Nov. 6, 1956 F. B. HARLEY 2,769,220

RELEASABLE BUCKLES

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FIG. 1.

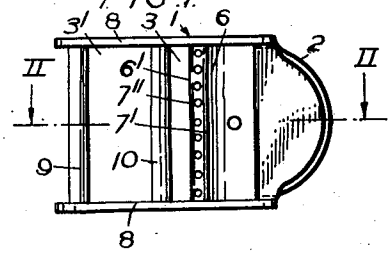


FIG. 2.

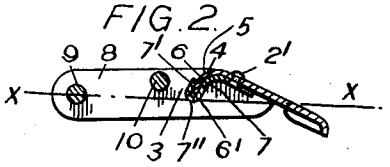


FIG. 3.

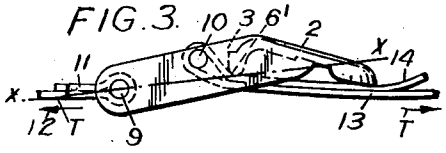


FIG. 4.

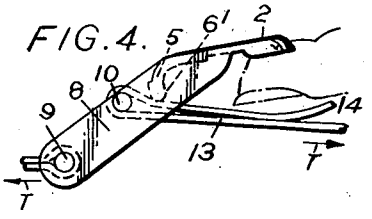


FIG. 5.

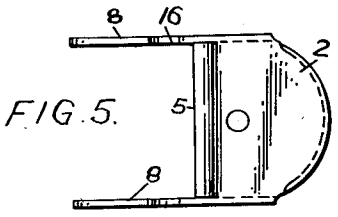


FIG. 6.

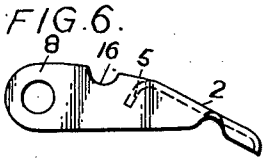


FIG. 7.

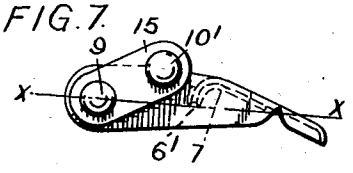


FIG. 8.

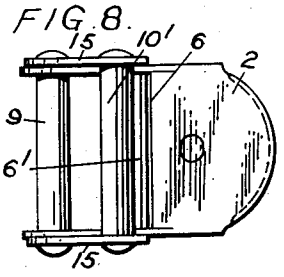


FIG. 9.

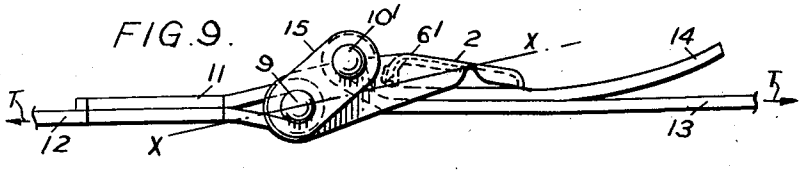
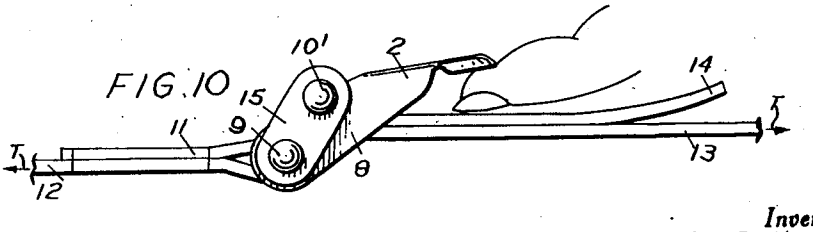


FIG. 10.



Inventor
Frank B. Harley

By Emery, Holcomb & Blair
Attorneys

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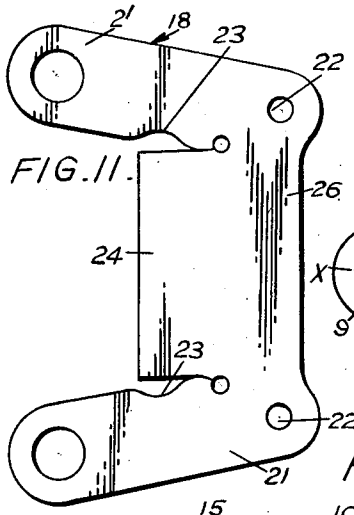


FIG. 11.

