

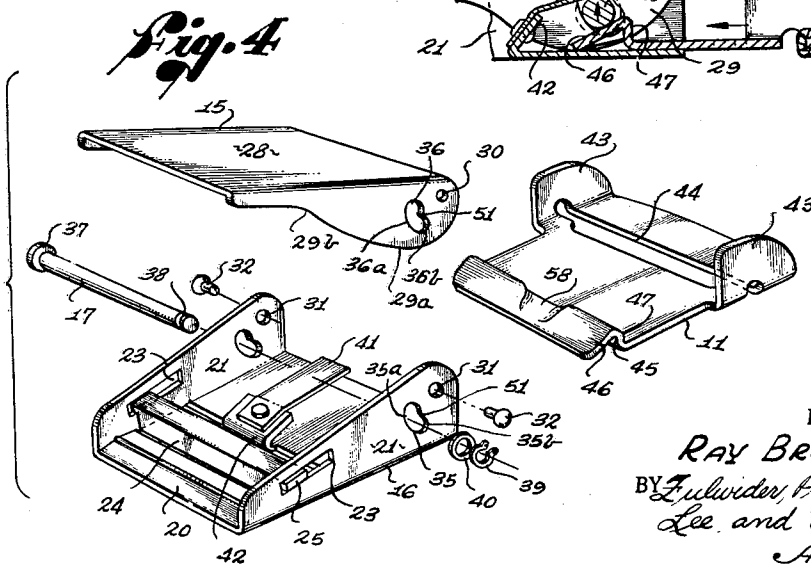
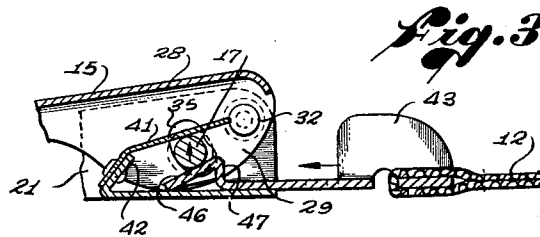
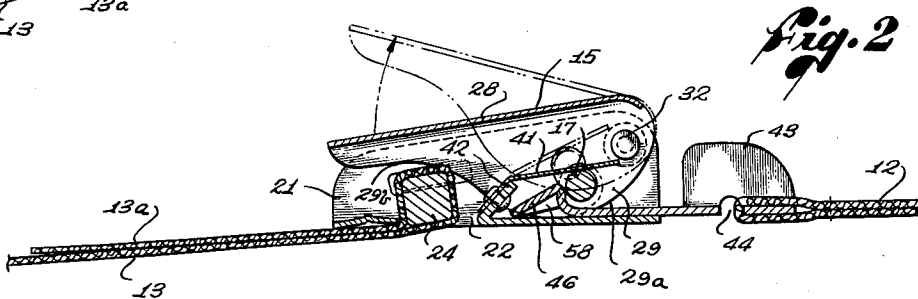
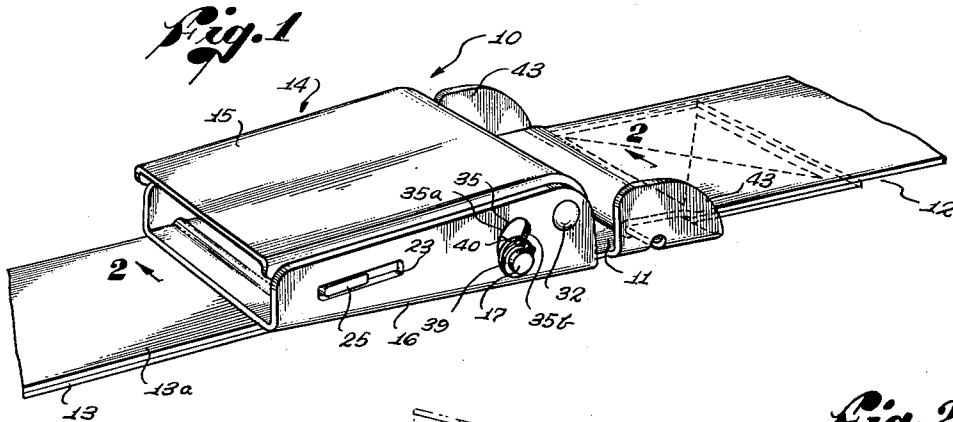
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SAFETY BELT BUCKLE

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SAFETY BELT BUCKLE

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11 Claims. (Cl. 24-230)

This invention relates generally to belt buckle devices, and more particularly to a new and improved buckle of simplified construction for use in releasably securing the ends of safety belts of the type used in airplanes, motor vehicles and the like.

