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(54) **DUAL ACTION LOCKING BUCKLE DEVICE**

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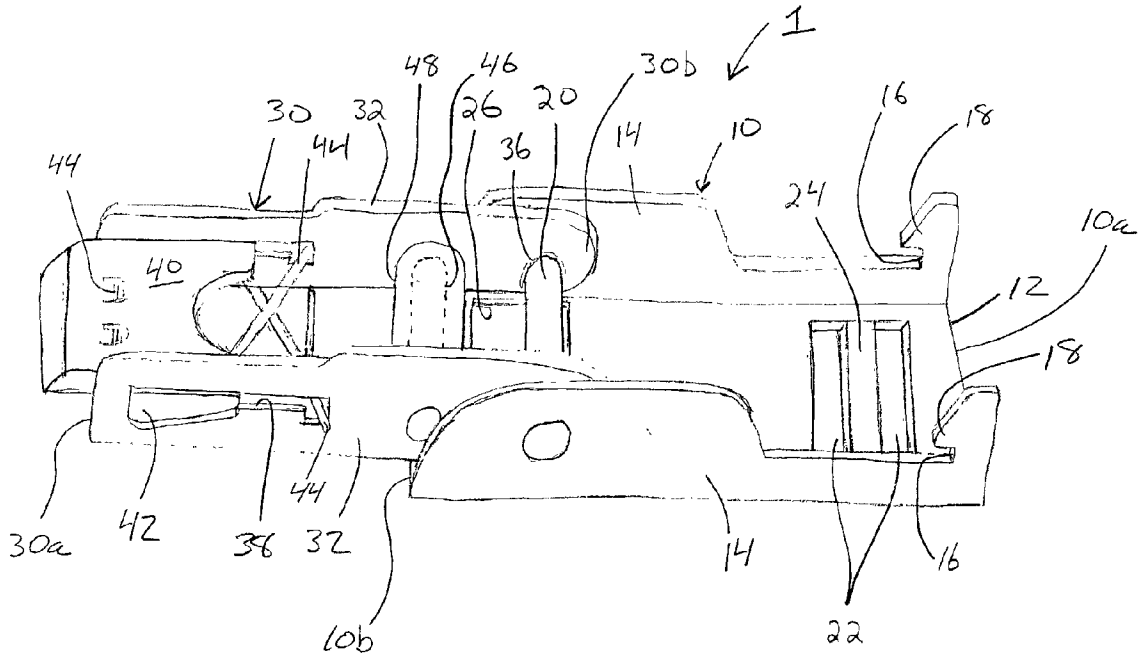
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(57) **ABSTRACT**

A strap buckle having a handle member rotatably connected to a base member about a first bolt, between an open position and a closed position. A second bolt is connected to the handle member between the first bolt and the handle member's distal end so that the second bolt rotates about the first bolt as the handle member is rotated between the open and closed positions. A sleeve is rotatably disposed around the second bolt. A strap is looped around the sleeve, with strap segments extending therefrom. When the buckle is in the open position, the strap segments extend past, but not around, the first bolt. When the buckle is in the closed position, the strap segments extend around the first bolt such that friction between the strap segments rounding the first bolt prevent movement of the strap in one direction, while allowing movement in the reverse direction.



