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Schnurmacher

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[54] **STRAP AND BUCKLE ASSEMBLY**

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[52] **U.S. Cl.**..... **24/68 R,** 24/68 SB, 24/68 CD, 24/71 SB, 24/71 TD, 24/71.3

[51] **Int. Cl.**..... **A43c 11/00,** A44b 21/00

[58] **Field of Search**..... 24/71.3, 71.2, 68 SB, 68 E, 24/68 F, 68 ST, 68 R, 69 R, 69 CT, 68 CD, 71 R, 71 SR; 292/246

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Attorney, Agent, or Firm—Flehr, Hohbach, Test, Albritton & Herbert

[57] **ABSTRACT**

Strap and buckle assembly for securing articles together and/or tying them down. The strap is wrapped around the articles, and the buckle is utilized in the manner of a ratchet to tighten the strap and secure it in its tightened condition. In one embodiment increasing the tension on the strap serves to enhance the clamping of the buckle parts about the strap so as to preclude accidental release between the buckle and strap. A second embodiment also provides positive locking of the buckle to the strap notwithstanding increased tension applied to the strap.

4 Claims, 8 Drawing Figures

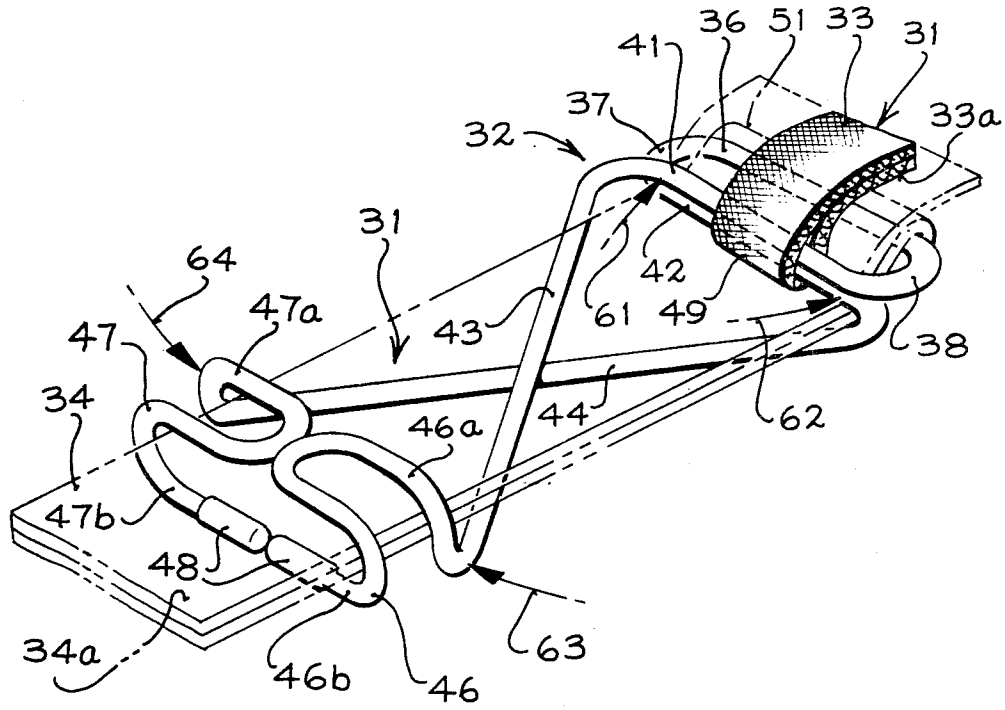
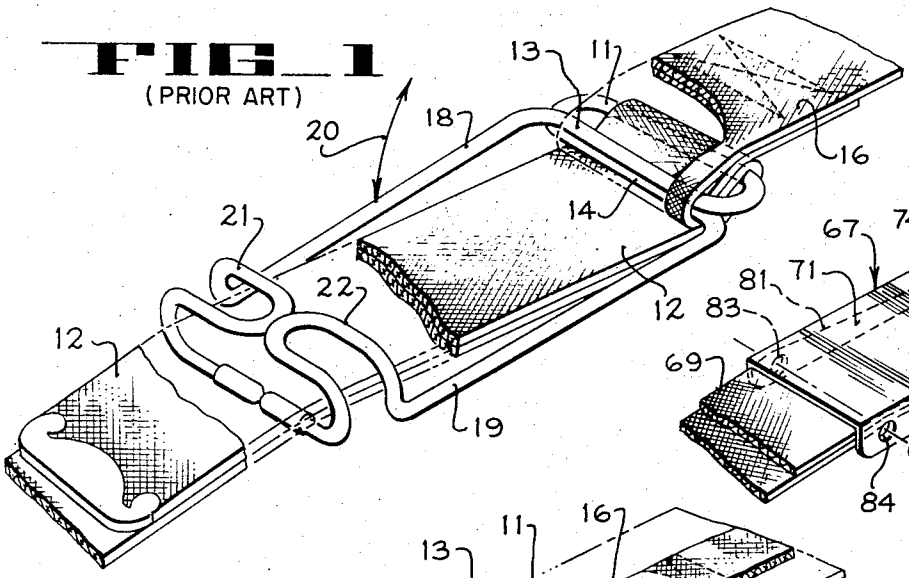


