Jan. 13, 1959 E. C. ELSNER ET AL 2,867,876

BUCKLE

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Fig. 1.

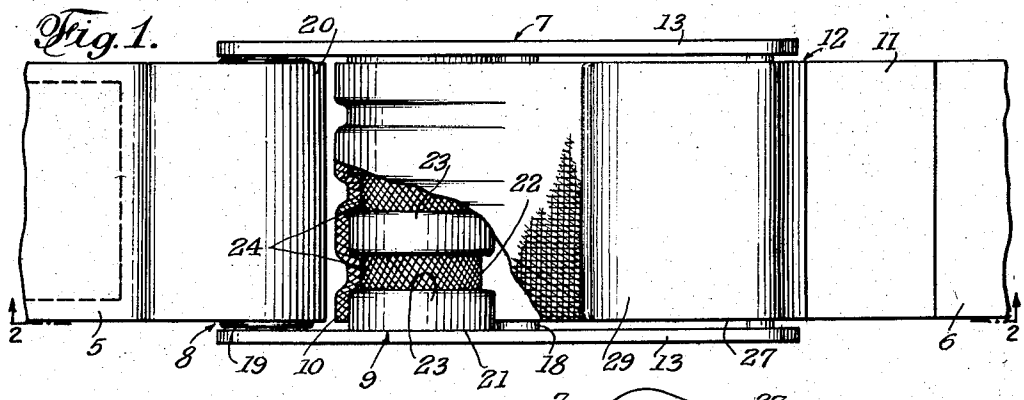


Fig. 2.

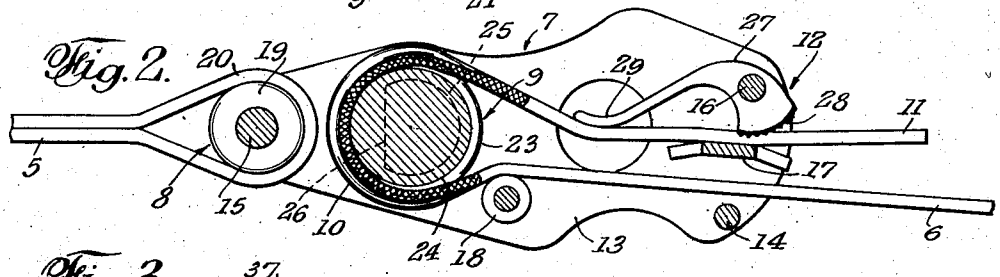


Fig. 3.

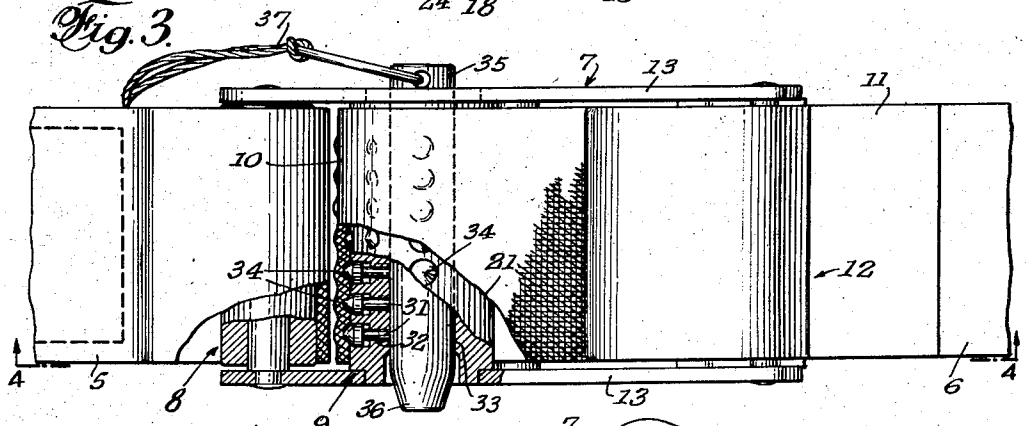
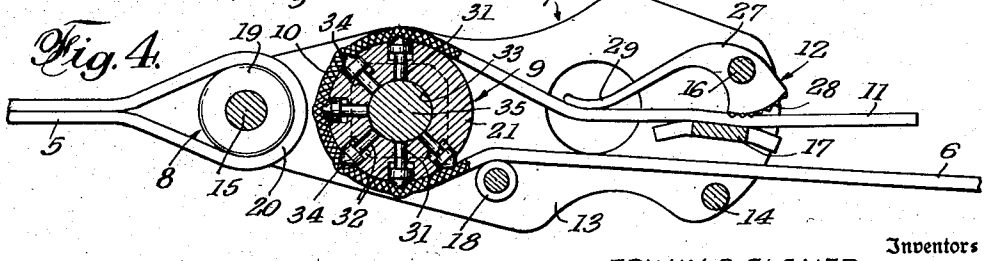