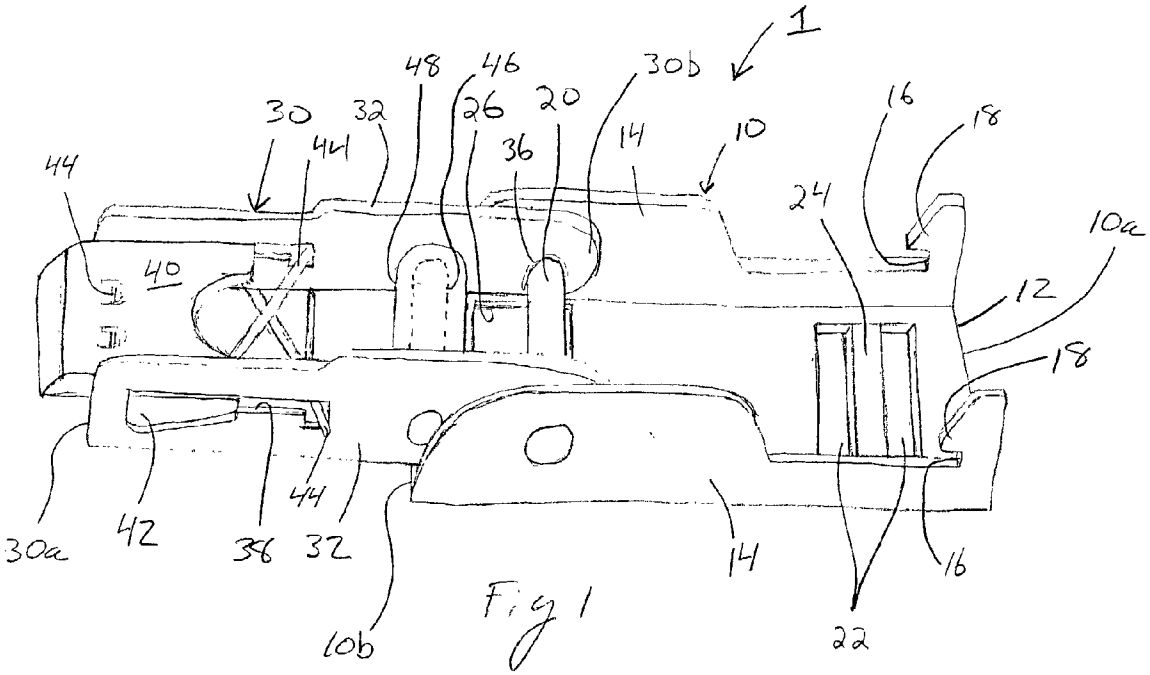

1
48
46
30b
30
32
26
20
14
10
16
18
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36
24
10a
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12
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30a
42
38
32
44
14
16
10b
22

