

Nov. 3, 1970

R. CARLMARK

3,537,148

SELF-LOCKING TIGHTENER FOR BELTS, WIRES AND THE LIKE

Filed Feb. 26, 1969

4 Sheets-Sheet 1

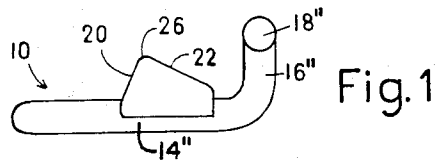


Fig. 1

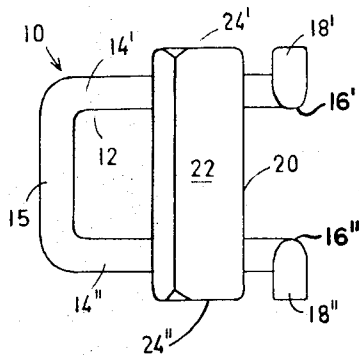


Fig. 2

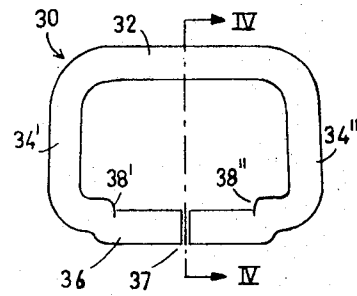


Fig. 3

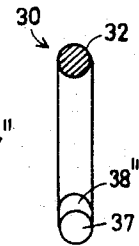


Fig. 4

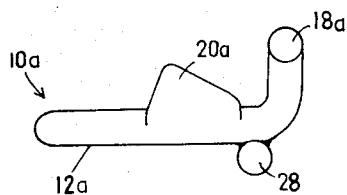


Fig. 5.

