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(54) **BICYCLE BRAKING DEVICE AND METHOD**

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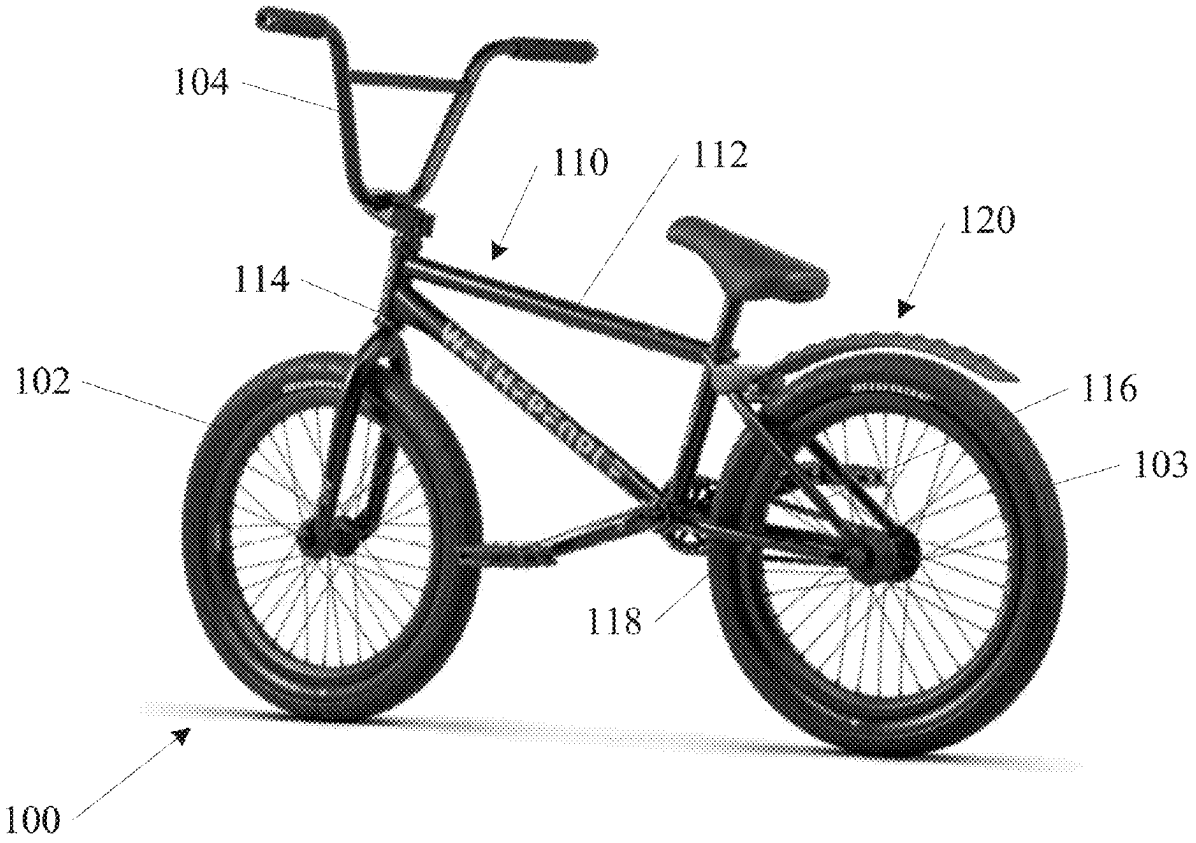
(57) **ABSTRACT**

A bicycle braking device and associated methods are disclosed. In one example, the bicycle braking device includes an elongated contact surface for actuation by a user, where the elongated contact surface can be pressed against a bicycle tire to slow or stop the bicycle. In selected examples, the bicycle braking device includes a replaceable brake pad with high friction and wear properties.