Fig 1

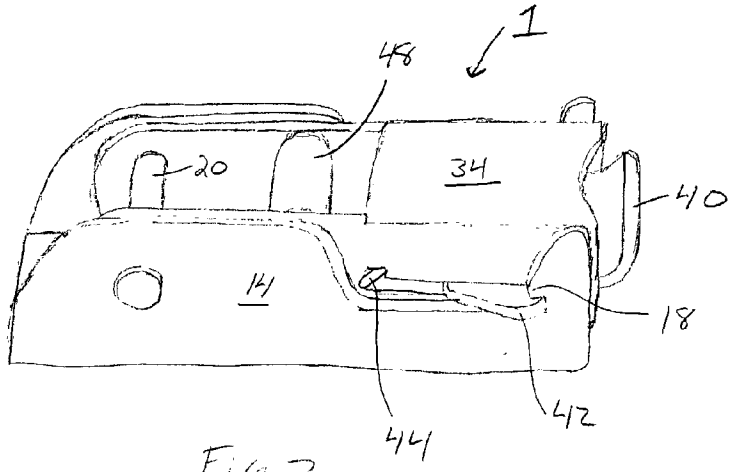

1
48
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34
40
14
18
44
42

Fig 2

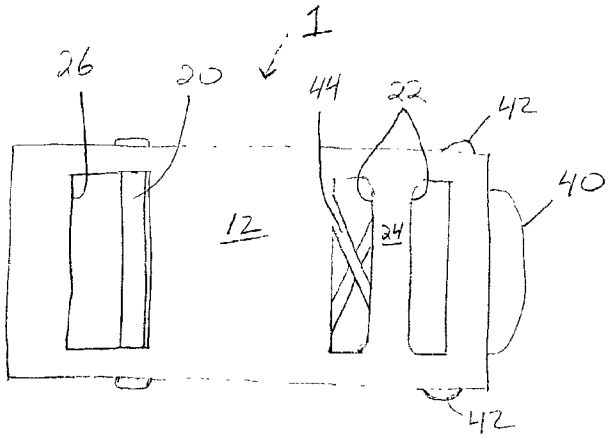


Fig 3

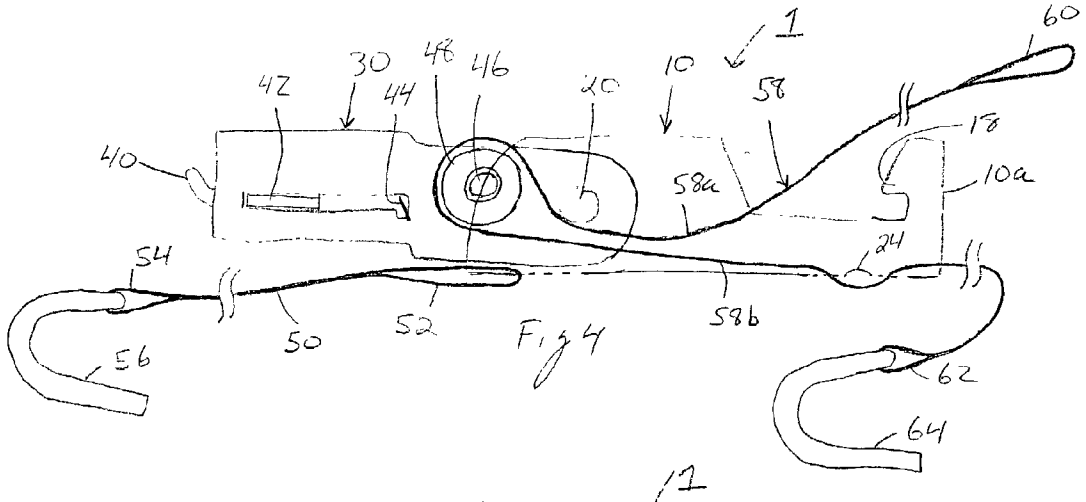


Fig 4

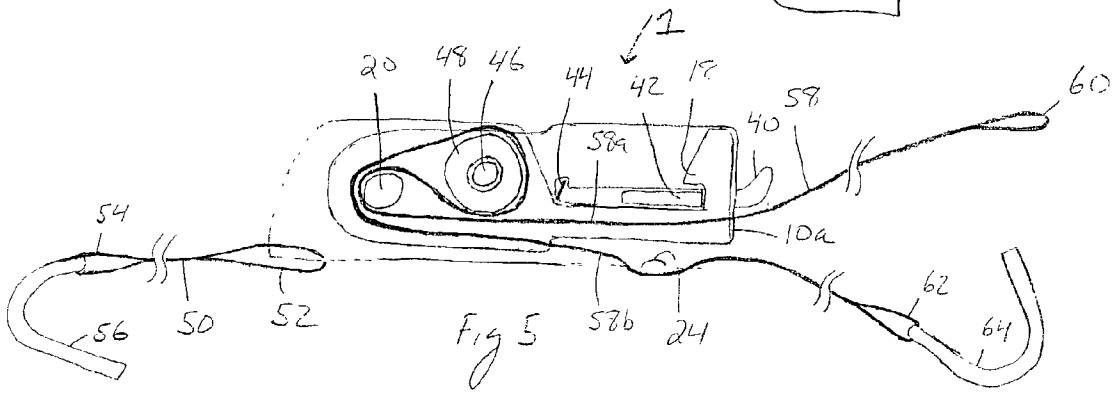


Fig 5

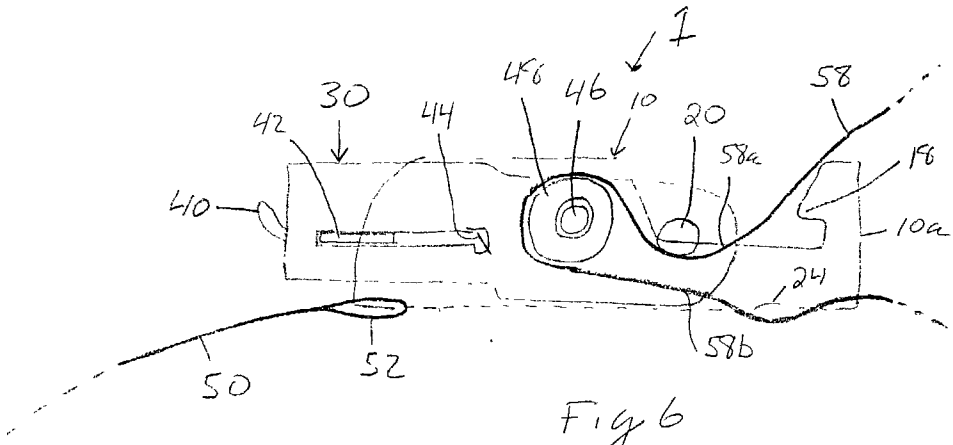

1
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42
44
46a
46
10
20
58
58a
18
40
10a
24
58b
50
52