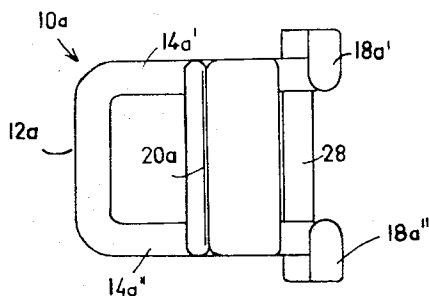


Fig. 6

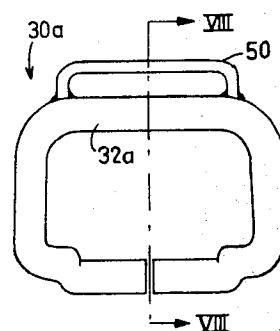


Fig. 7

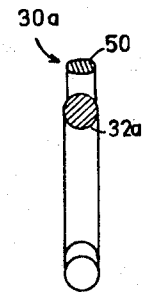


Fig. 8

INVENTOR
ROLF CARLMARK

By
Woodhams, Blanchard & Flynn
ATTORNEYS

Nov. 3, 1970

R. CARLMARK

3,537,148

SELF-LOCKING TIGHTENER FOR BELTS, WIRES AND THE LIKE

Filed Feb. 26, 1969

4 Sheets-Sheet 2

Fig. 9

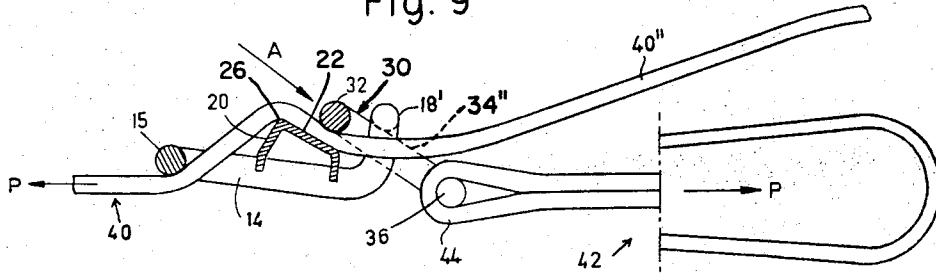


Fig. 10

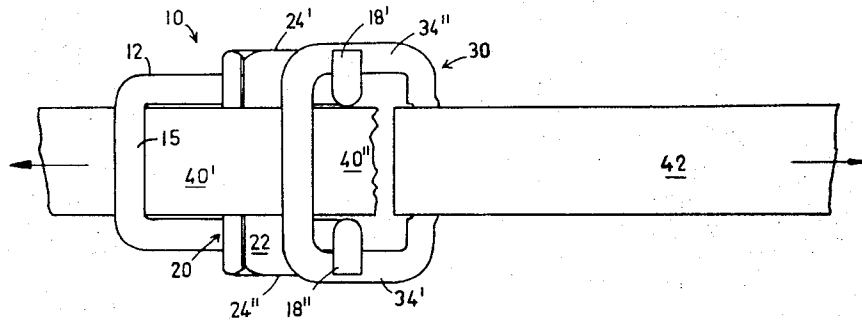
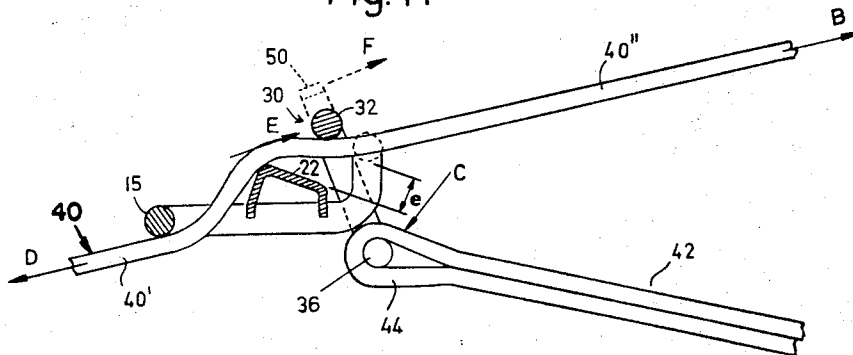


Fig. 11



INVENTOR
ROLF CARLMARK

BY
Woodham, Blanchard & Flynn
ATTORNEYS

Nov. 3, 1970

R. CARLMARK

3,537,148

SELF-LOCKING TIGHTENER FOR BELTS, WIRES AND THE LIKE

Filed Feb. 26, 1969

4 Sheets-Sheet 3

Fig. 12

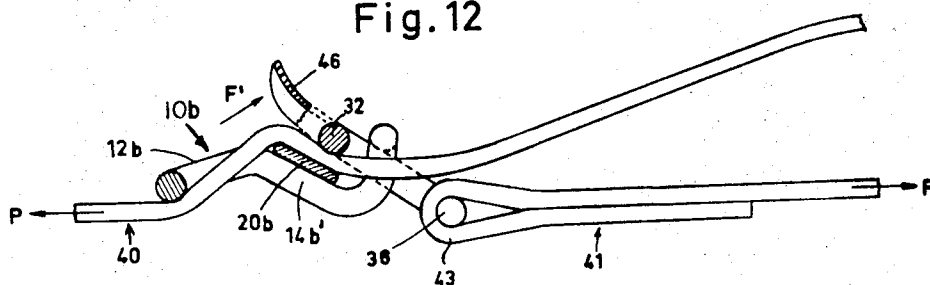


Fig. 13

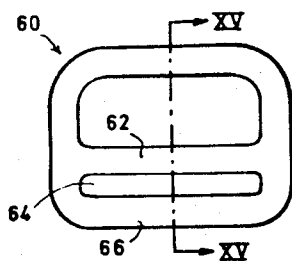
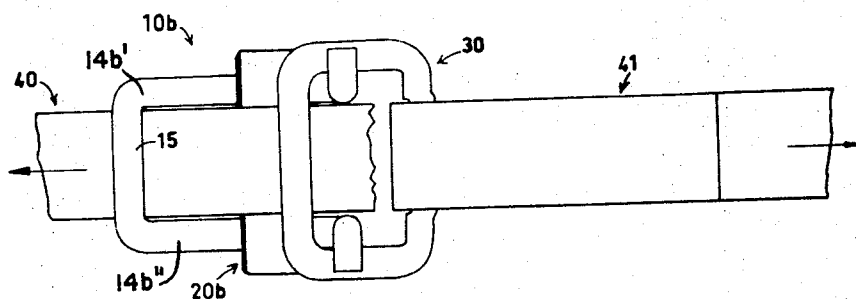