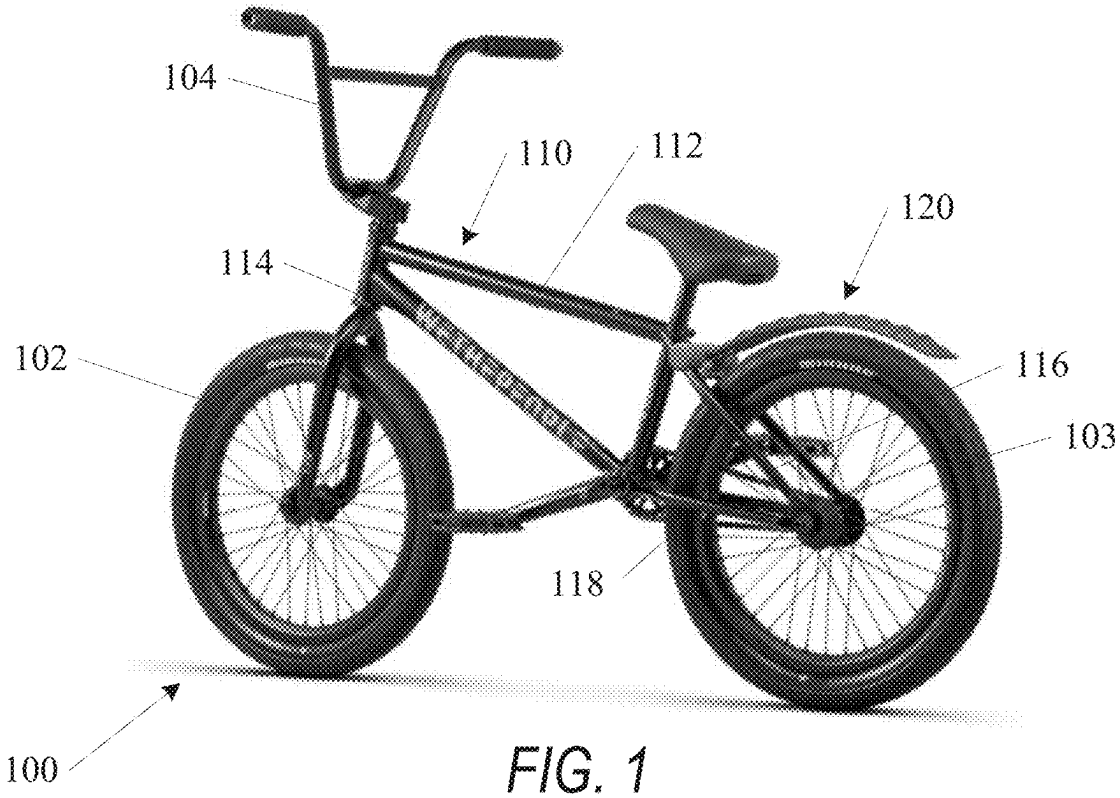

104
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FIG. 1

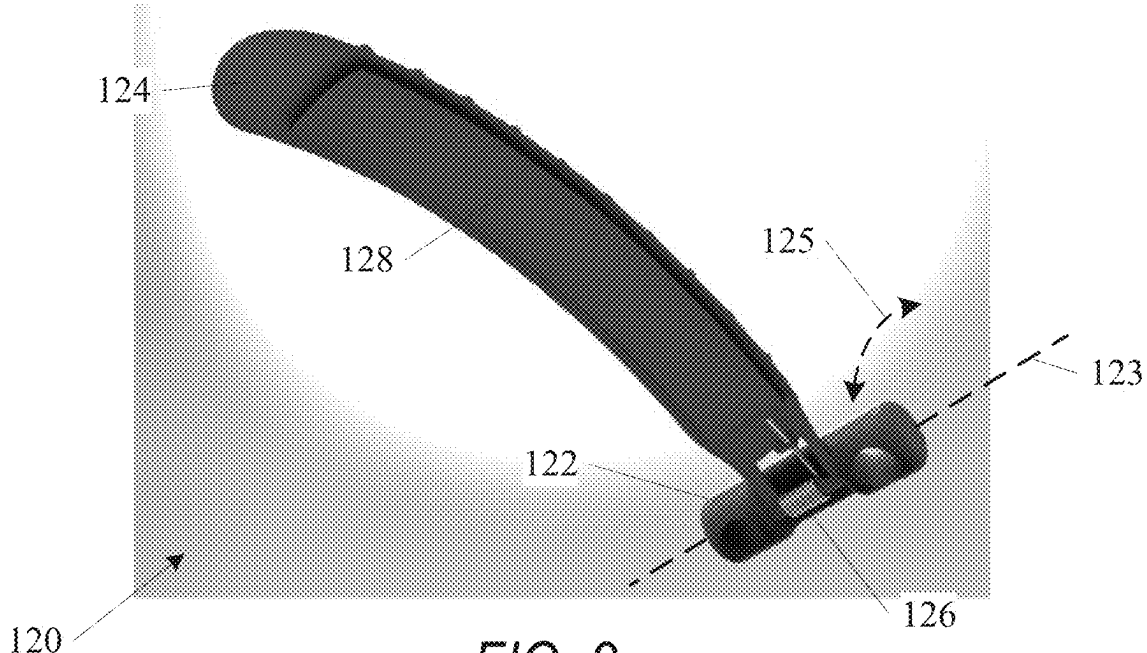
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FIG. 2