Fig 6

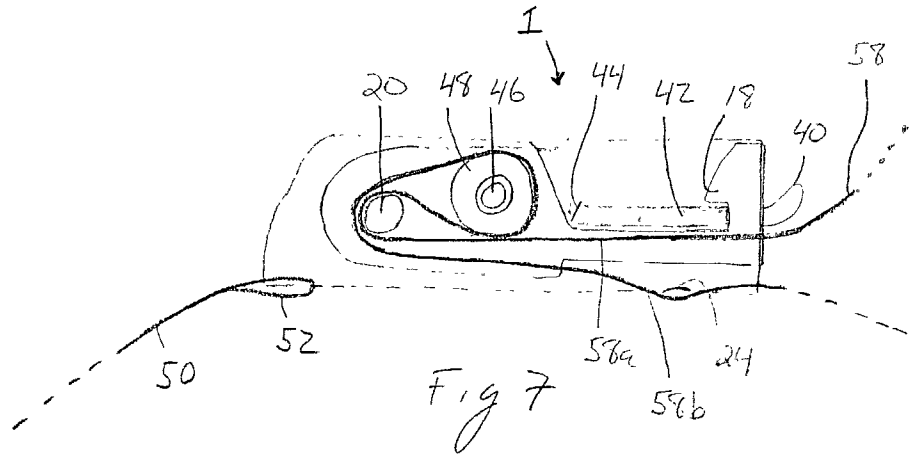

1
20
48
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44
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58
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58a
24
58b

Fig 7

DUAL ACTION LOCKING BUCKLE DEVICE

[0001] This application claims the benefit of U.S. Provisional Application No. 60/347,358, filed Jan. 11, 2002, and entitled Dual Action Locking Roller Pin Over Center Buckle.

FIELD OF THE INVENTION

[0002] The present invention relates to buckle assemblies used for tensioning and locking a strap for tying down and securing loads to anchor points, and more particularly to a buckle device that allows the user to cinch the strap tight without having to release the buckle.

BACKGROUND OF THE INVENTION

[0003] Buckle devices for tensioned straps to secure loads are known in the art. Ideally, such devices allow the user to position the strap in a semi-tensioned state, lock the buckle to prevent the strap from moving in a reverse direction through the buckle, and still allow the strap to move in a forward direction so that user can pull the free end of the strap until the desired tension on the strap is achieved.

[0004] One such buckle device is shown in U.S. Pat. No. 6,158,092 to Huang, which generally consists of a rotational retaining member having two shaft halves having a slit therebetween through which the free end of the strap extends. When the buckle is in its open position, the strap extends through the slit and around one of the shaft halves. The strap can be pulled through the open buckle by overcoming the frictional forces between the strap and the slit and one shaft half. When the buckle is in its closed position, the strap is wound almost completely around the retaining member and through the slit, with portions of the strap overlapping each other. Huang teaches that the strap is held in place yet still can be tightened by pulling on the strap free end because the friction between the strap and metal retaining member is smaller than the friction of the overlapping portions of the strap. However, in practice, it can still require a significant force to pull the strap through the slit and around the shaft half of the open buckle, even if the retaining member is made of a smooth metal and the strap is made of nylon. Moreover, it can also require an excessive force on the free end of the strap to pull it through the closed buckle, given that the user is overcoming significant frictional forces of rounding two orthogonal edges of the slit and sliding around both shaft halves. Still further, the Huang device uses a relatively intricate set of specialized parts to form the rotational retaining member (e.g. pair of shaft halves with polygonal studs and pin holes, side discs with polygonal holes, etc), which makes the bracket device rather complicated and expensive to make.

[0005] There is a need for a strap buckle design that minimizes the pulling force needed to move the strap through the buckle in its open position, that secures the strap from reverse movement in its closed position, and that minimizes the pulling force needed to cinch the strap tighter in the forward direction when the buckle is in its closed position. Such a buckle design should be simple in both design and operation.

SUMMARY OF THE INVENTION

[0006] The present invention is a buckle device that secures the strap from reverse movement, yet minimizes the pulling force needed to cinch the strap tight while the buckle is in its closed position.

[0007] The buckle device of the present invention includes a base member having opposing sidewalls and a distal end, a handle member having opposing arms and a distal end, a first bolt that rotatably connects the sidewalls to the arms so that the handle member rotates relative to the base member about the first bolt between an open position with the distal ends separated from each other and a closed position with the distal ends positioned adjacent to each other, a second bolt connected between the arms so that the second bolt rotates around the first bolt as the handle rotates between the open and closed positions, a sleeve rotatably disposed around one of the first and second bolts, and a strap looped around the sleeve with a free segment and a load segment of the strap extending therefrom. With the handle member in the open position, the free and load segments extend past, but not around, the other one of the first and second bolts. With the handle member in the closed position, the free and load segments extend around the other one of the first and second bolts, with the free segment disposed between the load segment and the other one of the first and second bolts, such that the strap is allowed to move around the sleeve as the free segment is pulled but is prevented from moving around the sleeve as the load segment is pulled by friction between the free and load segments extending around the other one of the first and second bolts.