Fig. 4.



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Fig. 5.

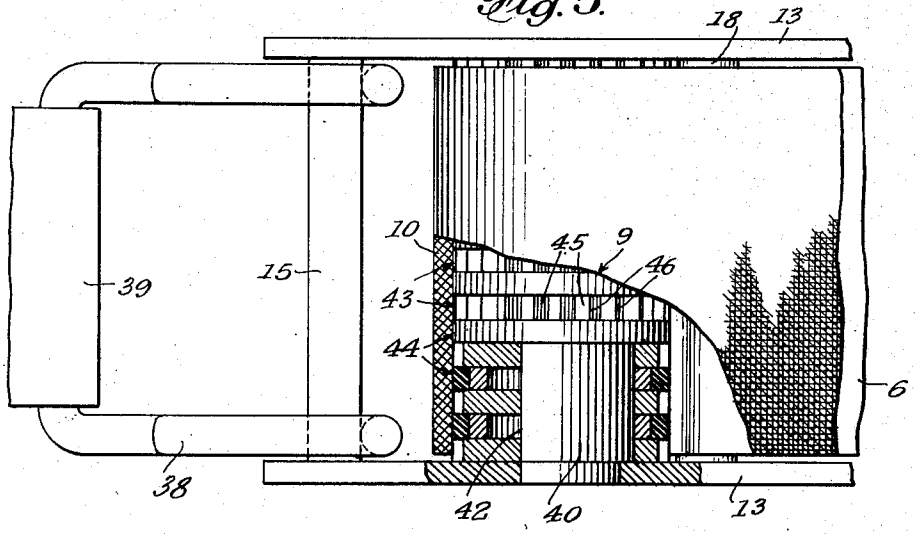


Fig. 6.

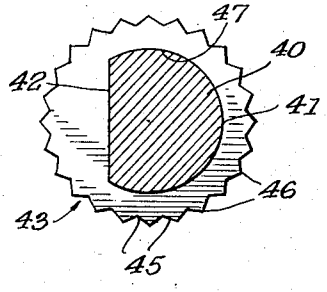


Fig. 7.

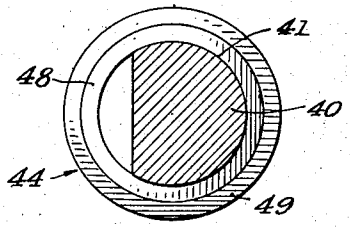
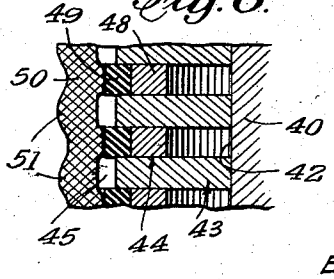


Fig. 8.



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BUCKLE

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Application January 25, 1954, Serial No. 405,757

5 Claims. (Cl. 24—168)

This invention relates to a buckle construction to connect the ends of a strap, or to connect the ends of two straps each separately secured at their opposite ends, or to connect one strap end to any fixed point.

An object of the present invention is to provide means increasing the strap-retention power of a buckle.

Another object of the invention is to provide improved means, as above indicated, that increases the strap-retention power by displacement or distortion of a strap that is releasably connected to the buckle.

The invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes, preferred embodiments of the present invention, which are given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

Fig. 1 is a plan view of a preferred form of buckle embodying the present invention.

Fig. 2 is a longitudinal sectional view as taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a plan view of a modified form of buckle, with parts thereof in section.

Fig. 4 is a longitudinal sectional view as taken substantially on line 4—4 of Fig. 3.

Fig. 5 is an enlarged fragmentary plan view, partly in section, of another form of the invention.

Figs. 6 and 7 are cross-sectional views of details of the buckle shown in Fig. 5.

Fig. 8 is a further enlarged fragmentary detail sectional view showing the manner of deformation of the strap or web under high loading.

The buckle that is illustrated is shown as connecting strap ends 5 and 6. The same may be the ends of the same strap, or ends of two separate straps each anchored at their opposite ends. Insofar as this invention is concerned, strap 5 represents any point of anchorage and may be a hook, eye, etc.

It is contemplated that strap 6 may be made as a pliable and readily deformable woven web. Such a web may be woven of nylon yarn or any other synthetic yarn of comparable strength. While strong, such a web also is slick and has a tendency to slip unless considerable resistance is employed to counteract the same.

The buckle that is illustrated comprises, generally, a frame 7, means 8 to anchor strap end 5, or a comparable element, to said frame, means 9, transverse of the frame, over which a loop or bight 10 of strap 6 is adapted to be trained and the same doubled back to form a free end 11, and means 12 to grip said free end and, thereby, retain the strap 6 in tension.

The frame 7 is shown as comprising side plates 13 that are held in spaced relation not only by a spacer rod 14 but also a shaft 15 comprising part of means 8, the means 9, a shaft 16 and a plate 17 comprising part of means 12; and a rod 18 associated with the means 9. The spacing between the plates is such that the width of web or strap 6 may freely fit therebetween.

The means 8 is shown as a roller 19 on shaft 15, an eye 20 formed in strap end 5 being trained over said roller and, thereby, being anchored to frame 7.

The means 9, in the form of Figs. 1 and 2, is shown as a cylindrical member 21 that is provided with a set of transverse grooves 22 that define lands 23 therebetween. The bottom cylindrical faces of said grooves are roughened as by knurls 24. The member 21 is fixedly held between side plates 13 in any of the usual ways. In this case, reduced ends 25 of said member are provided with at least the flat face 26 and said ends fitted into comparably shaped holes in said side plates.

The means 12 comprises the mentioned transverse plate 17 and a member 27 that is pivotally mounted on shaft 16 and is provided, at one end, with a roughened cam face 28 directed toward plate 17, and a curved lever 29 at the other end and terminating between means 9 and plate 17.

The strap 6 is adapted to be passed beneath plate 17, be trained over means 9 from beneath, and pass between said plate 17 and the cam face 28 of member 27. The bight thus formed terminates in the mentioned free end 11. Tension on the strap 6 draws cam face 28 into gripping engagement with end 11 because the portion of said end engaged by lever 29, seeking to straighten, engages said lever. The latter is, thereby, urged upwardly and causes a downward strap-gripping movement of cam face 28.

When there is comparatively small pull or tension on strap 6, the bight 10 therein merely conforms to the outer cylindrical form of fixed member 21. Consequently, said strap, made as above indicated, merely slides over lands 23. Thus, the buckle may be easily threaded in the manner above described.

It will be realized that cam face 28 increases its grip on strap end 11 as the tension on strap 6 is increased. However, an inordinately strong tension on strap 6 may result in slippage of the gripping means 12 or in rupture of the strap where cam face 28 engages the same. As mentioned, the nylon or comparable web used, while extremely strong, is quite slick and, if member 21 were the usual smooth-faced element, the same would offer but little frictional resistance to slippage of the bight 10 under strong tension on strap 6.