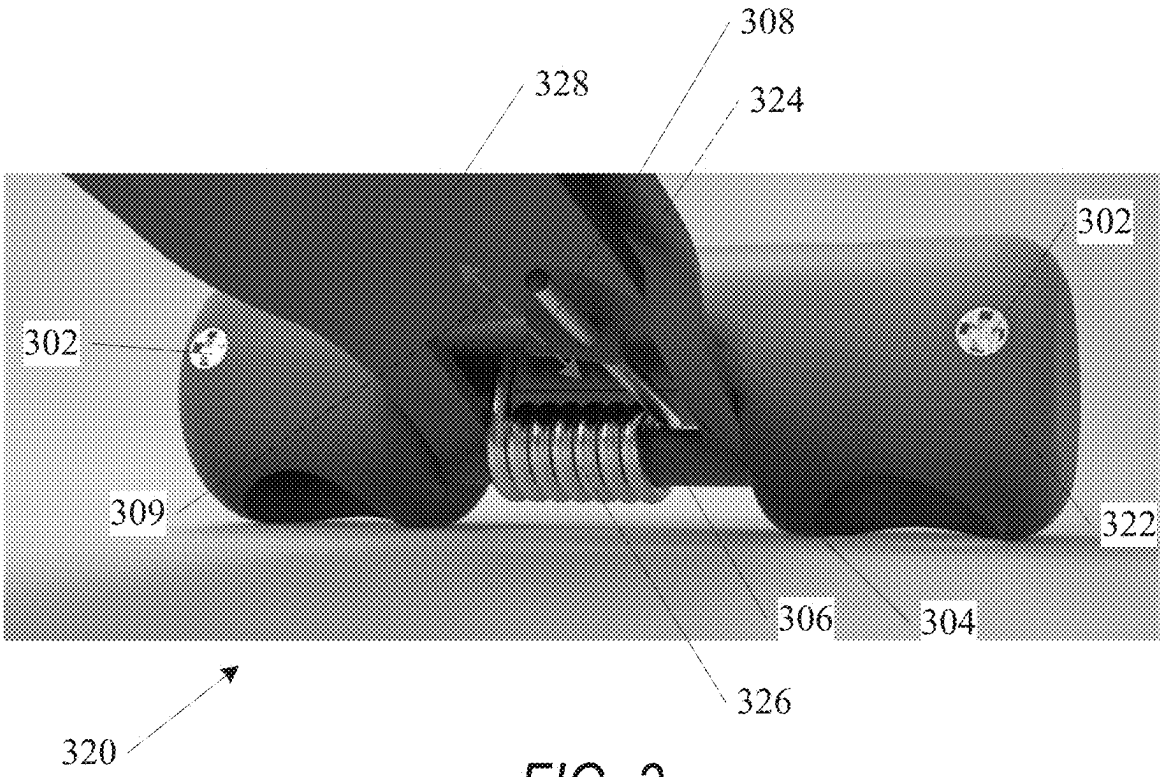

FIG. 3

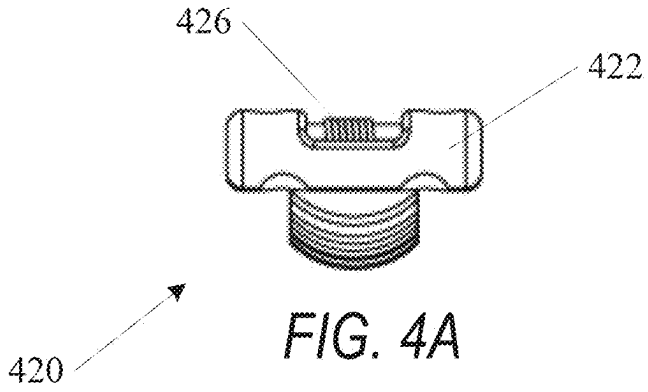

FIG. 4A

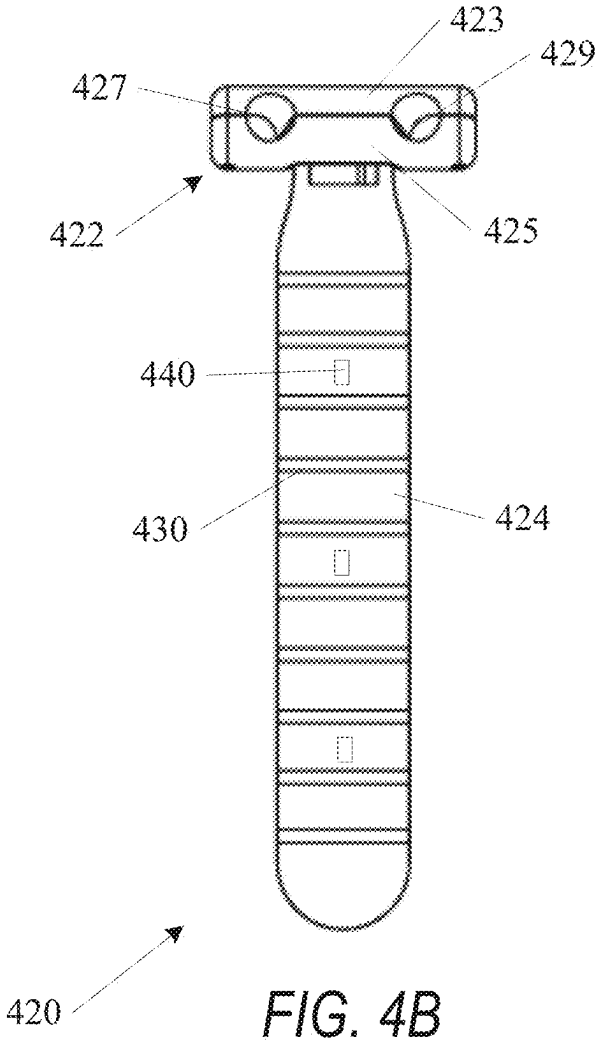

FIG. 4B

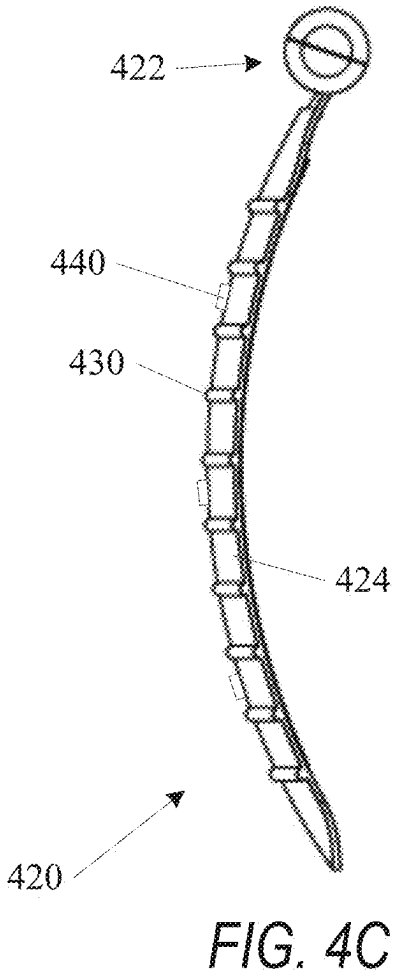

FIG. 4C

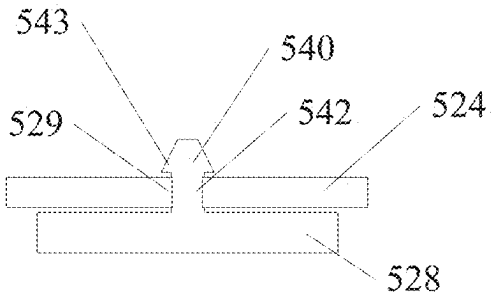

FIG. 5

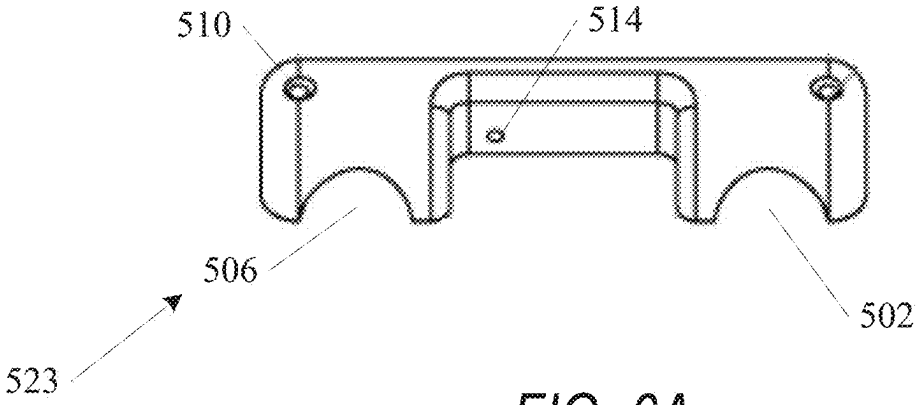