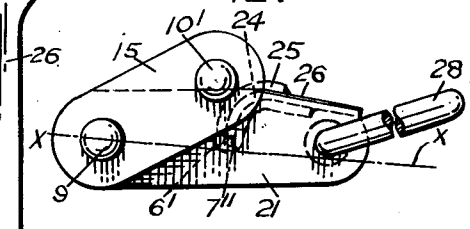


FIG. 12.

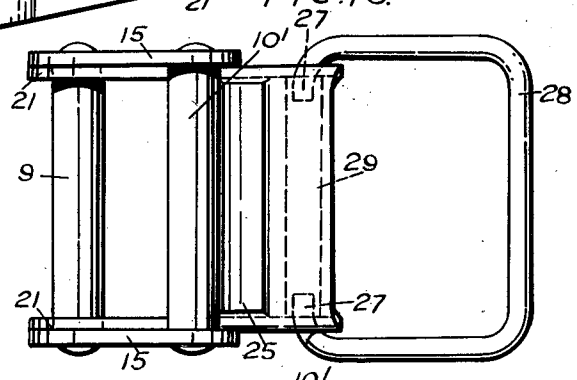


FIG. 13.

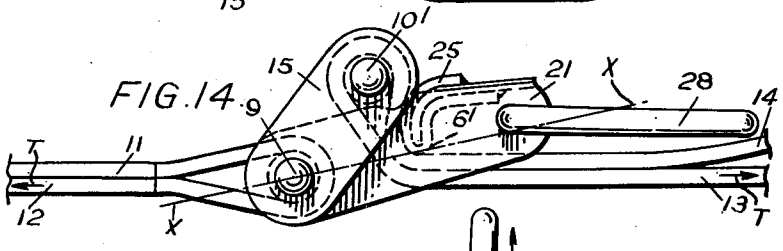


FIG. 14.

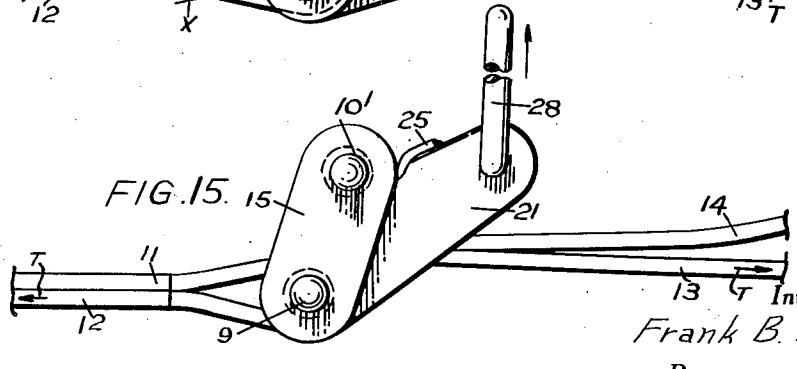


FIG. 15.

Inventor
Frank B. Harley
By
Emery, Holcombe & Blair
Attorneys

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FIG. 16.

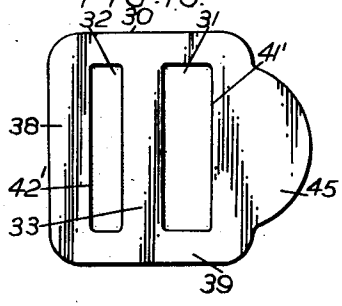


FIG. 17.

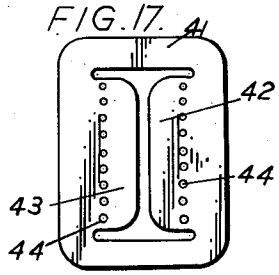


FIG. 18.