Fig. 14

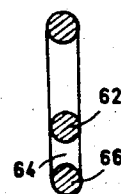


Fig. 15

INVENTOR
ROLF CARLMARK

BY
Woodhams, Blanchard & Flynn
ATTORNEYS

Nov. 3, 1970

R. CARLMARK

3,537,148

SELF-LOCKING TIGHTENER FOR BELTS, WIRES AND THE LIKE

Filed Feb. 26, 1969

4 Sheets-Sheet 4

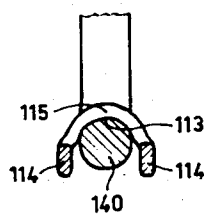
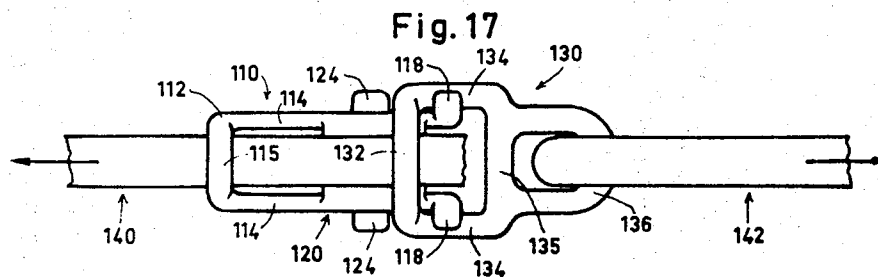
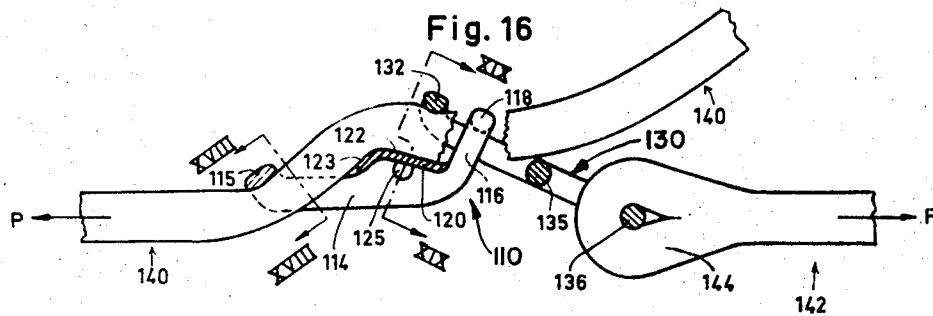


Fig. 18

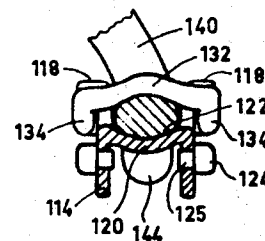


Fig. 19

INVENTOR
ROLF CARLMARK

BY
Woodhams, Blanchard & Flynn
ATTORNEYS

1

3,537,148

SELF-LOCKING TIGHTENER FOR BELTS, WIRES AND THE LIKE

Rolf Carlmark, Box 756, 890 20, Sundasen, Sweden

Filed Feb. 26, 1969, Ser. No. 802,493

Claims priority, application Sweden, Mar. 1, 1968,

2,689/68

Int. Cl. A44b 21/00

U.S. Cl. 24—68

10 Claims

ABSTRACT OF THE DISCLOSURE

A self-locking tightener for flexible tension elements having a stirrup-like member cooperating with a buckle member. The stirrup member has a U-shaped portion provided with a transverse bridge attached to and extending between limbs of the stirrup member and lying substantially parallel with a crosspiece of the stirrup member. The ends of the limbs are raised and bent over to form two coaxial lugs facing away from one another and extending parallel to the bridge. The buckle is substantially rectangular in shape and loosely embraces the stirrup member between the bridge and the lugs, and is adapted to pivotably engage the lugs through the medium of two sidepieces. A crosspiece of the buckle is adapted to clamp, while the lugs serve as reaction points, against the bridge, a tension element passing over said bridge when a pulling force is applied to the opposite crosspiece of the buckle.