FIG. 6A

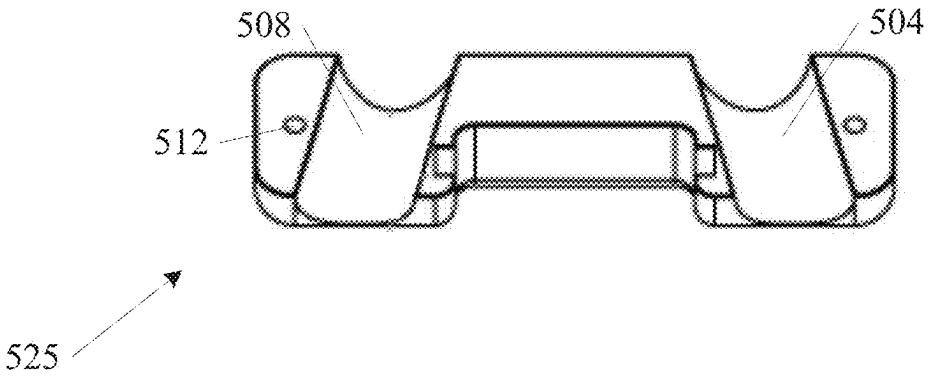

FIG. 6B

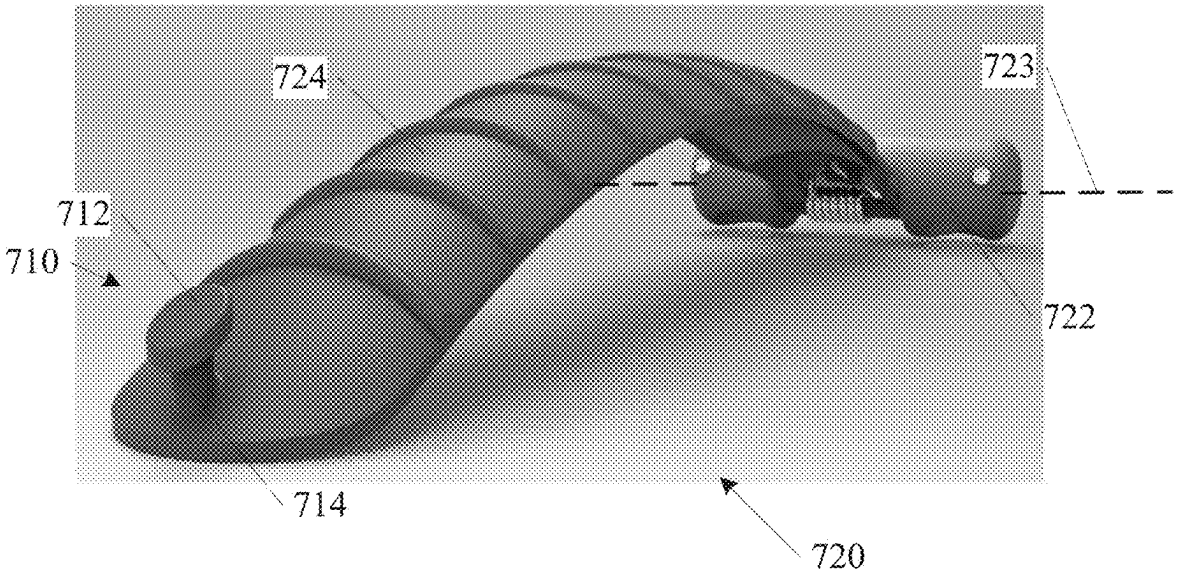

FIG. 7

BICYCLE BRAKING DEVICE AND METHOD

TECHNICAL FIELD

[0001] Embodiments described herein generally relate to bicycles, bicycle braking devices and associate methods.