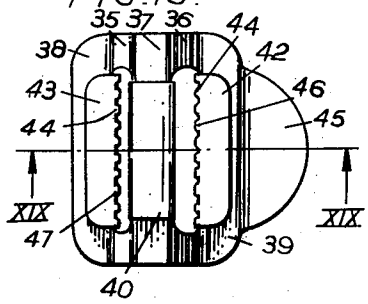


FIG. 19.

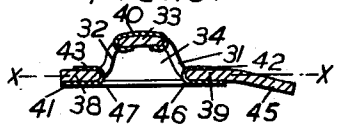


FIG. 20.

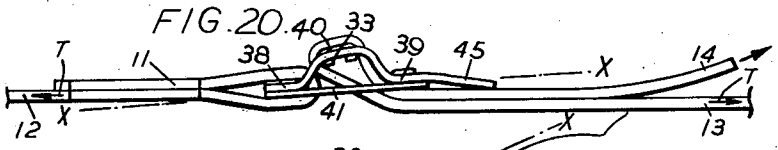


FIG. 21.

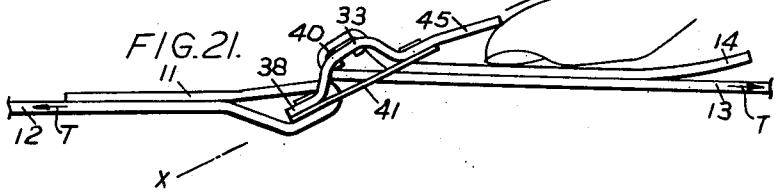


FIG. 22.

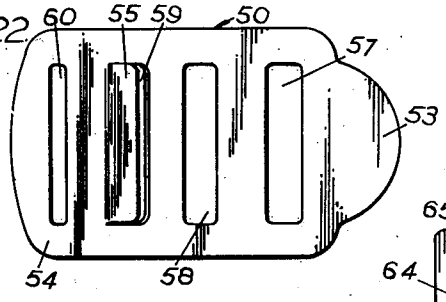
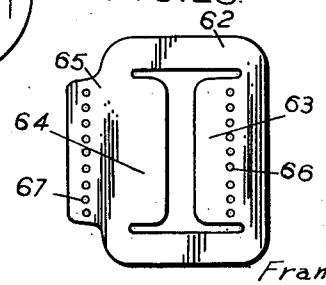


FIG. 23.



Inventor
Frank B. Harley
By
Emery, Holcombe & Blair
Attorneys

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FIG. 25.

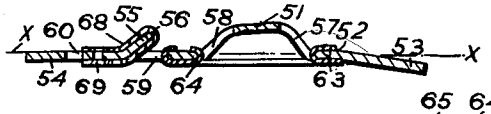


FIG. 24

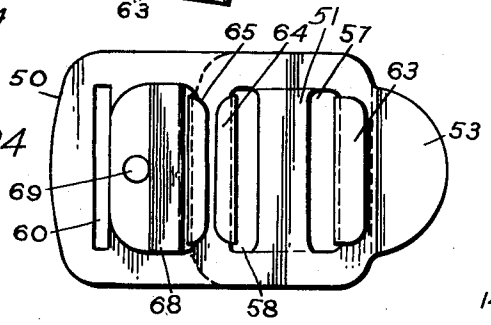


FIG. 26.