FIG_1
(PRIOR ART)



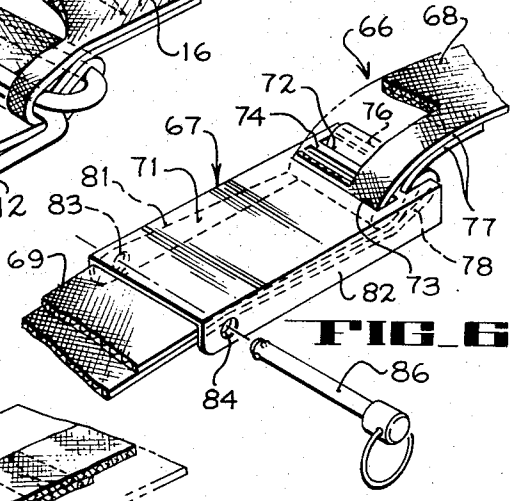


FIG_6

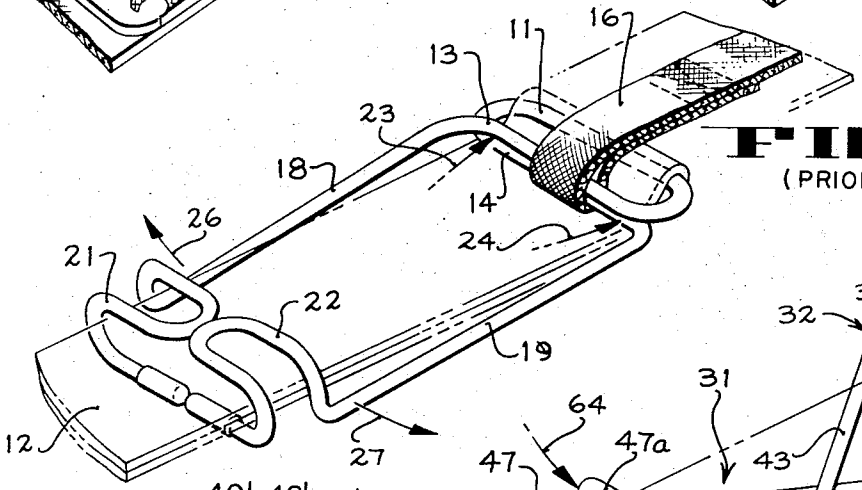


FIG_2
(PRIOR ART)