BACKGROUND

[0002] Bicycles are a popular vehicle for transportation and recreation. One type of recreation includes freestyle riding where tricks or maneuvers are performed. Often the maneuvers are performed at a park or area designated for bicycles, skateboards, etc. Conventional bicycle brakes often require cables between a brake lever on a handlebar and a brake caliper at a given wheel of the bicycle. When used for trick riding, the cables can inhibit some desired tricks. For example, spinning the handlebars around more than 180 degrees may be difficult or impossible with many cable brake configurations. As a result, many freestyle riders choose to not use brakes when performing tricks. Additionally, freestyle bike riding is often hard on bicycle equipment. Forces involved in many tricks are high, and components of the bicycle may be damaged by the trick itself, or any crashes that may be sustained when working on a trick.

[0003] It is desired to have the ability to reliably slow or stop a freestyle bicycle with a durable device that can withstand the rigors of practicing and performing tricks. A bicycle braking device is desired that address these concerns, and other technical challenges.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIG. **1** shows a bicycle with a braking device in accordance with some example embodiments.

[0005] FIG. **2** shows a bicycle braking device in accordance with some example embodiments.

[0006] FIG. **3** shows a close up view of selected components of a bicycle braking device in accordance with some example embodiments.

[0007] FIG. **4**A shows an end view of a bicycle braking device in accordance with some example embodiments.

[0008] FIG. **4**B shows a top view of the bicycle braking device from FIG. **4**A in accordance with some example embodiments.

[0009] FIG. **4**C shows a side view of the bicycle braking device from FIG. **4**A in accordance with some example embodiments.

[0010] FIG. **5** shows a close up view of a brake pad of a bicycle braking device in accordance with some example embodiments.

[0011] FIG. **6**A shows a component of a bicycle frame attachments of a bicycle braking device in accordance with some example embodiments.

[0012] FIG. **6**B shows another component of a bicycle frame attachments of a bicycle braking device in accordance with some example embodiments.

[0013] FIG. **7** shows another bicycle braking device in accordance with some example embodiments.

DESCRIPTION OF EMBODIMENTS

[0014] The following description and the drawings sufficiently illustrate specific embodiments to enable those skilled in the art to practice them. Other embodiments may incorporate structural, logical, electrical, process, and other changes. Portions and features of some embodiments may be included in, or substituted for, those of other embodiments. Embodiments set forth in the claims encompass all available equivalents of those claims.

[0015] FIG. **1** shows a bicycle **100**. The bicycle **100** includes a pair or wheels **102**, handlebars **104**, and a frame **110**. The frame **110** includes a top tube **112**, a downtube **114**, seat stays **116**, and chain stays **118**. A braking device **120** is included in the bicycle **100** of FIG. **1**. In the example shown, the braking device **120** is coupled to the bicycle frame **110** in a location adjacent to a tire **103** of the rear wheel **102**.

[0016] In one example, the bicycle **100** is a freestyle bicycle that is used for performing tricks. In freestyle bicycle riding, traditional bicycle brakes are often not practical, as they can get in the way of the rider, and may prohibit certain motions of the bicycle during tricks. However, control over speed is desirable during use.

[0017] In one example, the braking device **120** is pivotally connected to the bicycle frame **110** at an axis of rotation. In one example method of use, pressing on the braking device with a foot or other body part causes components of the braking device **120** to rotate, and make frictional contact with the tire **103**. In one example, the frictional contact causes a braking force that slows down the bicycle. When slowing or stopping is no longer desired, the user removes their foot or other body part from the braking device **120**, and the tire **103** and wheel **102** are again free to rotate. More detailed description of the components and operation of the braking device **120** is provided in examples below.

[0018] FIG. **2** shows the braking device **120** from FIG. **1**. A bicycle frame attachment **122** is shown. An extended contact surface **124** is shown, pivotally connected to the bicycle frame attachment **122** at an axis of rotation **123**. In one example, the extended contact surface **124** includes a curved surface. In one example, the curved surface is configured to follow a diameter of a bicycle wheel. This provides improved frictional contact between the extended contact surface **124** and a bicycle tire.

[0019] The extended contact surface **124** has a range of motion **125** about the axis of rotation **123**. A biasing device **126** is shown coupled between the extended contact surface **124** and the bicycle frame attachment **122** to urge the extended contact surface **124** toward a first location within the range of motion **125**. In operation, the first location is a location that is away from the tire **103**, but only at a close distance, so that when a user applies their foot or other body part to a backside of the extended contact surface **124**, the extended contact surface **124** is able to quickly make frictional contact with the tire **103**.

[0020] The braking device **120** of FIG. **2** further shows a brake pad **128** attached to a bottom of the extended contact surface **124**. In one example, the brake pad **128** is formed from a material that provides a desired level of friction with the tire **103**. In one example, the brake pad **128** is formed from a material that provides a low wear rate. In one example, the brake pad **128** is formed from a material that reduces damage to the tire **103**. These properties may not be the same as the material chosen for the extended contact surface **124**. In one example, the brake pad **128** includes copper. Copper provides a number of advantages, including high heat dissipation from friction. In one example, the brake pad **128** includes ceramic material. Examples of ceramic material include, but are not limited to, a composite that includes ceramic powder, sintered ceramic solids, etc. Ceramic material provides a number of advantages, includ-

ing high heat resistance from friction, and high wear resistance. In one example, the brake pad **128** includes a polymer material. One example of a polymer material includes a silicone material. Polymer material provides a number of advantages, including resilient deformation that can be useful for attachment and replacement as discussed in more detail below. Silicone material provides a number of advantages, including high heat resistance from friction.