[0008] In another aspect of the present invention, the buckle device includes a base member having opposing sidewalls and a distal end, a handle member having opposing arms and a distal end, a first bolt that rotatably connects the sidewalls to the arms so that the handle member rotates relative to the base member about the first bolt between an open position with the distal ends separated from each other and a closed position with the distal ends positioned adjacent to each other, a second bolt connected between the arms so that the second bolt rotates around the first bolt as the handle rotates between the open and closed positions, wherein one of the first and second bolts is disposed closer to the base member distal end relative to the other one of the first and second bolts with the handle in the open position, and wherein the other one of the first and second bolts is disposed closer to the base member distal end relative to the one of the first and second bolts with the handle in the closed position, a sleeve rotatably disposed around the other one of the first and second bolts, and a strap looped around the sleeve with a free segment and a load segment of the strap extending therefrom. With the handle member in the open position, the free and load segments extend past, but not around, the one of the first and second bolts. With the handle member in the closed position, the free and load segments extend around the one of the first and second bolts, with the free segment disposed between the load segment and the one of the first and second bolts, such that the strap is allowed to move around the sleeve as the free segment is pulled but is prevented from moving around the sleeve as the load segment is pulled by friction between the free and load segments extending around the one of the first and second bolts.

[0009] In yet another aspect of the present invention, the buckle device includes a base member having a proximate end and a distal end, a handle member having a proximate end and a distal end, a first bolt that rotatably connects the proximate ends together so that the handle member rotates relative to the base member about the first bolt between an open position with the distal ends separated from each other

and a closed position with the distal ends positioned adjacent to each other, a second bolt connected to the handle member at a position between the first bolt and the handle member proximate end so that the second bolt rotates around the first bolt as the handle rotates between the open and closed positions, a sleeve rotatably disposed around the second bolt, and a strap looped around the sleeve with a free segment and a load segment of the strap extending therefrom. With the handle member in the open position, the free and load segments extend past, but not around, the first bolt. With the handle member in the closed position, the free and load segments extend around the first bolt, with the free segment disposed between the load segment and the first bolt, such that the strap is allowed to move around the sleeve as the free segment is pulled but is prevented from moving around the sleeve as the load segment is pulled by friction between the free and load segments extending around the first bolt.

[0010] Other objects and features of the present invention will become apparent by a review of the specification, claims and appended figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] **FIG. 1** is a perspective view of the buckle assembly of the present invention, in its open position.

[0012] **FIG. 2** is a perspective view of the buckle assembly of the present invention, in its closed position.

[0013] **FIG. 3** is a bottom view of the buckle assembly of the present invention.

[0014] **FIG. 4** is a cross-sectional view of the buckle assembly of the present invention, in its open position.

[0015] **FIG. 5** is a cross-sectional view of the buckle assembly of the present invention, in its closed position.

[0016] **FIG. 6** is a cross-sectional view of an alternate embodiment of the buckle assembly of the present invention, in its open position.

[0017] **FIG. 7** is a cross-sectional view of the alternate embodiment of the buckle assembly of the present invention, in its closed position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] The buckle assembly **1** of the present invention is illustrated in FIGS. **1-3**, and includes a base member **10** pivotly attached to a handle member **30**.

[0019] The base member **10** includes a base plate **12** with two opposing sidewalls **14** extending therefrom. Notches **16** creating engagement hooks **18** are formed in the sidewalls **14** near a distal end **10***a* of base member **10**. A first bolt **20** is connected between the sidewalls **14** near a proximate end **10***b* of base member **10**. Any conventional attachment scheme (e.g. rivet, bolt head, welding, etc.) can be used to secure bolt **20** to sidewalls **14**. A pair of strap openings **22** are formed in base plate **12** near base member distal end **10***a*, leaving a beam **24** formed therebetween. A single strap opening **26** is formed in the base plate **12** near proximate end **10***b*.

[0020] The handle member **30** includes a pair of arm members **32** joined together by a support plate **34** near a distal end **30***a* of handle member **30**. The arms **32** include bolt holes **36** near a proximate end **30***b* of handle member **30**, through which first bolt **20** extends so that the proximate ends **10***b*/**30***b* of base and handle members **10**/**30** are rotatably connected to each other about first bolt **20**. Slots **38** are formed in arms **32** adjacent handle member distal end **30***a*. A latch plate **40** includes engagement tabs **42** that slidably extend out through slots **38**. A spring member **44** engaged between slots **38** and latch plate **40** biases plate **40** toward the handle member distal end **30***a*. A second bolt **46** is connected between arms **32** at a position between first bolt **20** and handle member distal end **30***a*. A hollow sleeve **48** is disposed around, and freely rotates about, second bolt **46** (i.e. the inner diameter of sleeve **48** is greater than the outer diameter of the second bolt **46**).