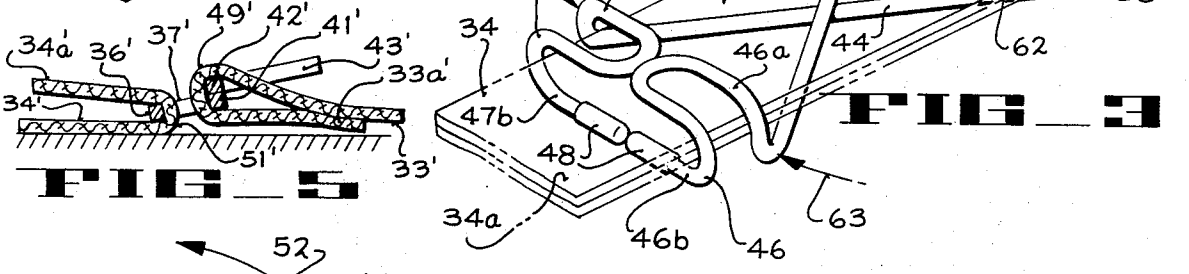


FIG_3

FIG_5

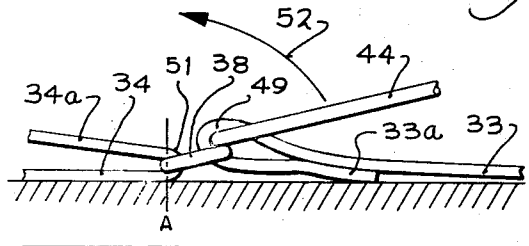


FIG_4A

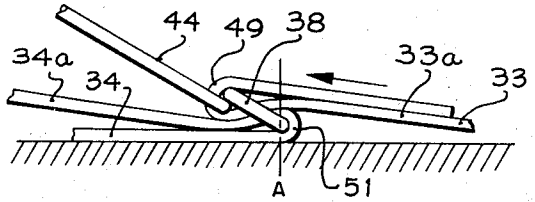


FIG_4B

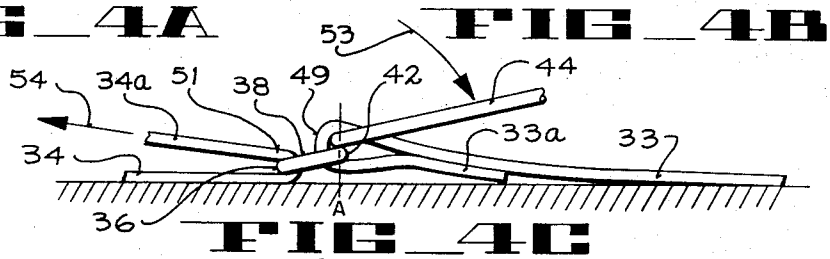


FIG_4C

STRAP AND BUCKLE ASSEMBLY

BACKGROUND OF THE INVENTION

This invention pertains generally to straps for tying and securing objects in place and more particularly to an assembly comprising a strap with a buckle which serves to tighten and hold the strap in its tightened condition.

Heretofore, straps have been utilized for securing objects tightly together as well as for tying them down as, for example, on the bed of a truck, on the deck of a ship, on the roof of a car, or in the baggage compartment of an aircraft. When two or more articles are to be secured together, a strap having a buckle affixed to one end thereof is generally passed around the articles, and the free end of the strap attached to the buckle. Certain buckles can then be used to draw the ends of the strap together to secure the strap in a tightened condition. When articles are to be secured to a base, two straps are generally utilized. One end of each strap is attached to the base by suitable fasteners, such as hooks, and the other end of one strap is permanently affixed to a buckle. When the straps have been passed over the articles to be secured, the free end of the second strap is attached to the buckle, and the buckle is utilized to draw the ends of the straps together and then to secure them.

One type of buckle heretofore provided for tightening and securing a strap is illustrated in FIGS. **1** and **2**. This buckle is formed of a resilient rod or wire stock and has a transverse cross arm **11** formed at one end and about which the free end **12** of a strap is looped. The buckle also has a pair of transverse arms **13** and **14** about which the other end **16** of the strap is looped and permanently secured, as by stitching. Substantially parallel side arms **18, 19** extend from opposite ends of the transverse arms. Hooks **21, 22** at the free ends of arms **18, 19,** respectively serve to retain the buckle flat to the strap. The buckle is pivoted back and forth about cross arm **11,** as indicated by arrow **20,** to tighten the strap, and then the buckle is secured in the position illustrated, i.e., with the buckle adjacent to free end **12** of the strap and with hooks **21** and **22** engaging the two thicknesses of the strap at this end. The buckle can be released from its secured position by spreading the free ends of arms **18** and **19** laterally apart to disengage hooks **21, 22** from the strap.