[0021] FIG. **3** shows a close-up view of selected components of a bicycle braking device **320**, similar to the bicycle braking device **120** from FIGS. **1** and **2**. An extended contact surface **324** is shown coupled to a bicycle frame attachment **322**. A brake pad **328** is included in the example of FIG. **3**. In one example, the bicycle frame attachment **322** includes a pair of split body members that are secured together using fasteners **302**. Details of the split body members are discussed in more detail below.

[0022] FIG. **3** shows a close-up view of a biasing device **326** similar to the biasing device **126** from FIG. **2**. In the example shown, the biasing device **326** includes a spring. In one example the biasing device **326** includes a metallic spring, although other materials, such as carbon fiber, polymers, etc. are also within the scope of the invention. Metallic springs may include steel, stainless steel, aluminum, etc. Stainless steel provides a number of advantages, including high resistance to corrosion.

[0023] In one example the biasing device **326** includes a torsion spring, although the invention is not so limited. Other spring configurations, such as coil springs, extension springs, compression springs, leaf springs, flat springs, etc. are also within the scope of the invention. In the example of FIG. **3**, the biasing device **326** includes a torsion spring that is located on a hinge portion **306**. In one example, the hinge portion **306** is integrally molded with the extended contact surface **324**. The hinge portion **306** defines an axis of rotation of the extended contact surface **324**, as shown with axis **123** in the example of FIG. **2**. The example of FIG. **3** further includes a spring retainer **304** that engages with an end **308** of the torsion spring **326**. In on example, the spring retainer **304** is integrally molded with the extended contact surface **324**.

[0024] Integral molding simplifies construction, reduces cost, and provides a robust construction of the bicycle braking device **120**. In one example, the extended contact surface **324** and associated integrally molded components are formed from acrylonitrile butadiene styrene (ABS) polymer. Other polymers are also within the scope of the invention, although ABS provides a high level of toughness at a low manufacturing cost.

[0025] In the example of FIG. **3**, the spring retainer **304** is configured to both secure the end **308** of the torsion spring **326** and to allow a linear degree of freedom **309** of the end **308** of the spring **326**. In operation, as the extended contact surface **324** pivots, the linear degree of freedom **309** of the end **308** of the spring **326** allows the biasing force to be applied, while still permitting motion of the contact surface **324**.

[0026] FIGS. **4**A-**4**C show three views of a bicycle braking device **420**, similar to the bicycle braking device **120** from FIGS. **1** and **2**. In FIG. **4**A, an end view shows a bicycle frame attachment **422** and a biasing device **426**. In FIG. **4**B, a top view shows the bicycle frame attachment **422** including a first split body member **423** and a second split body member **425**. The first split body member **423** and the second split body member **425** are coupled together to define a pair of seat stay openings **427**, **429**. In operation, the pair of seat stay openings **427**, **429** correspond to a size and angle of seat stays **116** as shown in FIG. **1**. Although seat stay mounting is shown in selected examples, the invention is not so limited. Other frame members, or other bicycle components can also be used to mount the bicycle braking device **420**. Examples include, but are not limited to, seats, seatposts, brake bridges, top tubes, etc.

[0027] FIG. **4**B further shows one or more ridges **430** on a user side of an extended contact surface **424**. In operation, the one or more ridges **430** provide additional traction to help keep a user's foot or other body part in place while applying braking pressure to the extended contact surface **424**. Although ridges are shown, other structures, such as an abrasive surface finish, a number of bumps, etc. are possible structure to help engage a user's foot, etc.

[0028] FIG. **4**B also shows a number of attachment devices **440**. In one example, the attachment device **440** are configured to secure a brake pad to the extended contact surface **424**. Fasteners, such as screws, nuts, etc. are possible attachment devices **440**. In one example, an attachment device **440** includes an integrally molded attachment device **440**, and a brake pad is replaceable without the use of tools. One example of an integrally molded attachment device **440** is shown in more detail in FIG. **5**.

[0029] FIG. **4**C shows a side view of the bicycle frame attachment **422** including the bicycle frame attachment **422**, the extended contact surface **424**, and the one or more ridges **430**. A portion of the attachment devices **440** is also shown extending above a top surface of the extended contact surface **424**. FIG. **5** shows one example of an attachment device **540**. A brake pad **528** is shown with an integrally formed protrusion **542** and a head portion of the attachment device **540**. In the example shown, a bayonet configuration **543** is used. In use, the bayonet configuration **543** is deformed as it passes through a hole **529** in the extended contact surface **524**. The bayonet configuration **543** then springs back to its original shape, larger than the hole **529**. In this manner, the brake pad **528** can be attached to the extended contact surface **524** without the use of tools. Any deformable material can be utilized for the attachment device **540** to provide an attachment without tools. As noted above, suitable materials include, but are not limited to, polymers, metals, etc. One example includes a silicone polymer that is deformable, and has high heat resistance.

[0030] FIGS. **6**A and **6**B show additional detail of a frame attachment (**122**, **322**, **422**) that includes a pair of split body members. A first split body member **523** is shown in FIG. **6**A, and a second split body member **525** is shown in FIG. **6**B. The split body members **523**, **525** define a pair of seat stay openings. A first opening part **502** and a second opening part **504** come together to form a first seat stay opening. A third opening part **506** and a fourth opening part **508** come together to form a second seat stay opening. In one example, engaging two seat stays provides better stability and a more secure connection for the bicycle braking device. In the example of FIG. **6**A, a second spring holder **514** is included for a second end of a spring **326** as shown in FIG. **3**. Holes **510** and **512** are included in the example of FIGS. **6**A and **6**B to accommodate fasteners such as fasteners **302**, although other coupling methods are within the scope of the invention.