The present invention is concerned with self-locking tighteners for belts, straps, wires, chains and the like, that is, tension elements by means of which two belt or wire portions can be united in an optionally set position and securely held in said position when subjected to pulling forces. The tightener or buckle unit of the present invention is generally usable for connecting together all types of belts and bands, even steel bands, straps, wires, also steel wires, ropes, chains and so on. In particular the tightener according to the invention is useful in connection with certain types of harnesses, and such a tightener is well adapted for disclosing the invention.

In the case of trotting harnesses, for instance, the sulky driver does not as a rule grip the reins directly when racing or in practice, because of the difficulty in gripping the reins in exactly the correct manner and position. If the reins are straight and the driver grasps them direct, using one of the conventional grips, his hold on the reins is not normally sufficiently safe for this type of driving (trotting). On the other hand, if the sulky driver wraps the reins about his wrist the grip is locked to a certain extent and cannot be released quickly enough, rendering it difficult to control the horse. Consequently, sulky drivers use instead a so-called handgrip on the reins, usually in the form of a single strap loop or eye clamped on the reins. It is of great importance that the handgrip is attached to the reins in such a position that the driver obtains the correct driving attitude in an appropriate forward leaning position, and that the handgrip is at the correct distance from the horse's bit, to permit the driver to instruct the horse to increase or decrease its pace.

The device known hitherto to the art for fixing the handgrip to the reins comprises a conventional buckle presenting a transversely extending bar, in which the handgrip is fastened while the reins are passed through the buckle and around the bar. This conventional coupling between the handgrip and the reins has the disadvantage of being awkward and time consuming to alter

2

and adjust, it is most difficult to move the buckle along the reins, and can only be accomplished in increments. This difficulty in adjusting the buckle correctly with regard to the reins is particularly harassing in view of the fact that the handgrip is not adjusted to its correct position on the reins until the driver is seated in the sulky or the training buggy and has driven some distance, to assess the feel and correctness of the harness. Since most trotters strain very hard against the bridle, it is practically impossible to adjust the position of the handgrip without stopping the sulky and holding the horse's head. By means of the belt tightener or buckle unit in accordance with the invention the drawbacks indicated above in harnesses of the type in question may be completely obviated.

The object of the present invention is therefore in general to provide a novel, self-locking belt tightener for belts, straps, wires and the like which can be moved easily along a belt or wire to optional positions of adjustment and which maintains safely under load its position once set, whilst at the same time it is easily unlocked to change said position. This object is achieved by means of the tightener according to the present invention.

The invention will now be described with reference to a number of embodiments thereof illustrated in the accompanying drawings, in which:

FIGS. 1 and 2 are a side view and plan view, respectively, of a stirrup-like member forming part of the tightening device according to the invention.

FIG. 3 is a plan view of a buckle member forming part of said tightening device.

FIG. 4 is a cross section through the line IV—IV in FIG. 3.

FIGS. 5 and 6 are a side view and plan view, respectively, of a modified stirrup-like member forming part of the strap-tightening device of the invention.

FIG. 7 is a plan view of a modified buckle of the tightening device.

FIG. 8 is a cross section through the line VIII—VIII in FIG. 7.

FIG. 9 is a longitudinal section through the strap-tightening device of the invention attached to a strap, more specifically one rein of a harness, while the buckle is fixed to a handgrip strap.

FIG. 10 is a plan view of the unit shown in FIG. 9.

FIG. 11 is a view corresponding to the view shown in FIG. 9, but with the belt tightener unlocked.

