. Additionally, steps may be performed in any suitable order. As used in this document, “each” refers to each member of a set or each member of a subset of a set.

Claims

1. An exercise machine comprising: a frame, a rocker arm operable to perform a striding exercise motion relative to the frame, an actuator coupling the rocker arm to the frame, the actuator being configured to adjust a position of the rocker arm relative to the frame to adjust an incline of the striding exercise motion, and a dampener configured to apply a preload force on the actuator to dampen reversing loads from the rocker arm and reduce backlash in the actuator.
2. The exercise machine according to claim 1, wherein said preload force includes a tension force.
3. The exercise machine according to claim 1, wherein said preload force includes a compression force.
4. The exercise machine according to claim 1, wherein said dampener includes a spring.
5. The exercise machine according to claim 4, wherein said spring includes an elastomer.
6. The exercise machine according to claim 4, wherein said spring includes a first spring member and a second spring member coupled to the first spring member.
7. The exercise machine according to claim 1, wherein said preload force includes at least one of a tension force and a compression force, and said dampener is configured to apply the at least one of the tension force and the compression force on the actuator.
8. The exercise machine according to claim 7, wherein said actuator is configured to extend and retract, and said dampener is configured to apply the compression force when the actuator is extended and to apply the tension force when the actuator is retracted.
9. The exercise machine according to claim 7, wherein said dampener includes a first spring configured to apply the tension force on the actuator and a second spring configured to apply the compression force on the actuator.
10. The exercise machine according to claim 1, wherein said actuator includes a linear actuator having a first end pivotably coupled to the frame and a second end pivotably coupled to the rocker arm.
11. The exercise machine according to claim 10, further including an incline link pivotably coupling the rocker arm to the frame, the second end of the linear actuator being pivotably coupled to the rocker arm via the incline link.
12. The exercise machine according to claim 11, wherein said dampener including a spring configured to bias the incline link relative to the frame to apply said preload force as a tension force on the actuator.
13. The exercise machine according to claim 11, wherein said dampener including a spring configured to bias the incline link relative to the frame to apply said preload force as a compression force on the actuator.
14. The exercise machine according to claim 1, said dampener including a first spring and a second spring, said first spring and said second spring being configured to abut each other to apply the preload force.
15. The exercise machine according to claim 14, wherein one of the first spring and the second spring travels along a non-linear path relative to the other one of the first spring and the second spring, and wherein at least one of the first spring and the second spring has a shape configured to

generally maintain alignment between the first spring and the second spring as the first spring and the second spring are compressed along the non-linear path.

16. The exercise machine according to claim 1, wherein said dampener is configured to apply said preload force throughout movement into and between a low-incline configuration and a high-incline configuration.

17. An exercise machine comprising: a frame, a rocker arm operable to perform a striding exercise motion relative to the frame, an incline link pivotably coupling the rocker arm to the frame, a linear actuator having a first end pivotably coupled to the frame and a second end pivotably coupled to the incline link, the linear actuator being extendible and retractable to adjust a position of the rocker arm relative to the frame, and a dampener configured to apply at least one of a tension force and a compression force on the linear actuator that dampens reversing loads from the rocker arm to thereby reduce backlash in the linear actuator.

18. The exercise machine according to claim 17, wherein said dampener is configured to apply both the tension force and the compression force on the linear actuator.

19. The exercise machine according to claim 17, wherein said linear actuator is configured to extend and retract, and said dampener is configured to apply the compression force when the linear actuator is extended and to apply the tension force when the linear actuator is retracted.

20. The exercise machine according to claim 17, wherein said dampener includes a first spring configured to apply the tension force on the linear actuator and a second spring configured to apply the compression force on the linear actuator.

21. The exercise machine according to claim 17, wherein the dampener includes a spring that is compressed between the incline link and the frame upon retraction of the linear actuator, which applies the tension force on the linear actuator.

22. The exercise machine according to claim 17, further comprising a pivot linkage coupled to the frame and to the incline link, wherein the dampener includes a spring, and wherein the dampener is configured to compress the spring between the pivot linkage and the frame when the linear actuator is in an extended position to apply the compression force on the linear actuator.

23. The exercise machine according to claim 22, wherein the pivot linkage includes a spring arm and a connecting link that are pivotably coupled together.

24. The exercise machine according to claim 17, further comprising a pivot linkage coupled to the frame and the incline link, the dampener comprising a first spring and a second spring, the dampener configured to compress the first spring between the incline link and the frame when the linear actuator is in a retracted position to apply the tension force on the linear actuator, the dampener configured to compress the second spring between the pivot linkage and the frame when the linear actuator is in an extended position to apply the compression force on the linear actuator.

25. The exercise machine according to claim 17, wherein said dampener includes a low-incline dampener configured to dampen the reversing loads when the exercise machine is in a low-incline configuration and a high-incline dampener configured to dampen the reversing loads when the exercise machine is in a high-incline configuration.

26. The exercise machine according to claim 25, wherein said low-incline dampener is configured to apply the tension force and said high-incline dampener being configured to apply the compression force.

27. The exercise machine according to claim 25, wherein said dampener is configured to apply at least one of said tension force and said compression force throughout movement into and between a low-incline configuration and a high-incline configuration.

28. The exercise machine according to claim 17, wherein the dampener comprises a first spring supported on the frame and a second spring supported on a movable member, wherein the first spring and the second spring are compressed between the frame and the movable member to generate at least one of the tension force and the compression force; and wherein the second spring travels along a non-linear path relative to the frame, and at least one of the first spring and the second spring has a shape configured to generally maintain alignment between the first spring and the second spring as the first spring and the second spring are compressed along the non-linear path.