The present means 9 is provided to materially increase the friction on the bight 10 and, thereby, in a large measure reduce the pull of strap 6 on the gripping means 12. As the pull on strap 6 becomes greater, the pliable web, in the bight 10, is drawn or deformed inwardly into grooves 22, as shown best in Fig. 1. Thus, the width of the web is stretched into serpentine form as the same conforms to the grooves and lands of member 21, creating a strong friction that realizes the objects of the invention. Under extraordinary tension on strap 6, the bight is pulled into engagement with the knurls 24 which offer still greater frictional resistance to slippage of bight 10.

In the above-described form of the invention, the bight 10 is deformed inwardly. In the form of Figs. 3 and 4, said bight is deformed outwardly. To this end, the member 21 of means 9 is provided with a plurality of elements 31 that are radially disposed in seats 32 and are freely slidable in said seats. Member 21 is formed with a longitudinal bore 33 into which the inner ends of elements 31 are adapted to enter. The outer ends of said elements are formed with conical tips 34 that are diametrally larger

than the inner ends of the elements. The seats **32** are formed accordingly and the elements are retained against outward displacement as by peening the outer rims of said seats around the conical tips.

Ordinarily, any pull on bight **10** will cause retraction of elements **31** and the member **21** will merely present its cylindrical surface to the bight. When it is desired to increase the frictional engagement between means **9** and said bight, a rod or cylindrical bar **35** is introduced into bore **33**, and by engaging the inner ends of elements **31**, projects the conical tips **34** thereof beyond the cylindrical face of member **21**. As shown, said tips deform the web outwardly and produce the desired friction.

Entry in bore **33** of rod **35** is facilitated by conically reducing the end **36** of said rod and, by retaining the latter captive as by means **37**, the same is always available when use thereof is desired.

As shown in both above-described forms of the invention, the circumferential extent of the bight **10** around cylindrical member **21** is increased by placing rod **18** in such relationship to member **21** that the strap **6** is offset in a direction toward end **11**. Thus, the extent of the bight may be in the nature of 270° of engagement with member **21**.

The form of buckle shown in Figs. 5 to 8 is similar to above described forms except for the construction of the means **9**. Also, the strap **5** has been replaced by a hook **38** that is directly and separably connected to shaft **15**. Said hook may be connected to a fixed anchor or, as shown, may be carried on the end of a strap **39**.

The means **9** of this latter form is shown as comprising a transverse member **40** that is fixed between the frame sides **13** in the same way as disclosed for member **21**. Said member **40** has a cylindrical surface **41** and a flat surface **42**. However, the cross-sectional form of member **40** may be varied providing the same has an outer peripheral surface on which one set of annular members may revolve, and flats, keyways, etc. that hold a second set of annular members non-rotational.

According to the invention, there are strung on member **40** two sets of elements **43** and **44** alternately one with the other, as best seen in Figs. 5 and 8. Each element **43** comprises a preferably metallic member having a peripheral edge provided with relatively deep serrations **45** that present transverse edges **46**. Said element **43** is provided with a hole **47** that has the shape of the cross-sectional form of member **40**. Therefore, element **43** is held non-rotational, as can be seen from Fig. 6.

Each element **44** comprises a metallic annulus **48** rotationally fitting on member **40** and a rubber hoop or band **49** encircling said annulus. Both annulus and band are preferably the same width and the latter preferably has a rectangular cross-section.

The diametral size of said band **49** is made to be substantially equal to the outer size of serrated element **43**. Consequently, when the bight **10** of strap **6** is trained over the peripheries of elements **43** and **44**, as shown, the rubber hoops being uncompressed, prevent the edges **46** of serrations **45** from biting into said bight, as shown in Fig. 5, and the bight readily slides around the means **9**. However, as the pull or force on strap **6** is increased, the rubber hoops **49** are compressed accordingly and, as can be seen from Fig. 8, portions **50** of the bight are pulled inwardly out of their normal plane and alternate portions **51** are drawn into firm engagement with edges **46** which, therefore, bite into the web. Since elements **43** are non-rotational, the foregoing results in a greatly increased resistance to slippage of the strap bight **10**.