FIGS. 12 and 13 correspond to FIGS. 9 and 10, respectively, and show a tightener having a modified stirrup member.

FIG. 14 shows a modified buckle.

FIG. 15 is a section along the line XV—XV in FIG. 14.

FIGS. 16 and 17 are likewise views corresponding to FIGS. 9 and 10, respectively, but show the tightener provided for cooperation with a rope or wire.

FIGS. 18 and 19 are cross sections along lines XVIII—XVIII and XIX—XIX, respectively, in FIG. 16.

The various views of the embodiments of the tightener are oriented in the drawings such that the "front" and "upper" parts of the component details are to the right and at the top, respectively, in the figures, whilst the "rear" and "lower" parts are to the left and at the bottom, respectively.

The belt-tightening device of the present invention comprises two main parts (FIGS. 1–4), namely a substantially U-shaped stirrup member 10 and a buckle 30. The stirrup member 10 consists of a U-shaped clamp or brace 12 made of wire rod, preferably stainless wire rod, and presenting limbs 14', 14'' which are joined by a crosspiece 15, and a bridge piece 20 extending across

3

the clamp 12. The ends of the limbs 14' and 14'' are bent up at right angles to the plane on the U, to form two uprights 16' and 16'' which terminate in short, coaxial lugs 18' and 18'', respectively, bent outwardly at right angles to the uprights 16' and 16'', as can be seen from FIGS. 1 and 2. The bridge member 20 of the stirrup 10 is welded to the limbs 14' and 14'' and extends thereacross, parallel to the common center line of the lugs 18' and 18''. The upper surface of the bridge 20 is provided with a sloping surface 22 which faces the lugs 18' and 18'' and the ends 24' and 24'' of the bridge extend beyond the limbs 14' and 14'' so that the length thereof is approximately equal to the width of the clamping member 12 over the lugs 18' and 18'' (FIG. 2). The upper edge 26 of the bridge member 20 is rounded slightly and is situated at a level essentially flush with the bottom surface of the lugs 18' and 18'' or lower (FIG. 1).

The other part of the strap-tightening device, the buckle 30, is preferably made of the same wire-rod material as the clamping member 12 and is bent substantially in the shape of a rectangle with rounded corners. The buckle consists of an upper crosspiece 32, two sidepieces 34' and 34'', and a lower crosspiece 36 with a central joint 37. The latter crosspiece is also provided with two shoulders 38', 38'', which are swaged into the material thereof and the purpose of which will be disclosed below.

In the embodiment of the stirrup 10a shown in FIGS. 5 and 6, the length of the bridge member 20a is equal to the width of the clamping bracket 12a, and thus lacks the protruding end portions of the previous embodiment. Instead, a transversely extending bar 28 is welded to the bottom surface of the clamp 12a in the position shown in FIG. 5. The length of the bar 28 is equal to the width of the clamping bracket 12a over the lugs 18a' and 18a'' and its outwardly projecting ends have the same purpose as the ends 24 of the bridge 20 in the previous embodiment, which purpose will be evident in the following description.