[0031] FIG. **7** shows another braking device **720** similar to the braking device **120** from FIG. **1**. A bicycle frame attachment **722** is shown. An extended contact surface **724** is shown, pivotally connected to the bicycle frame attachment **722** at an axis of rotation **723**. In the Example of FIG. **7**, an accessory post **710** is further provided. In one example, the accessory post **710** is integrally molded with the extended contact surface **724**, although the invention is not so limited. Integral molding provides increased strength to the accessory post **710** and reduced manufacturing cost. In one example, the accessory post **710** is configured to attach a bicycle light.

[0032] In the example shown, the accessory post **710** includes an attachment section **714** and a retainer **712**. In one example, the attachment section **714** is dimensioned within a range of possible diameters to approximate a commercial bicycle seat post. In one example, a range of diameters is between 25 mm and 30 mm in diameter. A number of commercially available bicycle lights are designed to mount to a seatpost. By configuring the attachment section **714** to approximate a seatpost, easy attachment of existing bicycles lights is facilitated. In selected configurations, the retainer **712** is further included as a wider portion above the attachment section **714**. In operation, the inclusion of a retainer **712** helps to keep an attached bicycle light from sliding upwards and falling off the accessory post **710**.

[0033] To better illustrate the method and apparatuses disclosed herein, a non-limiting list of embodiments is provided here:

[0034] Example 1. A bicycle braking device, comprising: a bicycle frame attachment; an extended contact surface, pivotally connected to the bicycle frame attachment at an axis of rotation, the extended contact surface having a range of motion about the axis of rotation; a biasing device coupled between the extended contact surface and the bicycle frame attachment to urge the extended contact surface toward a first location within the range of motion.

[0035] Example 2. The bicycle braking device of Example 1, further including a brake pad attached to a bottom of the extended contact surface.

[0036] Example 3. The bicycle braking device of Example 2, wherein the brake pad includes copper.

[0037] Example 4. The bicycle braking device of Example 2, wherein the brake pad includes a ceramic.

[0038] Example 5. The bicycle braking device of Example 2, wherein the brake pad includes silicone.

[0039] Example 6. The bicycle braking device of Example 5, wherein the brake pad includes an integrally molded attachment device, and the brake pad is replaceable without use of tools.

[0040] Example 7. The bicycle braking device of Example 1, wherein the bicycle frame attachment includes a pair of split body members, when coupled together along a split seam, the split body members defining a pair of seat stay openings.

[0041] Example 8. The bicycle braking device of Example 1, wherein the extended contact surface includes a curved surface.

[0042] Example 9. The bicycle braking device of Example 1, wherein the extended contact surface includes one or more ridges.

[0043] Example 10. The bicycle braking device of Example 1, wherein the extended contact surface includes an ABS polymer; and an integrally molded hinge portion.

[0044] Example 11. The bicycle braking device of Example 10, wherein the biasing device includes a metal spring.

[0045] Example 12. The bicycle braking device of Example 11, wherein the extended contact surface includes an integrally molded spring retainer.

[0046] Example 13. The bicycle braking device of Example 12, wherein the spring retainer is configured to allow a linear degree of freedom of an end of the metal spring.

[0047] Example 14. The bicycle braking device of Example 1, further including an accessory post located at an end of the extended contact surface.

[0048] Example 15. A bicycle, comprising: a pair of wheels attached to a bicycle frame, the frame including; a top tube; a down tube; chain stays; seat stays; a braking device, including; a bicycle frame attachment coupled to the frame; an extended contact surface, pivotally connected to the bicycle frame attachment at an axis of rotation, the extended contact surface having a range of motion about the axis of rotation; and a biasing device coupled between the extended contact surface and the bicycle frame attachment to urge the extended contact surface toward a first location within the range of motion, wherein the first location is spaced away from a rear tire of the pair of wheels.

[0049] Example 16. The bicycle of Example 15, wherein the bicycle frame attachment is coupled to the frame at a location on the seat stays.

[0050] Example 17. The bicycle of Example 16, wherein the bicycle frame attachment is coupled to both seat stays of the frame.

[0051] Example 18. The bicycle of Example 15, further including a brake pad attached to a bottom of the extended contact surface.

[0052] Example 19. The bicycle of Example 18, wherein the brake pad includes a polymer.

[0053] Example 20. The bicycle of Example 19, wherein the brake pad includes an integrally molded attachment device, and the brake pad is replaceable without use of tools.

[0054] Example 21. The bicycle of Example 20, wherein the extended contact surface includes one or more ridges.

[0055] Throughout this specification, plural instances may implement components, operations, or structures described as a single instance. Although individual operations of one or more methods are illustrated and described as separate operations, one or more of the individual operations may be performed concurrently, and nothing requires that the operations be performed in the order illustrated. Structures and functionality presented as separate components in example configurations may be implemented as a combined structure or component. Similarly, structures and functionality presented as a single component may be implemented as separate components. These and other variations, modifications, additions, and improvements fall within the scope of the subject matter herein.