It has been observed that the foregoing buckle tends to uncontrollably release itself from its clamped position under certain circumstances. Thus, the pull of strap end **16** on transverse arms **13** and **14** tends to draw the "free" ends of these transverse arms **13, 14** backwardly as illustrated by arrows **23** and **24** thereby drawing hooks **21** and **22** laterally apart, as indicated by arrows **26** and **27.**

It will be readily evident that if the tension in the strap increases suddenly, as it can, for example, if a truck on which the strap is utilized hits a bump or has to stop abruptly, the hooks can separate sufficiently whereby they can lose their grasp on the strap, in which case the buckle springs loose and rotates clockwise (as shown in FIG. **1**) 180° about cross arm **11,** releasing the strap. Similarly, the tendency of the hooks to be drawn apart by increased tension limits the extent to which the strap can be tightened and its ultimate utility.

SUMMARY OF THE INVENTION AND OBJECTS

The invention provides a strap and buckle assembly in which the ability of the buckle to hold the strap is positively maintained notwithstanding substantial increased tension in the strap. In one embodiment, the buckle is fabricated of a resilient rod, such as spring steel, and provided with crossed arms which draw retaining hooks together as tension in the strap is increased. In another embodiment, the buckle comprises a rigid plate with a removable pin for positively locking the buckle in its secured position.

It is, in general, an object of the invention to provide a new and improved strap and buckle assembly.

Another object of the invention is to provide a strap and buckle assembly of the above character in which the buckle holds the strap in its tightened condition and is positively locked or clamped to the strap yet is readily releasable therefrom.

Additional objects and features of the invention will be apparent from the following description in which the preferred embodiments are set forth in detail in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1** and **2** show perspective views of a prior art strap and buckle assembly and are so labeled.

FIG. **3** shows a perspective view of one embodiment of a strap and buckle assembly according to the invention.

FIGS. **4A–4C** show fragmentary views, illustrating the operation of the buckle and strap assembly of FIG. **3.**

FIG. **5** shows a fragmentary sectional view of another embodiment of a strap and buckle assembly according to the invention.

FIG. **6** shows a perspective view of another embodiment of a strap and buckle assembly according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The embodiment illustrated in FIG. **3** includes an elongate strap **31** and a buckle **32.** Strap **31** is fabricated of a suitable material such as cotton or nylon belting, and is preferably woven. Strap **31** has a fixed end **33** and a free end or adjustable end **34** attached to buckle **32** in a manner described hereinafter in detail. Strap **31** can consist of either a single section or a plurality of sections. With a single section, ends **33** and **34** will be the opposite ends of the same section, while with more than one section they will be the confronting ends of different sections.

Buckle **32** is formed of a semi-rigid, resilient rod or wire stock, such as oil tempered spring steel. As illustrated, the rod has a rounded cross section, although it can have a rectangular or other suitable cross section if desired.

A transversely extending cross arm **36** is provided at one end of the buckle, and short lever arms **37** and **38** extend from the ends of cross arm **36.** Transverse arms **41, 42** extend from the short lever arms in a direction generally parallel to cross arm **36.** Elongate operating arms **43, 44** extend diagonally from opposite ends of transverse arms **41** and **42** and cross each other intermediate the ends of buckle **32.** As discussed more fully hereinafter, the strap is tightened by grasping arms **43,**

44 and pivoting the buckle back and forth about cross arm **36** between positions adjacent to strap ends **33** and **34**, respectively. The amount of tightening provided by each pivoting movement of the buckle is determined by the effective length of lever arms **37** and **38**, i.e., the distance between cross arm **36** and transverse arms **41**, **42**. The length of arms **43**, **44** provides a sufficient mechanical advantage for tightening the strap.