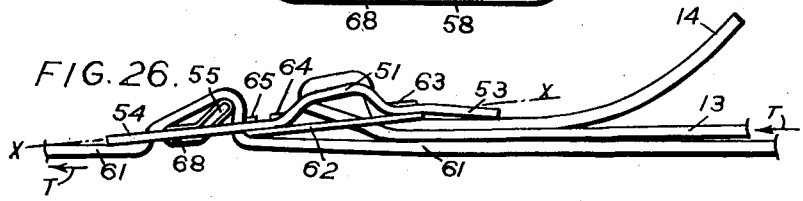
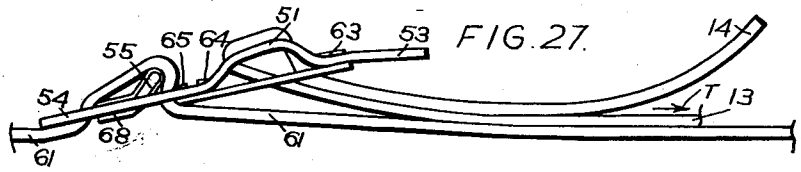


FIG. 27.



Inventor
Frank B. Harley
By Emery, Holcomb & Blair
Attorneys

United States Patent Office 2,769,220 Patented Nov. 6, 1956

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RELEASABLE BUCKLES

Frank Bernard Harley, Egham, England

Application July 17, 1950, Serial No. 174,149

Claims priority, application Great Britain February 3, 1950

7 Claims. (Cl. 24—193)

This invention relates to releasable coupling devices or buckles for straps, tapes and the like, and of the kind comprising a single integral body or frame, for example of metal plate, having a main anchorage element for permanent, or semi-permanent, connection to a strap or tape, or to any other part, and an auxiliary anchorage element transverse to the direction of the applied load and to which another strap, or another part of the same strap, can be connected so as to be readily releasable.

The invention has for its object to provide a simple and inexpensive device of this kind which, whilst being virtually slip-proof when under load, will yet be substantially instantaneously releasable without requiring the operation of any rotary, pivotal, sliding or other latch or lock, whilst obviating the necessity for any part which penetrates or passes through the releasable strap or tape.

To this end, in a coupling device or buckle according to the invention, the auxiliary anchorage element is disposed between, and laterally displaced from a primary plane which passes through, the main anchorage element and a pressure element or gripping edge approximately parallel to the auxiliary anchorage element. Thus, when the releasable strap is passed through the primary plane, round the auxiliary anchorage element, and back through the said plane past the pressure element, the part of the strap more adjacent to the pressure element or gripping edge is gripped between the latter and the main body of the strap, to which the load is applied, due to the said load tending to bring the auxiliary anchorage element into alignment with the main anchorage element and with the direction of the applied load. Moreover, by manually tilting the coupling in opposition to the said tendency, the grip applied by the pressure element or gripping edge is released.

The invention may be carried into practice in various ways, but seven practical constructions are shown, by way of example, in the accompanying drawings, in which:

Figure 1 illustrates one construction in bottom plan,

Figure 2 is a section on the line II—II of Figure 1,

Figure 3 shows the coupling interconnecting two straps, or the two ends of a single strap, such for example as a belt,

Figure 4 is a view similar to that of Figure 3, but with the coupling being released,

Figures 5 and 6 are top and side views of the initial plate metal pressing of a modified construction embodying a movable auxiliary anchorage element,

Figures 7 and 8 show the completed modified form of coupling in side elevation and plan respectively,

Figures 9 and 10 are views similar to those of Figures 3 and 4 but of the construction shown in Figures 5 to 8,

Figure 11 is a plan of the initial pressing for a construction which is a modification of that shown in Figures 5 to 10,

Figures 12 and 13 show, in side elevation and plan respectively, the construction assembled from the pressing shown in Figure 11,

Figures 14 and 15 are views similar to those of Figures 9 and 10 but employing the coupling shown in Figures 12 and 13,

Figure 16 illustrates, in plan, the top plate, in the form of a pressing, for yet a further construction,

Figure 17 is a plan of the bottom plate for attachment to the top plate of Figure 16,

Figure 18 shows the parts of Figures 16 and 17 assembled to form the complete coupling,

Figure 19 is a section on the line XIX—XIX of Figure 18,

Figures 20 and 21 are views similar to those of Figures 14 and 15 but employing the coupling shown in Figures 18 and 19,

Figures 22 to 27 are views similar to those of Figures 16 to 21 respectively, but of another construction.