[0056] Although an overview of the inventive subject matter has been described with reference to specific example embodiments, various modifications and changes may be made to these embodiments without departing from the broader scope of embodiments of the present disclosure. Such embodiments of the inventive subject matter may be referred to herein, individually or collectively, by the term "invention" merely for convenience and without intending

to voluntarily limit the scope of this application to any single disclosure or inventive concept if more than one is, in fact, disclosed.

[0057] The embodiments illustrated herein are described in sufficient detail to enable those skilled in the art to practice the teachings disclosed. Other embodiments may be used and derived therefrom, such that structural and logical substitutions and changes may be made without departing from the scope of this disclosure. The Detailed Description, therefore, is not to be taken in a limiting sense, and the scope of various embodiments is defined only by the appended claims, along with the full range of equivalents to which such claims are entitled.

[0058] As used herein, the term "or" may be construed in either an inclusive or exclusive sense. Moreover, plural instances may be provided for resources, operations, or structures described herein as a single instance. Additionally, boundaries between various resources, operations, modules, engines, and data stores are somewhat arbitrary, and particular operations are illustrated in a context of specific illustrative configurations. Other allocations of functionality are envisioned and may fall within a scope of various embodiments of the present disclosure. In general, structures and functionality presented as separate resources in the example configurations may be implemented as a combined structure or resource. Similarly, structures and functionality presented as a single resource may be implemented as separate resources. These and other variations, modifications, additions, and improvements fall within a scope of embodiments of the present disclosure as represented by the appended claims.

[0059] The specification and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

[0060] The foregoing description, for the purpose of explanation, has been described with reference to specific example embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the possible example embodiments to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings. The example embodiments were chosen and described in order to best explain the principles involved and their practical applications, to thereby enable others skilled in the art to best utilize the various example embodiments with various modifications as are suited to the particular use contemplated.

[0061] It will also be understood that, although the terms "first," "second," and so forth may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first contact could be termed a second contact, and, similarly, a second contact could be termed a first contact, without departing from the scope of the present example embodiments. The first contact and the second contact are both contacts, but they are not the same contact.

[0062] The terminology used in the description of the example embodiments herein is for the purpose of describing particular example embodiments only and is not intended to be limiting. As used in the description of the example embodiments and the appended examples, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will also be understood that the term "and/or" as used herein refers to and encompasses any and all possible combinations of one or more of the associated listed items. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0063] As used herein, the term "if" may be construed to mean "when" or "upon" or "in response to determining" or "in response to detecting," depending on the context. Similarly, the phrase "if it is determined" or "if [a stated condition or event] is detected" may be construed to mean "upon determining" or "in response to determining" or "upon detecting [the stated condition or event]" or "in response to detecting [the stated condition or event]," depending on the context.

1. A bicycle braking device, comprising:

a bicycle frame attachment;

an extended contact surface, pivotally connected to the bicycle frame attachment at an axis of rotation, the extended contact surface having a range of motion about the axis of rotation;

a biasing device coupled between the extended contact surface and the bicycle frame attachment to urge the extended contact surface toward a first location within the range of motion.

2. The bicycle braking device of claim **1**, further including a brake pad attached to a bottom of the extended contact surface.

3. The bicycle braking device of claim **2**, wherein the brake pad includes copper.

4. The bicycle braking device of claim **2**, wherein the brake pad includes a ceramic.

5. The bicycle braking device of claim **2**, wherein the brake pad includes silicone.

6. The bicycle braking device of claim **5**, wherein the brake pad includes an integrally molded attachment device, and the brake pad is replaceable without use of tools.

7. The bicycle braking device of claim **1**, wherein the bicycle frame attachment includes a pair of split body members, when coupled together along a split seam, the split body members defining a pair of seat stay openings.

8. The bicycle braking device of claim **1**, wherein the extended contact surface includes a curved surface.

9. The bicycle braking device of claim **1**, wherein the extended contact surface includes one or more ridges.

10. The bicycle braking device of claim **1**, wherein the extended contact surface includes an ABS polymer; and

an integrally molded hinge portion.

11. The bicycle braking device of claim **10**, wherein the biasing device includes a metal spring.

12. The bicycle braking device of claim **11**, wherein the extended contact surface includes an integrally molded spring retainer.

13. The bicycle braking device of claim **12**, wherein the spring retainer is configured to allow a linear degree of freedom of an end of the metal spring.

14. The bicycle braking device of claim **1**, further including an accessory post located at an end of the extended contact surface.

15. A bicycle, comprising:

a pair of wheels attached to a bicycle frame, the frame including;

a top tube;
a down tube;
chain stays;
seat stays;
a braking device, including;
a bicycle frame attachment coupled to the frame;
an extended contact surface, pivotally connected to the bicycle frame attachment at an axis of rotation, the extended contact surface having a range of motion about the axis of rotation; and
a biasing device coupled between the extended contact surface and the bicycle frame attachment to urge the extended contact surface toward a first location within the range of motion, wherein the first location is spaced away from a rear tire of the pair of wheels.

16. The bicycle of claim **15**, wherein the bicycle frame attachment is coupled to the frame at a location on the seat stays.

17. The bicycle of claim **16**, wherein the bicycle frame attachment is coupled to both seat stays of the frame.

18. The bicycle of claim **15**, further including a brake pad attached to a bottom of the extended contact surface.

19. The bicycle of claim **18**, wherein the brake pad includes a polymer.

20. The bicycle of claim **19**, wherein the brake pad includes an integrally molded attachment device, and the brake pad is replaceable without use of tools.

21. The bicycle of claim **20**, wherein the extended contact surface includes one or more ridges.

* * * * *