shape, forcing the other components of the foot and ankle assembly to return to their neutral positions.

In an alternative embodiment, the keel component, or just the toe portion of the keel component, may be made using a carbon-epoxy material to provide more energy return in the toe portion. The keel and ankle components may be made from any plastic or any fiber-reinforced plastic.

Additionally, referring to FIG. **11**, an alternative holding assembly **105** may be provided. In this embodiment, a heel plate **102** is attached to the keel component and projects posteriorly, creating a gap **104** between the heel plate and the keel component. Steel cables **106** are attached to the heel plate and run up through the central bumper component to attach to the ankle component. At heel strike, the heel plate collapses against the keel component, reducing the tension in the steel cables and allowing the ankle component to rotate relative to the keel, resulting in a dorsiflexion foot motion. To increase the tension in the cable, a bolt **108** located at the attachment point may be turned clockwise, forcing the attachment to move upward. To decrease tension, the bolt may be turned counterclockwise, lowering the attachment piece.

In a further embodiment, illustrated in FIG. **12**, instead of the axial pin being bolted to the bracket, the pin **54** may fit through slots **112** in the top portion of the bracket **50**. A bolt **114** threaded into the top of the bracket on each side may then hold the axial pin from the top. By tightening each bolt, the axial pin drives the ankle component against the central bumper, limiting the ankle motion. Loosening each bolt allows for increased motion.

Other alternative embodiments are contemplated by the present invention. For example, the ankle may have an attachment mechanism other than an inverted pyramid, such as a clamp. The holding assembly may be, for example, a spring or elastic band on each side or encircling the components. One end of the spring may be attached to the keel and the other end to the ankle. The foot may have a split toe for greater inversion/eversion capability.

The invention is not to be limited by what has been particularly shown and described, except as indicated by the appended claims.

What is claimed is:

1. An artificial foot and ankle comprising:

a keel component having an upper surface, the upper surface having a selected radius of curvature in both a sagittal plane and a frontal plane;

an ankle component having a lower surface, the lower surface having a selected radius of curvature in both the sagittal plane and the frontal plane;

a central bumper component interposed between the keel component and the ankle component; and

a holding assembly holding together the keel component, the ankle component, and the central bumper component;

wherein the ankle component is configured to disengage from the central bumper component in at least one zone distant from a region of contact pressure during rolling motion.

2. The artificial foot and ankle of claim **1**, wherein the holding assembly comprises a closed loop holding the keel component, the ankle component, and the central bumper component with the ankle component capable of rolling motion relative to the keel component in the sagittal plane and the frontal plane and a horizontal plane.

3. The artificial foot and ankle of claim **1**, wherein the selected radius of curvature in the sagittal plane of the lower surface of the ankle component is greater than the selected radius of curvature in the sagittal plane of the upper surface of the keel component.

4. The artificial foot and ankle of claim **1**, wherein the central bumper component has an upper surface and a lower surface, the upper surface and the lower surface having a radius of curvature corresponding to the radius of curvature of the upper surface of the keel component in both the sagittal plane and the frontal plane.

5. The artificial foot and ankle of claim **1**, wherein the holding assembly includes a heel plate attached to the keel component, and cables attached to the heel plate and the ankle component.

6. The artificial foot and ankle of claim **5**, wherein the holding assembly includes a tension adjustment mechanism operative to adjust the tension in the cables.

7. The artificial foot and ankle of claim **1**, wherein the keel component is formed of a plastic material of a fiber-reinforced plastic material.

8. The artificial foot and ankle of claim **1**, wherein the keel component is formed of a glass-reinforced or carbon-reinforced or glass-and-carbon-reinforced vinyl ester material or a carbon-epoxy material.

9. The artificial foot and ankle of claim **1**, wherein the keel component includes a toe portion and the toe portion is formed of a carbon-epoxy material.

10. The artificial foot and ankle of claim **1**, wherein the keel component includes a toe portion, the toe portion comprising a leaf spring assembly.

11. The artificial foot and ankle of claim **10**, wherein the toe portion comprises a plurality of graduated layers.

12. The artificial foot and ankle of claim **1**, wherein the keel component further includes an arched bottom surface.

13. The artificial foot and ankle of claim **1**, wherein the keel component includes a mid portion having a uniform thickness.

14. The artificial foot and ankle of claim **1**, wherein the central bumper component is formed of an elastic material selected to provide shock absorption and a restoring force to return the artificial foot and ankle to a neutral position after application of a load.

15. The artificial foot and ankle of claim **1**, wherein the central bumper component includes an anterior portion having a toe bumper pocket formed therein, and a toe bumper is disposed in the toe bumper pocket, the toe bumper having a hardness value different from a hardness value of the central bumper component.

16. The artificial foot and ankle of claim **1**, wherein the ankle component is formed of a plastic material or a fiber-reinforced plastic material.

17. The artificial foot and ankle of claim **1**, wherein the ankle component is formed of a glass-reinforced or carbon-reinforced or glass-and-carbon-reinforced vinyl ester material.

18. The artificial foot and ankle of claim **1**, wherein the ankle component further includes an attachment element extending from an upper surface.

19. The artificial foot and ankle of claim **1**, further comprising a dorsiflexion stop assembly disposed to control dorsiflexion of the artificial foot and ankle.

20. The artificial foot and ankle of claim **19**, wherein the dorsiflexion stop assembly comprises a strap member extending through corresponding openings in the keel component and the central bumper component and attached to a dorsiflexion rod adjustably mounted at the posterior of the ankle component to provide a tension adjustment of the strap member.