[0021] The handle member **30** rotates relative to base member **10** between an open (unfolded) position and a closed (folded) position. **FIG. 1** illustrates the handle member open position, where the distal ends **10***a*/**30***a* are extended away from each other. **FIGS. 2 and 3** illustrate the handle member closed position, where the handle member **30** rotates about first bolt **20** and distal ends **10***a*/**30***a* fold toward each other, until engagement tabs **42** snap into and engage with hooks **18** to secure handle member **30** in the closed position. To open the buckle back to its open position, the latch plate **40** is urged back against the resilient force of spring **44** until tabs **42** clear hooks **18**, where the handle member **30** can then be rotated to the open position of **FIG. 1**.

[0022] **FIGS. 4 and 5** illustrate the strap paths for the buckle in both the open and closed positions. Specifically, a first strap **50** has a first end that terminates in a loop **52** that is connected around strap opening **26**, and a second end that terminates in a second loop **54** connected around a load hook **56**. Load hook **56** is shaped to easily engage with anchor points used to secure a load.

[0023] A second strap **58** has a first end **60** that is free and preferably (but not necessarily) terminates in a loop that is not connected to anything, and a second (load) end terminating in a loop **62** that is connected around a load hook **64**. The second strap **58** is positioned in the buckle **1** as follows. With the buckle **1** in its open position, the free end **60** of strap **58** enters the buckle from the distal end **10***a* through the first strap opening **22** and back up through the second strap opening **22** (i.e. around beam **24**), and is fed underneath bolt **20**, underneath and around hollow sleeve **48**, back underneath bolt **20**, and out of distal end **10***a* of buckle **1**, as shown in **FIG. 4**. In this position, the strap passes virtually unhindered past bolt **20** and is looped around hollow sleeve **48**, with the sleeve **48** separating strap **58** into a free segment **58***a* (extending out of the buckle and terminating in free end **60**) and a load segment **58***b* (extending out of the buckle and terminating in the load end **62**). Sleeve **48** rotates freely about bolt **46** (e.g. one or both elements are formed of low friction materials, and may be lubricated), which allows the strap **58** (and sleeve **48**) to move around second bolt **46** very easily. Thus, the strap **58** can be pulled through the buckle in this open position with minimum resistance by pulling on either the free end **60** or load end **62**. Beam **24** helps keep the load segment of the strap properly referenced with respect to sleeve **48**.

[0024] **FIG. 5** illustrates the path of strap **58** when the buckle is moved to its closed position. By moving the buckle

to this closed position, bolt/sleeve **46**/**48** are rotated around to the other side of bolt **20** (i.e. toward distal end **10***a*), thereby wrapping both the free segment **58***a* and load segment **58***b* of the strap **58** around first bolt **20**, with strap free segment **58***a* disposed between first bolt **20** and load segment **58***b*. In this configuration, the strap **58** can only move in a single direction. When the free segment of the strap is pulled, there is relatively low resistance with strap **58** offered by the first bolt **20**, and very low resistance offered by the sleeve **48** (freely rotating about second bolt **46**). As long as the load segment **58***b* of strap **58** is not under tension, there is also very little friction between the free and load segments of the strap wrapped around first bolt **20** because these strap segments are not being pressed together. This allows the user to cinch the strap tight by pulling on the free end **60**, even though the buckle is closed.

[**0025**] However, when the load segment of strap **58** is tensioned (e.g. pulled by forces from the load on the load end **62**), the load segment **58***b* of the strap rounding first bolt **20** bears down against the free segment **58***a* of the strap rounding first bolt **20**. In order for the strap to move toward the load end **62**, the load and free segments of strap **58** rounding first bolt **20** (which are pressed together by the pulling force of the strap) would have to move in opposite directions. The high friction between these strap segments prevents such movement. The greater the pull force at the load end, the greater the force that presses these strap segments together (i.e. increasing the friction therebetween), thus preventing the strap from moving toward the load end. Should the load segment of the strap ever slacken, the user can cinch the strap tighter by pulling on the strap's free end without having to release the buckle from its close position.

[**0026**] The elements of buckle **1** are preferably made of any rigid and durable material, such as stainless steel or brass metal. The straps **50**/**58** are preferably made of woven nylon, polyester or any other man made and/or natural fiber.