In each of the constructions illustrated in the drawings the coupling is suitable for interconnecting two straps or tapes, or two parts of one and the same strap. For convenience in description, however, the various constructions will be described as interconnecting the two ends of a belt for personal wear and formed of a woven fabric such, for example, as webbing.

In the construction shown in Figures 1 to 4, the principal or body part of the coupling is formed of a single pressing **1** of plate metal (Figures 1 and 2) rounded at one end to form a longitudinally extending finger-piece **2** and having a central opening **3** stamped out from a point **4** to the other end of the plate **1**. A part **5** of the tongue which is stamped out to form the opening **3** is bent or folded down, through approximately a 90° angle, as shown in Figure 2, so as to provide a downwardly curved surface **6** disposed crosswise of the longitudinal axis of the coupling. A metal cover plate **7** is secured by a rivet **2'** to the under surface of the finger-piece **2** and is bent around at **7'** so as to cover the free edge of the tongue **5** and form a pressure element or rounded gripping edge **6'** symmetrical about a median plane transversely disposed with respect to the longitudinal axis of the coupling. Two integral longitudinal marginal portions or side-pieces **8** of the plate-like body **1** are bent down so that each lies in a plane approximately normal to the length of the gripping edge **6'** which thus extends between the two side-pieces **8** (Figure 1). The side-pieces **8** are interconnected near their ends by a main anchorage element in the form of a cross-piece or pin **9**.

Similarly interconnecting the two side-pieces **8** near their upper edges is an auxiliary anchorage element in the form of a cross-piece, pin or roller **10** which extends parallel to, but is laterally spaced from, the gripping edge **6'** and main anchorage element **9**, the element **10** being displaced to one side of a primary plane of reference X—X containing the gripping edge **6'** and the longitudinal axis of the pin **9**.

When in use, a free end portion **11** of a belt **12** is passed upwards round the pin **9** and is secured, for example by stitching, to the main body **12** of the belt so that this is permanently connected to the coupling or buckle. The other end **13** of the said belt is inserted upwards through the plane X—X between the pins **9** and **10**, over the pin **10** to form a loop, and then down between the pin **10** and the gripping edge **6'**. Since the part **13** of the belt is free to move through the coupling under a pull applied to the free end **14** of the belt, the latter can be drawn around the auxiliary anchorage **10** to shorten the belt until the required tensile load T is applied between the parts **12** and **13** through the coupling or buckle. As the load T is applied, the part of the end portion **14** lying against the gripping edge **6'** is gripped between this edge and the body portion **13** so that the parts **13**, **14** will be firmly held against slip through the coupling under the load T. The gripping force will increase as the tensile load T increases

since the pull applied at 12 and 13 tends to bring the pin 10 into alignment with the pin 9 and the direction of the applied load T, this tendency being checked ultimately by the end of the fingerpiece 2 pressing upon the end portion 14 of the belt, as shown in Figure 3. As will be apparent from Figures 2 and 3, the plane of the fingerpiece 2 is inclined to the primary reference plane X—X so that when the belt is secured around the waist of the wearer, the coupling as a whole tends to conform to the curvature of the waist thus giving a smooth continuation of the belt without unsightly or inconvenient protuberances.

It will thus be seen that, whilst the load T can be readily increased to the required value by merely pulling on the free end 14 of the belt, the part 13, 14 cannot slip back under the said load. When, however, it is desired to reduce this load, or wholly to disconnect the belt 13, 14 from the coupling, this can be effected substantially instantaneously by merely lifting the finger-piece 2, as shown in Figure 4, so as to tilt the coupling as a whole about the axis of the pin 9, thus lifting the gripping edge 6' away from the strap portion 14 which is then free to slide back through the coupling.

With a view to opposing lateral bunching of the strap portions 13 and 14 towards one end of the slot 3 between the auxiliary anchorage element 10 and the gripping edge 6', the cover plate has a plurality of recesses or apertures 7'' which are so aligned that they extend in a row along the operative part of the gripping edge 6'.