Inwardly opening confronting jaws **46** and **47** are formed at the free ends of arms **43**, **44**, respectively. These jaws include upper loops **46***a*, **47***a* and lower retaining arms **46***b*, **47***b*. The loops and arms of jaws **46**, **47** are spaced apart by a distance somewhat greater than two thicknesses of strap **31**, and smooth protective tips **48** are carried on the confronting ends of arms **46***b*, **47***b*.

The fixed end **33** of strap **31** is permanently affixed to the buckle by passing an end of strap **31** around both transverse arms **41**, **42** and then stitching or otherwise securing it to itself to form a closed loop **49** encircling arms **41**, **42**. The stub end **33***a* is preferably disposed on the underside of the loop to maximize the frictional force between adjacent layers of the strap when the strap is tightened in the manner described below.

Operation and use of the assembly of FIG. **3** can be described with reference to FIGS. 4A-4C. Strap **31** is placed around the articles to be secured, and free end **34** threaded through the opening between cross arm **36** and transverse arms **41** and **42**, then folded back to overlie itself to form an open loop **51**. The strap is tightened by grasping and exerting tension on free end **34***a* of open loop **51** with one hand and, while maintining tension on free end **34***a*, pivoting the buckle in the direction of arrow **52** about cross arm **36** from a position adjacent to the fixed strap end to a position adjacent to the free end. This rocking or pivoting movement draws loops **49** and **51** past each other (FIG. 4B), tightening the strap to an extent determined by the effective length of the short lever arms **37**, **38**. As buckle **32** is rocked toward the free end of strap **31**, the outer run of loop **51** is clamped against the inner run to prevent slippage of the free end (FIG. 4B).

If further tightening of the strap is desired, the buckle is rocked back toward the fixed end of the strap, as indicated by arrow **53**. During the return movement, slack produced by the preceding tightening movement is taken up simply by pulling free end **34***a* of loop **51** in the direction indicated by arrow **54**. The buckle is then rocked back toward the free end of the strap, drawing the strap yet more tightly about the articles. The process is repeated until the desired degree of tightening has been effected. Note the advance of arm **36** relative to point A in FIGS. 4A through 4C.

Once the strap has been tightened to the extent desired, the buckle is secured in position adjacent to the free end of the strap by placing arms **46***b* and **47***b* under the two runs of loop **51**, with loops **46***a* and **47***a* on top of the two runs. With the jaws so positioned, the free end of the belt is securely constrained between loops **46***a* and **47***a* and hook arms **46***b* and **47***b*.

As in the prior art, the tension in the strap tends to pull the ends **37**, **38** of transverse arms **41** and **42** away from hooks **46**, **47** as illustrated by arrows **61** and **62**. However, unlike the prior art, this pull tends to draw jaws **46**, **47** more tightly together, as indicated by arrows **63**, **64**.

The confronting portions of loops **46***a* and **47***a* hook arms **46***b* and **47***b* are disposed to abut against each other to limit the inward movement.

Thus, buckle **32** serves to enhance its gripping characteristic under increased tension in the strap so as to preclude release of the grip of buckle **32** on strap **31** under the adverse circumstances which, in the past, tended to dislodge the grip of the buckle in FIG. **1**.

Yet, buckle **32** can be released simply by drawing the free ends of arms **43**, **44** in an outward direction to disengage the jaws from the strap, then allowing the end of the buckle with the hooks to pivot away from strap end **34**. With the buckle so positioned, the free end of strap **31** is readily withdrawn from buckle **32**.

FIG. **5** illustrates another embodiment which is similar to that described above, except that the buckle is formed of a rod having a generally square cross section. This square cross section has been found to provide a better grip on the strap in some applications. Primed reference numerals are used in FIG. **5** to designate elements which correspond to similar elements in FIGS. **3** and **4**.

The embodiment of FIG. **6** includes an elongate strap **66** and a buckle **67**. Strap **66** is generally similar to strap **31**, and it includes a fixed end **68** and a free end **69**. Buckle **67** comprises a generally rectangular rigid plate **71** having a pair of transversely extending longitudinally spaced apart, adjacent openings **72**, **73** defining parallel cross arms **74** and **76** toward one end of plate **71**. Strap end **68** is formed in a closed loop **77** which passes through openings **72** and **73** and around inner cross arm **74**. The free end **69** of the strap is formed in an open loop **78** which passes around outer cross arm **76**.

