A universal variable resistance device is disclosed. The device includes a flexible, resilient rod having a base end for mounting to a stable or immovable object, and a distal end against which a force is exerted to flex the rod. One or more outer rods are coaxially mounted around the rod. Each of the one or more outer rods is configured to extend toward the distal end of the center rod to provide an increased resistance to the force and retract toward the base end of the center rod to provide less resistance to the force. Alternatively, a holder is provided that holds the rod at a point along the rod. The holder is configured to slide toward the distal end of the rod to provide an increased resistance to the force, and slide toward the base end of the rod to provide less resistance to the force.
UNIVERSAL VARIABLE RESISTANCE DEVICE

BACKGROUND

[0001] Various devices use flexible, resilient rods for providing variable resistance. For example, some exercise machines use a number of such rods to provide resistance in lieu of weights. To vary the amount of resistance, the rods can be connected and used together in various combinations. Such variation, however, requires the use of multiple rods, which can be unsightly, difficult to manage and maintain, and difficult to use.

SUMMARY

[0002] This document introduces a universal variable resistance device having a flexible, resilient center rod having a base end for mounting to a stable or immovable object, and a distal end against which a force is exerted to flex the center rod. The center rod is configured to flex in a cantilevered fashion. In some embodiments, the universal variable resistance device further includes one or more outer rods coaxially mounted around the center rod. Each of the one or more outer rods, individually or in a combination, is configured to extend toward the distal end of the center rod to provide an increased resistance to the force and retract toward the base end of the center rod to provide less resistance to the force.

[0003] In other aspects, some embodiments of a universal variable resistance device include a flexible, resilient rod having a base end for mounting to a stable or immovable object, and a distal end against which a force is exerted to flex the rod. These embodiments further include a holder that holds the rod at a point along the rod. The holder is configured to slide toward the distal end of the rod to provide an increased resistance to the force and slide toward the base end of the rod to provide less resistance to the force.

[0004] The details of one or more embodiments are set forth in the accompanying drawings and the description below. Other features and advantages will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] These and other aspects will now be described in detail with reference to the following drawings.

[0006] FIGS. 1A and 1B illustrate a universal variable resistance device according to first exemplary embodiments.

[0007] FIGS. 2A, 2B and 2C illustrate a universal variable resistance device according to second exemplary embodiments.

[0008] Like reference symbols in the various drawings indicate like elements.

DETAILED DESCRIPTION

[0009] FIGS. 1A and 1B illustrate a universal variable resistance device 100 according to first exemplary embodiments. As shown by way of example in FIG. 1A, the universal variable resistance device 100 includes a flexible, resilient rod 102 and a holder 104. The rod 102 has a base end 101 for attaching to a stable or immovable object, and a distal end 103 to which force can be applied to bend the rod 102 in cantilevered fashion from the base end 101. The rod 102 can be made of any flexible but rigid materials such as fiberglass, composite fiber materials, metal, wood, or the like. The rod 102 can be resistively flexed from a substantially straight position to a curved, flexed position.

[0010] The amount of resistance required to bend the rod 102, and thus provided by the resistance device 100, is inversely proportional to a length L of the rod 102 that extends from, or beyond, the holder 104 to the distal end 103. A connector 107 may be connected to the rod 102 proximate the distal end 103, to which a cable or other movable object may be connected in order to bend the length L of the rod 102.

[0011] The holder 104 includes an aperture 105 through which the rod 102 is provided. The aperture 105 can also be a groove or channel. The rod 102 and/or holder 104 are slidable with respect to each other, such that the length L of the rod 102 that extends from the holder 104 to the distal end 103 can be varied. Accordingly, as shown in FIG. 13, shortening the length L of the rod 102 increases resistance provided by the resistance device 100, while lengthening the length L of the rod 102 decreases resistance provided by the resistance device 100.

[0012] FIGS. 2A, 2B and 2C illustrate a universal variable resistance device 120 according to second exemplary embodiments. The resistance device 120 includes a flexible, resilient center rod 106. The center rod 106 is preferably solid, but may also be hollow. The resistance device 120 further includes one or more sliding outer rods 108. The resistance device 120 has a base end 111 that attaches to a stable or immovable object, and a distal end 112 against which a force can be exerted to bend the center rod 106 in cantilevered fashion from the base end 111.

[0013] The one or more outer rods 108 can slide from a retracted position substantially inside each other, as shown in FIG. 2A, to an extended position telescoping over the center rod 106 (or over the coaxial rod 108 immediately below) as shown in FIG. 2B. Each outer rod 108 can extend or telescope toward the distal end 113 of the center rod 106 to provide an increased resistance to the force exerted on the center rod 106 and/or one or more outer rods 108, and retract toward the base end 111 of the center rod 106 to provide less resistance to such a force. Thus, resistance provided by the resistance device 120 can be adjusted up or down.

[0014] Each of the rods 106, 108 and 110 can have a connector 112. The connector 112 preferably has an aperture. In some embodiments, the connector 112 on each of the rods 106, 108 and 110 are sized and configured to have the apertures line up in series, as shown in FIG. 2C, such that in the extended position each connector 112 can attach to a moving object such as a cable. Alternatively, in some embodiments, only the center rod includes a connector 112.

[0015] The universal variable resistance devices described above can be used in a variety of applications, without limitation. In some embodiments, a universal variable resistance device can be used for providing variable resistance in an exercise machine. Other uses are within the scope of this disclosure. Although a few embodiments have been
described in detail above, other modifications are possible. Other embodiments may be within the scope of the follow-
ing claims.

1. A universal variable resistance device comprising:
   a flexible, resilient center rod having a base end for
   mounting to a stable or immovable object, and a distal
   end against which a force is exerted to flex the center
   rod; and
   one or more outer rods coaxially mounted around the
   center rod, and being configured to extend toward the
   distal end of the center rod to provide an increased
   resistance to the force, and to retract toward the base
   end of the center rod to provide less resistance to the
   force.

2. A universal variable resistance device in accordance
   with claim 1, further comprising a connector attached prox-
   imate the distal end of the center rod, for connecting to an
   object that exerts the force.

3. A universal variable resistance device in accordance
   with claim 1, wherein each rod is formed of fiberglass.

4. A universal variable resistance device in accordance
   with claim 1, wherein each rod is formed of a composite
   fiber material.

5. A universal variable resistance device in accordance
   with claim 1, further comprising a connector attached to the
   distal end of the center rod and to a distal end of each of the
   one or more outer rods, and wherein each connector includes
   an aperture.

6. A universal variable resistance device, comprising:
   a flexible, resilient rod having a base end for mounting to
   a stable or immovable object, and a distal end against
   which a force is exerted to flex the rod; and
   a holder that holds the rod at a point along the rod, the
   holder being configured to slide toward the distal end of
   the rod to provide an increased resistance to the force,
   and to slide toward the base end of the rod to provide
   less resistance to the force.

7. A universal variable resistance device in accordance
   with claim 6, further comprising a connector attached prox-
   imate the distal end of the rod, for connecting to an object
   that exerts the force.

8. A universal variable resistance device in accordance
   with claim 6, wherein the rod is made of fiberglass.

9. A universal variable resistance device in accordance
   with claim 6, wherein the rod is formed of a composite fiber
   material.

10. A universal variable resistance device in accordance
    with claim 6, wherein the holder includes an aperture
    through which the rod extends and by which the rod is held.

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