When, as in the construction shown in Figures 1 to 4, the auxiliary anchorage element 10 is fixed relatively to the main anchorage element 9 and gripping edge 6', the openings 3, 3' through which the two end parts of the belt have to be passed are necessarily also fixed in width so that whilst straps or tapes up to a predetermined maximum thickness can be readily threaded through the said openings, difficulty may be experienced in this respect when inserting straps or tapes whose thickness exceeds the said maximum. With a view to meeting this difficulty, the auxiliary anchorage element 10 may be adjustable relatively to the main anchorage element 9 and pressure edge 6'. For example, as shown in Figures 5 to 10, the auxiliary anchorage element 10' is in the form of a pin or roller interconnecting the adjacent ends of two arms 15 (Figures 7 and 8) whose other ends are mounted to turn on, or with, extensions of the pin 9. In order to apply this coupling, the arms 15 are swung to the right as shown in Figure 7 until the pin 10' lies in recesses 16 formed in the upper edges of the side-pieces 8, and the end portion 11 of one part 12 of the belt is inserted upwards round the pin 9 and is secured to the part 12 as by stitching. Having inserted the free end 14 of the other part 13 of the said belt through the space between the anchored end 11, 12 and the pin or roller 10', the arms 15 are swung to the left, as viewed in Figure 7, thus leaving ample space between the pin 10' and the gripping edge 6' for downward passage of the end portion 14, which may then be readily looped around the auxiliary anchorage 10 and passed between the part 13 and the gripping edge 6', as shown in Fig. 9. As the load T is applied, the arms 15 will swing over towards the surface 6 and, though permitting free movement of the belt through the coupling under a pull applied to the free end 14 thereof, the gripping edge 6' will prevent longitudinal movement of the parts 13, 14 under the load T since the said load will cause the part 14 which bears against the gripping edge 6' to be gripped between the latter and the body portion 13 of the belt. If desired, the tongue 5 and gripping edge may be formed as a separate metal plate secured to the body of the coupling which may then be formed either of metal or of a plastic.

A modified construction is shown in Figures 11 to 15 in which the body of the coupling is again formed as a single metal pressing 18 (Figure 11), but the two side-

pieces 21 are provided with apertures 22 and notches 23, corresponding to the recesses 16 of Figures 5 to 10. The tongue 24 is covered by a metal plate 25 welded to the part 26 interconnecting the side-pieces 21. The arms 15 and pins or rollers 9 and 10' are as described with reference to Figures 5 to 10, but the two limbs 27 of a D ring 28 extend through the apertures 22 and make a forced fit in the opposite ends of a metal cylinder 29 which thus lies between the side pieces 21 when these have been folded down, as shown in Figures 12 and 13, and the D ring 28 has been attached. The operation of this construction is as described with reference to Figures 5 to 10, the notches 23 and cylinder 29 serving to limit the clamping movement of the pin or roller 10'; but release of the coupling is effected by pulling on the D ring 28 as indicated by the arrow in Figure 15. The gripping edge 6' and its line of apertures 7'' appear in Figure 12.

Yet a further construction is shown in Figures 16 to 21, in which the coupling comprises a top plate 30, in the form of a plate metal pressing (Figure 16) which has two openings 31, 32 formed therein thus forming an intermediate bar or bridge 33. The intermediate part of the plate 30, including the bar 33, is pressed out of the plane X—X of the plate (i. e. the primary plane) to form a groove 34. The two inclined sides 35, 36 of the groove 34 are interconnected by a flat 37 which thus lies in a plane spaced from that of the two base portions or feet 38, 39 of the top plate 30. In order to avoid rough or sharp edges on this bridge 33, a strip of metal plate 40 is laid over the bridge and the longitudinal margins of the plate 40 are folded through the slots 31, 32 and against the inner surface of the bridge, as shown in Figure 19. Similarly, in order to avoid sharp or rough edges along the longitudinal margins 41', 42' of the slots 31, 32, a bottom plate 41 (Figure 17) of sheet metal is provided having two tongues 42, 43 stamped therefrom, each tongue having a series of apertures 44 formed therein. The bottom plate 41 is applied to the feet 38, 39 of the top plate, as shown in Figure 19, whereupon the tongues 42, 43 are bent up through the slots 31, 32 so as to cover the edges 41', 42'. As will be seen from Figures 16, 18 and 19, the top plate 30 is provided with an integral finger-piece 45 which is inclined to the primary plane X—X.