Flanges **81** and **82** extend from the sides of plate **71** to provide strength to buckle **67**. Flanges **81**, **82** include aligned openings **83** and **84** toward the end of plate **71** remote from cross arms **74**, **76**. A retaining pin **86** removably mounted in flange openings **83**, **84** is spaced from plate **71** by a distance corresponding substantially to two thicknesses of the strap to provide means for securing buckle **67** in position adjacent to the free end **69** of the strap.

Operation and use of the strap and buckle assembly of FIG. **6** are generally similar to that of the embodiments previously described. The strap is tightened by rocking the buckle about cross arm **76** from a position adjacent to the fixed end **68** of the strap toward a position adjacent to the fixed end **68** of the strap toward a position adjacent to the free end **69**. The belt is secured in its tightened condition by inserting pin **86** in openings **83** and **84** with the two thicknesses of strap at the free end **69** disposed between plate **71** and pin **86**. The buckle is released simply by removing pin **86** and rotating the buckle toward the fixed end **68** of the strap.

From the foregoing it will be readily evident that an improved strap and buckle assembly has been provided.

I claim:

1. In combination, an elongate strap and a buckle for tightening and securing the strap, said buckle comprising a transversely extending cross arm at one end of the buckle, the strap having a free end adapted to be looped around the cross arm, a pair of short lever arms extending from the ends of the cross arm, transverse arms extending from the short lever arms in a direction generally parallel to the cross arm, one end of the strap

being formed with a closed loop fixed around the transverse arms, a pair of elongate operating arms extending diagonally from opposite ends of the transverse arms toward that end of the buckle remote from the cross arm and crossing each other intermediate the ends of the buckle, said operating arms being significantly longer than the short lever arms to provide a substantial mechanical advantage for tightening the strap when the buckle is pivoted about the cross arm in a direction extending from a position adjacent that end of the strap looped about the transverse arms toward the strap looped about the cross arm, and inwardly opening confronting jaws at the ends of the elongate operating arms for engaging that end of the strap looped about the cross arm to retain the buckle in position adjacent the last named end and thereby secure the strap in its tightened condition.

2. A buckle as defined in claim **1** wherein the buckle is formed from a rod of resilient material.

3. In combination, an elongate strap and a buckle for tightening and securing same, said buckle comprising a rigid plate having a pair of transversely extending spaced apart openings at one end of the plate defining a pair of parallel cross arms, one end of the strap being fixed in a closed loop passing through the openings and around the inner cross arm, the end-most cross arm being adapted to have the other end of the strap looped about the same, means extending from the sides of the plate and having aligned openings formed therein toward that end of the plate remote from the cross arms, and a transversely extending retaining pin removably mounted in the aligned openings and spaced from the plate sufficiently to accommodate two thicknesses of the strap to be interposed between the pin and the plate whereby the buckle can be secured in a position adjacent to that end of the strap looped about the outer cross arms.

4. In a buckle formed of a resilient rod for tightening and securing an elongate strap, a transversely extending cross arm at one end of the buckle about which a free end of the strap can be looped, a pair of short lever arms extending from the ends of the cross arm, a pair of transverse arms about which a second end of the strap can be looped and secured, said transverse arms extending from the short lever arms in a direction generally parallel to the cross arm, a pair of elongate operating arms extending diagonally from opposite ends of the transverse arms toward that end of the buckle remote from the cross arm and crossing each other intermediate the ends of the buckle, said release arms being substantially longer than the short lever arms to provide a substantial mechanical advantage for tightening the strap when the buckle is pivoted about the cross arm from a position adjacent that end of the strap looped about the transverse arms toward a position adjacent that end of the strap looped about the cross arm, and inwardly open confronting jaws at the ends of the elongate release arms for engaging that end of the strap looped about the cross arm to retain the buckle in position adjacent to the last named end and thereby secure the strap in its tightened condition.

* * * * *