[**0027**] The present invention provides for a buckle assembly that when in the closed position, minimizes frictional forces to allow the strap to move through the buckle in one direction, but maximizes frictional forces to prevent movement in the opposite direction. When the buckle is in its open position, the strap moves freely in both directions allowing the user to conveniently move the strap through the buckle. Moreover, the buckle of the present invention is made using simple mechanical parts (e.g. plates, bolts, sleeve, etc.) which are simple and inexpensive to manufacture.

[**0028**] **FIG. 6** illustrates an alternate embodiment of the present invention, where the handle rotates between the open and closed position about second (sleeved) bolt **46** (which is connected between base member sidewalls **14** and through apertures **36**) instead of first (unsleeved) bolt **20** (which is connected between handle member arms **32**). The orientation of the bolts **20**/**46** relative to each other are the same as described above for both the open and closed buckle positions. Namely, with the free and load segments of strap **58** entering the buckle at the distal end **10***a* of base plate **10**, and the buckle in its open position, the sleeved bolt **46** is disposed on the far side of the unsleeved bolt **20** relative to the distal end **10***a*, with the strap looped around the sleeved bolt. And, when the buckle is moved to its closed position, one of the bolts **20**/**46** rotates about the other one so that the sleeved bolt **46** is closest to the distal end **10***a*, with the strap looped around the sleeved bolt and with both the free and load segments **58***a*/**58***b* of the strap **58** looped around the unsleeved bolt **20**, and the free segment **58***a* is between the unsleeved bolt **20** and the load segment**58***b*.

[**0029**] It is to be understood that the present invention is not limited to the embodiment(s) described above and illustrated herein, but encompasses any and all variations falling within the scope of the appended claims. For example, while bolts **20**/**46** are shown to be round metallic members held in place with rivets and bolt heads, for the purposes of the present invention, these bolts can be any rigid member (e.g. rivets, pins, axles, or any other name denoting an elongated rigid member) connected to the base and handle members that allows the sleeve to freely rotate thereon and forces the free and load strap segments against each other in the buckle closed position. Further, straps **50**/**58** are shown terminating in loops, but any conventional means for attaching a strap end to hooks or buckles can be employed within the scope of the present invention. Moreover, elements such as hooks **18** and latch plate **40**, or connection points such as first bolt **20** and bolt holes **36**, etc., can be swapped between the base member **10** and handle member **30**, without materially affecting the operation of the buckle. Sidewalls **14** and arms **32** are structurally the same in that they provide opposing rigid walls between which the bolts are connected.

What is claimed is:

1. A buckle device, comprising:

a base member having opposing sidewalls and a distal end;

a handle member having opposing arms and a distal end;

a first bolt that rotatably connects the sidewalls to the arms so that the handle member rotates relative to the base member about the first bolt between an open position with the distal ends separated from each other and a closed position with the distal ends positioned adjacent to each other;

a second bolt connected between the arms so that the second bolt rotates around the first bolt as the handle rotates between the open and closed positions;

a sleeve rotatably disposed around one of the first and second bolts; and

a strap looped around the sleeve, with a free segment and a load segment of the strap extending therefrom;

wherein with the handle member in the open position, the free and load segments extend past, but not around, the other one of the first and second bolts; and

wherein with the handle member in the closed position, the free and load segments extend around the other one of the first and second bolts, with the free segment disposed between the load segment and the other one of the first and second bolts, such that the strap is allowed to move around the sleeve as the free segment is pulled but is prevented from moving around the sleeve as the load segment is pulled by friction between the free and load segments extending around the other one of the first and second bolts.

2. The buckle device of claim 1, wherein:

with the handle member in the open position, the free and load segments extend away from the sleeve and toward the base member distal end; and

with the handle member in the closed position, the free and load segments extend away from the sleeve and away from the base member distal end, around the other one of the first and second bolts, and then toward the base member distal end.

3. The buckle device of claim 1, further comprising:

hooks formed on one of the handle and base members;

a latch plate slidably attached to the other of the handle and base members for engaging with the hooks as the handle member is positioned in the closed position.

4. The buckle device of claim 3, further comprising:

a spring for resiliently urging the latch plate toward the hooks as the handle member is positioned in the closed position.

5. The buckle device of claim 1, wherein the base member further includes a base plate connected between the sidewalls with at least at least one strap opening formed therein, and wherein the strap load segment extends through the at least one strap opening.

6. The buckle device of claim 1, wherein the base member further includes a base plate connected between the sidewalls with a pair of strap openings formed therein, and wherein the strap load segment extends through the strap openings.

7. The buckle device of claim 1, further comprising:

a second strap having a first end connected to the base member.

8. The buckle device of claim 7, wherein:

the strap load segment terminates in an end that is connected to a hook member; and

the second strap having a second end that is connected to a hook member.