If, for example, the coupling or buckle is to be employed for interconnecting the two ends of a safety belt for passengers in aircraft, an end portion 11 of the part 12 of the belt is inserted upwards through the slot 32 and secured to the part 12 of the belt, as by stitching. The longitudinal edge of this slot covered by the apertured tongue 43 thus constitutes the main anchorage element of the coupling. Having placed the belt about the waist of the wearer, the releasable end 14 thereof is inserted upwards through the slot 32 and, around the bridges 33, 40, down through the other slot 31, the bridge 33, 40 thus constituting the auxiliary anchorage element. The belt is tightened by merely drawing on the free end 14 thereof as shown in Figure 20. As the tension T increases, the load tends to turn the coupling so as to bring the bridge 33, 40 into alignment with the direction of the applied load T. This tends to swing the primary plane X—X, containing the edges 46 and 47 into alignment with the direction of the applied load T whereby the end portion 14 of the belt lying in contact with the gripping edge 46 is firmly gripped between the said edge and the adjacent portion 13 of the belt. The greater the load T, the greater will be the grip so that whereas tightening can be effected by merely pulling on the free end 14 of the belt, slip in the reverse direction is prevented. Moreover, for instantaneous release, the coupling has only to be tilted by means of the finger-piece 45, as shown in Figure 21, so as to increase the angle between the primary plane X—X and the di-

rection of the applied load T, thereby releasing the pressure applied by the gripping edge 46.

Since, as will be apparent, this coupling is reversible, that is to say either of the outer longitudinal edges 46 or 47 may be used as the gripping edge whilst the other 47 or 46 is used as the main anchorage edge, a second finger-piece for effecting release of the coupling may be provided at the other end of the top plate 30.

Though the apertures 44 will be provided in each of the tongues 42, 43 if the coupling is to be reversible, only the tongue 42 need be so apertured if the coupling is to be unidirectional since the function of the apertures 44 is to impart recesses or serrations to the gripping edge thereby preventing lateral slip and "bunching" of the end portion 13, 14 of the belt, i. e. a tendency for the belt to crowd into one end of the slot 31.

It will be understood that in any of the above constructions the main anchorage pin 9 or cross-piece 38 may be connected through a strap or tape to any other part, such for example as a fixed anchorage, instead of to another strap or to another part of the same strap. In one reversible arrangement, the top plate 30, either of whose cross-pieces 38 or 39 can be used at will as the gripping edge, is provided at its two ends with slots or other openings constituting main anchorage elements and each of which can be connected to a hook, strap or other part for attachment, say, to a wall or ceiling.

It is sometimes necessary to provide a coupling or buckle which not only interconnects two straps in a readily releasable manner, but which can itself be adjusted along a strap or tape connected to the main anchorage element of the coupling. For example, it may be necessary releasably to connect a strap to a permanent or semi-permanent tab depending from a ceiling and to adjust the buckle for height along the tab. In one construction (Figures 22 to 27) a top plate 50, having a flat or curved bridge 51 as described above, is provided, at that end opposite to the gripping edge 52 and finger-piece 53, with a flat extension 54 from which is struck up a deflecting tongue 55 whose edge 56 extends parallel to the slots 57, 58 on opposite sides of the bridge 51. The deflecting tongue 55 lies between the elongated slot 59 thus formed in the extension 54 and a second slot 60. The deflecting tongue 55 is inclined to the primary plane X—X, and the fixed strap or tab 61 is inserted upwards (Figures 26 and 27) through the slot 60, over the deflecting tongue 55, and downwards through the other slot 59. The slots 59 and 60 and the deflecting tongue 55 between them thus constitute a main anchorage element which is adjustable along the tab 61 by pushing the latter therethrough, the deflecting tongue 55 preventing longitudinal movement of the tab by tension applied thereto.