Since the rubber-hooped elements can fully revolve when the strap is unstressed, threading of the buckle is greatly facilitated. By providing hoops **49** of a Shore hardness between **65** and **75**, a substantial increase of stress may be had before said hoops compress sufficiently to allow the serrations of elements **43** to grip. Any desired

resistance to slippage of the web may be obtained by varying the hardness of the rubber hoops.

While we have illustrated and described what we now contemplate to be the best modes of carrying out our invention, the constructions are, of course, subject to modification without departing from the spirit and scope of the invention. It is, therefore, not desired to restrict the invention to the particular forms of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

Having thus described the invention, what we claim and desire to be secured by Letters Patent is:

1. In a buckle for connecting the ends of a strap, a frame having sides between which said strap ends are disposed, a member spanning between the frame sides and to which one strap end is connected, a second and cylindrical member spanning between the frame sides adjacent the first member and over which the other strap end is trained in the form of a bight that terminates in a free end, said latter strap end being deformable, means to releasably clamp said free end to resist pull between the strip ends, and circumferentially arranged and transversely spaced means embodied in said cylindrical member to deform transversely spaced and circumferential portions of the strap bight outwardly from the in-between portions engaged by the cylindrical member, said latter means comprising projections on the cylindrical surface of said cylindrical member, said projections outwardly deforming the strap bight trained thereover under the mentioned pull.

2. In a buckle for connecting the ends of a strap, a frame having sides between which said strap ends are disposed, a member spanning between the frame sides and to which one strap end is connected, a second and cylindrical member spanning between the frame sides adjacent the first member and over which the other strap end is trained in the form of a bight that terminates in a free end, said latter strap end being deformable, means to releasably clamp said free end to resist pull between the trap ends, and circumferentially arranged and transversely spaced means embodied in said cylindrical member to deform transversely spaced and circumferential portions of the strap bight outwardly from the in-between portions engaged by the cylindrical member, said latter means comprising projections on the cylindrical surface of said cylindrical member, said projections outwardly deforming the strap bight trained thereover under the mentioned pull, said projections comprising retractable elements, said cylindrical member having a longitudinal bore, and a member enterable into said bore to project said elements.

3. In a buckle for connecting the two strap ends, at least one of which comprises woven synthetic yarn and is deformable, a cylindrical member in said buckle over which said deformable strap end is adapted to be trained to form a bight terminating in a free end, means in the buckle to releasably grip said free end against pull in a direction toward the cylindrical member, and circumferentially arranged and transversely spaced means embodied in said cylindrical member to deform transversely spaced circumferential portions of the mentioned bight outwardly from the in-between portions engaged by the cylindrical member, said latter means comprising projections on the cylindrical surface of said cylindrical member.

4. In a buckle for connecting two strap ends, at least one of which comprises woven synthetic yarn and is deformable, a cylindrical member in said buckle over which said deformable strap end is adapted to be trained to form a bight terminating in a free end, means in the buckle to releasably grip said free end against pull in a direction toward the cylindrical member, and circumferentially arranged and transversely spaced means embodied in said cylindrical member to deform transversely spaced circumferential portions of the mentioned bight outwardly from the in-between portions engaged by the

cylindrical member, said latter means comprising retractable projections on the cylindrical surface of the cylindrical member, and means releasably holding said projections projected.

5. In a buckle, a fixed transverse member over which the bight of a deformable strap is adapted to be trained, said member comprising base transversely spaced circumferential portions, and alternate circumferentially arranged raised portions, the strap bight, when under tension, conforming to the base and raised portions of the member, and radially arranged means mounting the raised portions for movement between a raised position and a retracted position, and means carried by the transverse member to raise the mentioned movable portions.

References Cited in the file of this patent

UNITED STATES PATENTS

1,324,804	Donason	Dec. 16, 1919
1,776,493	Domkee	Sept. 23, 1930
1,820,578	Mosgrove	Aug. 25, 1931
1,836,923	Hodge	Dec. 15, 1931
2,538,641	Elsner	Jan. 16, 1951
2,623,732	Morgan	Dec. 30, 1952