The stirrup-shaped member 10 and the buckle 30 are connected together by positioning the latter (for instance, before the crosspiece 36 has been closed, i.e., while joint 37 is open) between the bridge 20 of the stirrup 10 and the uprights 16' and 16''. The sidepieces 34' and 34'' of the buckle are thus movable but enclosed between the ends 24' and 24'' of the bridge 20 and the lugs 18' and 18'' as illustrated in FIGS. 9-11 (or between the lugs and the ends of the crossbar 28 in the case of the embodiment shown in FIGS. 5 and 6). The figures also show how the different parts of the strap-tightening device cooperate with a strap, belt or the like, such as the reins 40 of a harness provided with a loop-type handgrip 42 of the type discussed in the foregoing description. The handgrip 42 extends around the lower crosspiece 36 of the buckle 30, with an eye 44, said eye 44 being guided between the shoulders 38' and 38''. The reins extend in under the crosspiece 15 of the stirrup 10, up over the upper edge 26 of the bridge 20, along the sloping surface 22, and through the buckle 30 as illustrated in FIGS. 9 and 10. The sulky driver can now tighten the portion 40' of the reins extending to the bit with, for example, the force P by gripping the looped handgrip 42 and pulling it with the same force (see FIG. 9). This causes the buckle 30 to pivot about lugs 18' and 18'' of the stirrup member 10 (see FIG. 9), against which it rests on its sidepieces 34' and 34'' (FIG. 10), while its upper crosspiece 32 moves toward the bridge member 20. The reins 40 are thus pinched tightly between the sloping surface 22 of bridge 20 and the crosspiece 32 of the buckle 30. When the driver pulls on the handgrip 42, the crosspiece 32 attempts to move in the direction of arrow A (FIG. 9) and exerts a wedging action between the lugs 18' and 18'' and the reins 40, as a result of the fact that the perpendicular distance e (FIG. 11) between the bottom

4

surface of the lugs and the sloping surface is less than the total thickness of the strap 40 and the crosspiece 32 of the buckle. It should be mentioned at this point that the sole purpose of the outwardly projecting ends 24' and 24'' of bridge 20 (or ends of bar 28 in the embodiment of FIGS. 5 and 6) is to hold the buckle joined to the stirrup member, and do not necessarily contribute to the clamping action of the device.

As will be understood from the foregoing, the strap-tightening device of the invention is fully self locking. The device, however, can also be easily released by rotating the buckle 30 in the unlocking direction, as shown in FIG. 11. The reins are, in this way, released immediately, and their effective length 40' can be, for example, shortened by pulling the portion 40'' in the direction of arrow B (FIG. 11), the driver pushing his thumb against the eye 44 of the handgrip 42 generally in the direction of arrow C. The reins can be lengthened by pulling in the portion 40', in the direction of arrow D, the driver gripping with his thumb or some other suitable part of his hand the crosspiece 32 of the buckle 30 and the rounded corners, and pulling the buckle toward him, generally in the direction of arrow E.

As shown in FIGS. 7 and 8, the buckle can be provided with an attachment means adapted to receive a manipulating strap or the like. In the exemplary embodiment, the buckle 30a has welded to its upper crosspiece 32a an arched member 50 in which, for instance, is secured a short, thin strap (not shown). By holding the strap in member 50 and applying a force in the direction of arrow F (FIG. 11), the reins can be lengthened quite easily by pulling the portion 40' in the direction of arrow D.

In FIG. 12-15 there are shown a few modifications of the tightener of the invention disclosed above. FIGS. 12 and 13 are quite analogous to FIGS. 9 and 10, respectively, but it may be seen that the U-shaped portion 12b of the stirrup member 10b is bent upward in such a way that the cross bridge may be provided in this case simply by a straight plate 20b being secured across the limbs 14b' and 14b'' of the stirrup, as shown in FIGS. 12 and 13. In other respects the design is the same as that previously described, and if a pull with the force P (FIG. 12) is applied between a strap 41 secured to the lower crosspiece 36 by an eye 43 and a strap 40 adjustably running through the tightener, the latter strap will be securely locked against the bridge 20b by the upper crosspiece 32 of the buckle, exactly in the same way as previously described.

FIG. 12 also indicates how the buckle 30 can be extended or supplemented with an upper gripping portion or thumbgrip, for example, in the form of a cup-shaped formation 46 extending upward from the upper crosspiece 32 of the buckle. In this case the whole buckle including the gripping portion may suitably be die pressed or drop forged in one piece. In its effect the gripping portion 46 corresponds to the arched member 50 shown in FIGS. 7 and 8 for a manipulating strap or the like, which is able to release the tightener by exerting a force F on the member 50 and thus tilting the buckle. In the same way the tightener of FIG. 12 may be released by a force F' being applied by the thumb to the gripping portion 46.