Figure 22 shows the plate metal pressing for the top plate 50 before the bottom plate 62 (Figure 23) is applied and the tongues 63, 64 are bent over the outer edges of the slots 57, 58. The bottom plate 62 is provided with a supplementary tongue 65 which is folded up over one edge of the slots 59, as shown in Figures 24 and 25, the tongues 63 and 65 having apertures 66, 67, for the purpose described above. The deflection tongue 55 has its edge 56 covered by a metal plate 68 secured by a rivet 69 to the extension 54.

The couplings or buckles above described are not only simple and cheap to manufacture since they can be formed substantially wholly from pressings, but combine the advantages that they can be adjusted to the required tension at will, are free from slip when under load, and can yet be substantially instantaneously released without the operation of any part, such as a rotary or other catch, which is movable relatively to the body for that purpose.

It will be understood that the constructions above described are given by way of example only and that details may be modified to suit requirements. For example, instead of the integral finger-pieces above described, these may be constituted by pivoted D's or loops.

What I claim as my invention and desire to secure by Letters Patent is:

1. A releasable buckle for connecting a strap to another part comprising a body with parallel sides and closed ends affording a main anchorage adjacent one end for connection to the part to be connected to the strap, said body having intermediate its ends a transverse gripping edge having a rounded surface free of projections and provided with subsurface means to increase the frictional grip between it and the strap, said rounded surface being tangent to and defining a primary reference plane passing through said main anchorage, and an auxiliary anchorage about which the free end of the strap is looped in working position, said auxiliary anchorage being supported by said body intermediate its ends and lying parallel to the gripping edge between it and the main anchorage and spaced from said primary reference plane and from said gripping edge, said auxiliary anchorage being on the same side of said primary reference plane as the gripping edge, and said buckle being formed at its end remote from said main anchorage with means offset from said reference plane on the opposite side thereof to said gripping edge for preventing said primary reference plane and gripping edge from alining with the direction of the applied load by more than the thickness of the strap with which the buckle is designed to be used.

2. A releasable buckle as claimed in claim 1 including a plate having in it an opening affording the gripping anchorage and a facing plate bent around one edge of the opening to engage therewith on both faces and containing holes to help form the gripping edge.

3. A releasable buckle as claimed in claim 1 in which the gripping edge is symmetrical about a median plane extending transversely to the direction of the applied load at one side thereof, and the auxiliary anchorage is mounted so as to be movable relatively to the gripping edge in a direction having a substantial component at right angles to the direction of the applied load.

4. A releasable buckle as claimed in claim 3 including arms supporting the auxiliary anchorage for pivotal movement with respect to the gripping edge.

5. A buckle as claimed in claim 1 in which the body comprises a metal plate of generally U-shape having a base and two parallel limbs, whereof the base constitutes the gripping edge and the main anchorage is afforded by a bar extending between said limbs, whilst the auxiliary anchorage comprises a cross bar and two arms interconnected thereby and pivoted on the body about an axis substantially parallel to the cross bar.

6. A buckle as claimed in claim 5 in which the two limbs of the U-shaped body are bent into approximately parallel planes transverse to the length of the gripping edge.

7. A buckle as claimed in claim 1 in which, when load is applied between the strap and the said other part, the auxiliary anchorage is so located longitudinally that parallel planes at right angles to the direction of the applied load passing through the gripping edge and the adjacent face of the auxiliary anchorage respectively are spaced apart by a distance not substantially greater than the thickness of the strap and the free end of the strap is wrapped around the gripping edge through an angle not substantially less than 90°, the end of said body forming the alining preventing means serving also as a finger release for disengaging said gripping edge from the strap.

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