9. A buckle device, comprising:

a base member having opposing sidewalls and a distal end;

a handle member having opposing arms and a distal end;

a first bolt that rotatably connects the sidewalls to the arms so that the handle member rotates relative to the base member about the first bolt between an open position with the distal ends separated from each other and a closed position with the distal ends positioned adjacent to each other;

a second bolt connected between the arms so that the second bolt rotates around the first bolt as the handle rotates between the open and closed positions, wherein one of the first and second bolts is disposed closer to the base member distal end relative to the other one of the first and second bolts with the handle in the open position, and wherein the other one of the first and second bolts is disposed closer to the base member distal end relative to the one of the first and second bolts with the handle in the closed position;

a sleeve rotatably disposed around the other one of the first and second bolts; and

a strap looped around the sleeve, with a free segment and a load segment of the strap extending therefrom;

wherein with the handle member in the open position, the free and load segments extend past, but not around, the one of the first and second bolts; and

wherein with the handle member in the closed position, the free and load segments extend around the one of the first and second bolts, with the free segment disposed between the load segment and the one of the first and second bolts, such that the strap is allowed to move around the sleeve as the free segment is pulled but is prevented from moving around the sleeve as the load segment is pulled by friction between the free and load segments extending around the one of the first and second bolts.

10. The buckle device of claim 9, wherein:

with the handle member in the open position, the free and load segments extend away from the sleeve and toward the base member distal end; and

with the handle member in the closed position, the free and load segments extend away from the sleeve and away from the base member distal end, around the one of the first and second bolts, and then toward the base member distal end.

11. The buckle device of claim 9, further comprising:

hooks formed on one of the handle and base members;

a latch plate slidably attached to the other of the handle and base members for engaging with the hooks as the handle member is positioned in the closed position.

12. The buckle device of claim 11, further comprising:

a spring for resiliently urging the latch plate toward the hooks as the handle member is positioned in the closed position.

13. The buckle device of claim 9, wherein the base member further includes a base plate connected between the sidewalls with at least at least one strap opening formed therein, and wherein the strap load segment extends through the at least one strap opening.

14. The buckle device of claim 9, wherein the base member further includes a base plate connected between the sidewalls with a pair of strap openings formed therein, and wherein the strap load segment extends through the strap openings.

15. The buckle device of claim 9, further comprising:

a second strap having a first end connected to the base member.

16. The buckle device of claim 15, wherein:

the strap load segment terminates in an end that is connected to a hook member; and

the second strap having a second end that is connected to a hook member.

17. A buckle device, comprising:

a base member having a proximate end and a distal end;

a handle member having a proximate end and a distal end;

a first bolt that rotatably connects the proximate ends together so that the handle member rotates relative to the base member about the first bolt between an open

position with the distal ends separated from each other and a closed position with the distal ends positioned adjacent to each other;

a second bolt connected to the handle member at a position between the first bolt and the handle member proximate end so that the second bolt rotates around the first bolt as the handle rotates between the open and closed positions;

a sleeve rotatably disposed around the second bolt; and

a strap looped around the sleeve, with a free segment and a load segment of the strap extending therefrom;

wherein with the handle member in the open position, the free and load segments extend past, but not around, the first bolt; and

wherein with the handle member in the closed position, the free and load segments extend around the first bolt, with the free segment disposed between the load segment and the first bolt, such that the strap is allowed to move around the sleeve as the free segment is pulled but is prevented from moving around the sleeve as the load segment is pulled by friction between the free and load segments extending around the first bolt.

18. The buckle device of claim 17, wherein:

with the handle member in the open position, the free and load segments extend away from the sleeve and toward the base member distal end; and

with the handle member in the closed position, the free and load segments extend away from the sleeve and away from the base member distal end, around the first bolt, and then toward the base member distal end.

19. The buckle device of claim 17, further comprising:

hooks formed on the base member;

a latch plate slidably attached to the handle member for engaging with the hooks as the handle member is positioned in the closed position.

20. The buckle device of claim 19, further comprising:

a spring for resiliently urging the latch plate toward the distal end of the handle member.

21. The buckle device of claim 17, wherein the base member further includes a base plate with a pair of strap openings formed therein, and wherein the strap load segment extends through the strap openings.

22. The buckle device of claim 21, further comprising:

a second strap having a first end connected to the base plate.

23. The buckle device of claim 22, wherein:

the strap load segment terminates in an end that is connected to a hook member; and

the second strap having a second end that is connected to a hook member.

* * * * *