In FIGS. 14 and 15 a modified buckle 60 is shown which in this case is made in one piece, suitably drop forged or die pressed and provided with a cross-rib 62, between which and the lower crosspiece 66 of the buckle a slot 64 is formed, wherein a fitting strap can be received. This design is especially suitable in such a case when the buckle is not fixed in relationship to its strap but adapted to run on this strap, which is then guided in the slot 64.

Finally FIGS. 16-19 show an example of how the tightener according to the invention is used for locking a rope or a wire and, also, how the tightener as a whole can be manufactured by die pressing or drop forging. A comparison with for example FIGS. 9 and 10 shows that the tight-

ener according to FIGS. 16-19 is in complete agreement as to its structure and function with the previous embodiments and has only been adapted to the rounded cross-sectional shape of the rope or wire, etc. with which it is to cooperate. Furthermore, the stirrup member 110 component of the tightener has obtained by its method of manufacture (drop forging or die pressing) a more slender material profile when compared with the previous wire-rod stirrup 10.

Thus, the tightener according to FIGS. 16-19, adapted for a rope, wire or another tension-assuming and flexible element with a rounded cross section, comprises a substantially U-shaped stirrup 110 and a buckle 130. The stirrup 110 includes a U-shaped portion 112 having comparatively thin and high limbs 114 joined by a rear crosspiece 115 and a bridge piece 120. The crosspiece 115 as well as the bridge piece 120 have their respective surfaces 113 and 122 facing the passing rope or wire 140 curved (see FIGS. 18 and 19) for conforming to and guiding the wire. As in previous cases the front ends of the limbs 114 of the stirrup 112 merge into uprights 116 in turn merging into outwardly directed coaxial lugs 118 forming pivot and reaction points for the buckle 130. In this case the buckle comprises an upper rectangular portion composed of upper and lower crosspieces 132 and 135, respectively, joined by sidepieces 134. This upper portion is joined with a lower eye 136 by way of the crosspiece 135 and is adapted to be connected to a wire 142 looped or forming an eye at 144. The upper crosspiece 132 is rounded or arched in order that its inside should conform to the wire. Now, if the wire parts 140 and 142 are subjected to tension the same course of events as previously described will take place; the buckle 130 tilts about the lugs 118 and clamps by its crosspiece 132 the wire part 140 against the bridge 120 of the stirrup member 110, a wedge action being exercised at the same time by the buckle sliding somewhat along the lugs, the crosspiece 132 thus being urged a little closer to the bridge, which results in an enhanced clamping action. In order not to damage the wire or rope in bending about the bridge 120 the rear edge 123 of the latter is rounded.

For retaining the buckle 130 on the stirrup 110 the bridge 120 is not extended in this embodiment, but instead small plugs 124 of for example plastic having shanks 125 are secured in alignment on the sides of the stirrup and suitably located (see FIG. 17), the shanks 125 being press fitted into holes in the stirrup limbs 114 below the bridge 120. These plugs 124 will thus fulfill the same function as the ends 24 and 24' of the bridge 20 in FIGS. 1 and 10, or the ends of the crossbar 28 in FIGS. 5 and 6.

Within the scope of the invention further modifications of the tightener are possible. As previously disclosed the tightener according to the invention comprises two cooperating loosely joined parts, viz. a stirrup member and a buckle member. However, there is nothing to prevent a spring-like or resilient element from being introduced between the two members, e.g., between the stirrup 10 and the buckle 30 according to FIG. 9, so that the buckle is subjected, while retaining its general mobility, to a light torque in an anticlockwise direction, as viewed in FIG. 9, in relation to the stirrup 10. Hereby the buckle is always prepared for immediate locking engagement, and its play and free motion is controlled. The locking upper crosspieces 32 and 132 as well as the bridges 20 and 120 may of course be provided on its surface facing the through-running strap or wire with flutes, a coating or other friction-promoting means, according to the character of the desired locking action and the strap or wire itself. Finally the tightener according to the invention has a further interesting possibility of application in that it can be used twin coupled, that is, two tighteners are directed toward one another and their buckles are joined, which makes it possible to connect, stretch and lock two oppositely directed straps or wires by means of the twin tightener thus formed.

However, the invention is naturally not restricted to the embodiment shown and described, but can be varied further within the scope of the following claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A self-locking tightener for flexible tension elements, such as belts, straps, wires, chains and the like, comprising a stirrup-like member cooperating with a buckle, the stirrup member having a crosspiece and a essentially U-shaped portion provided with a transverse bridge attached to and extending between limbs of the stirrup member and lying substantially parallel with said crosspiece, the ends of the limbs being raised and bent over to form two coaxial lugs facing away from one another and extending parallel to the bridge, the buckle being substantially rectangular in shape and loosely embracing the stirrup member between the bridge and the lugs, the buckle having two sidepieces adapted to tiltably or pivotably engage the lugs a crosspiece of the buckle being adapted to clamp against the bridge while the lugs serve as reaction points, a tension element passing over said bridge when a pulling force is applied to the opposite crosspiece of the buckle, for example, by means of a second tension element, and the lug-engaging sidepieces of the buckle being so shaped and arranged that if they slide upon locking against the lugs the space between the locking or clamping crosspiece of the buckle and the bridge is reduced, the tension element thus being subjected to a wedge action.

2. A tightener according to claim 1, wherein the bridge on the side facing the tension element is provided with a sloping surface facing the lugs, the portion of said surface engaging the tension element being shaped to conform to the cross-sectional profile of said element.

3. A tightener according to claim 1, wherein those parts of the tightener which lock the tension element are provided on their surfaces engaging the element with flutes, knurlings, corrugations, coatings or other friction-creating means.

4. A tightener according to claim 1, wherein the distance between the bridge of the stirrup member and the crosspiece of the U-shaped portion of the stirrup is sufficient so as to permit the tension element to be readily passed up over the bridge and in between the surface thereof and the locking crosspiece of the buckle.

5. A tightener according to claim 1, wherein the length of the bridge is approximately equal to the width of the stirrup member over the lugs, the buckle being loosely enclosed between the ends of the bridge and the lugs.

6. A tightener according to claim 1, wherein the length of the bridge substantially coincides with the width of the U-shaped portion of the stirrup member over the limbs, a bar or pin having a length substantially equal to the width of the stirrup member over the lugs being affixed on the side of the U-portion opposite to the bridge parallel with the common center line of the lugs and at such a distance from said lugs that the buckle can be loosely enclosed between the ends of the bar and the lugs.

7. A tightener according to claim 6, wherein plugs or pins are secured in coaxial alignment on the sides of the stirrup limbs at such a distance from and in such a position in relationship to the lugs that the buckle can be loosely enclosed between the pins and the lugs.

8. A tightener according to claim 1, wherein the locking crosspiece of the buckle is provided with attachment means intended to receive a manipulating element, such as a strap or the like, in such a way that pulling of said element causes said crosspiece of the buckle to pivot away from its locking engagement with the tension element clamped against the bridge.

9. A tightener according to claim 1, wherein the locking crosspiece of the buckle is provided with a gripping portion or thumb grip so directed and located that it may be conveniently actuated manually to tilt the buckle and cause said crosspiece thereof to pivot away from its lock-

7

ing engagement with the tension element clamped against the bridge.

10. A tightener according to claim 1, wherein resilient means in the form of a flat spring or leaf spring is introduced between the stirrup member and the buckle member and is adapted to bring said members by a light resilient pressure toward locking position without hampering the relative adjustment movements of the members.

References Cited

UNITED STATES PATENTS

939,394 11/1909 Cohen ----- 24—171 XR

8

1,381,121	6/1921	Humphrey -----	24—194
1,465,286	8/1923	Riker -----	24—194
1,524,713	2/1925	Kersey -----	24—196
2,045,935	6/1936	White et al. -----	24—194
2,372,558	3/1945	Dowd -----	24—69 XR

5

JOHN PETRAKES, Primary Examiner

U.S. Cl. X.R.

10 24—194