Safety belts are widely used, especially in automobiles and airplanes, for the protection of passengers in the event of a crash or any maneuver tending to displace passengers from their seats. However, such safety belts can perform no more reliably than the buckles they employ for coupling the belt ends together.

Accordingly, it is one object of the present invention to provide an improved safety belt buckle which will maintain a pair of belt ends in coupled relationship against the impact of forces tending to displace them.

Another object is to provide an improved safety belt buckle having a novel locking mechanism in which the locking forces securing the belt ends increase with increasing pull upon the belt.

A further object of the invention is the provision of an improved buckle which resists opening due to inertial forces, but which can be readily unlocked by the user to selectively release the belt ends.

Still another object is to provide an improved safety belt buckle which can be deliberately unlocked with a minimum of effort by the user to release the belt ends even while the belt is under load and can only be unlocked by deliberate movement of the handle.

Yet another object of the present invention is the provision of an improved safety belt buckle which is locked by the single, simple manipulation of inserting a link into a buckle frame.

Still another object of the invention is to provide an improved belt buckle wherein the release handle used to unlatch the buckle remains undisturbed during insertion of the link into the buckle frame.

A still further object is to provide a safety belt buckle satisfying all of the foregoing objects in a rugged and reliable unit of simplified construction.

The above and other objects and advantages of this invention will be better understood by reference to the following detailed description when considered in connection with the accompanying drawing of an illustrative embodiment thereof, wherein:

FIGURE 1 is a perspective view of a safety belt incorporating the improved buckle of the present invention;

FIGURE 2 is a sectional view, taken along the line 2-2 of FIGURE 1, and illustrates the manner in which the buckle may be unlocked to release the belt ends;

FIGURE 3 is a partial elevational view, in section, illustrating the manner in which the two belt ends may be recoupled by simple insertion of the buckle link into the buckle frame; and

FIGURE 4 is an exploded assembly view, in perspective, illustrating the various structural components of the buckle.

Referring to the drawing, FIGURE 1 shows a buckle 10 embodying the invention. This buckle comprises a tongue or link 11, fixedly secured to an end of one belt 12, the link being shown in coupled relationship to a handle or frame assembly 14 that is adjustably connected to an end portion of another strap or belt 13. The assembly 14 includes handle 15 pivotally connected at a forward end to a forward end of a channel-shaped frame 16. The assembly 14 also includes a locking bar 17 en-

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gaged with side walls of both the handle 15 and frame 16, and that is spring-biased to normally maintain the handle 15 in the position shown in FIGURE 1. This locking bar has a cam engagement with a portion of the tongue 11, such that upon initial insertion of the tongue into the assembly 14, the locking bar 17 is displaced upwardly, but without effecting any upward movement of the handle 15. When the parts are engaged, as in FIGURE 1, and tension is present in the straps 12 and 13, the camming portion of the tongue 11 positively locks against the locking bar 17 which in turn has its opposite ends in wedging engagement with the frame 16, and the amount of locking force is proportional to the tension on the straps.

More specifically, the channel-shaped frame 16 has a web portion 20 intermediate a pair of similarly shaped side walls 21, preferably disposed parallel to one another. In the rear portion of the frame 16, i.e., to the left as viewed in the drawing, the web portion 20 is formed with a transversely extending slot 22 preferably of the same length as the width of the frame. Above this slot, the opposite side walls 21 of the frame 16 are formed with an aligned pair of slots 23 extending longitudinally of the side walls. An elongated bar 24 has a pair of opposite integral extensions 25 of rectangular cross-sectional configuration, slidably received in the pair of slots 23 whereby the bar 24 is bodily movable forwardly of the frame 16, but is keyed against any angular movement. As is clearly shown in FIGURE 2, the bar 24 is of lesser width than the slot 22 to provide ample clearance for a bight portion of the strap 13, whose end is wound around the bar 24. The loose end of the strap 13 is indicated at 13a, and it will be apparent that when tension is relieved on the strap 13, the bar 24 may be shifted relative to the slot 22 to permit adjustment of the assembly 14 longitudinally of the strap 13. When tension is present in the strap 13, the loose end portion 13a thereof is tightly clamped against the rear edge of the slot 22.

The handle 15 is also generally channel-shaped in configuration, having a web portion 28 intermediate an opposite pair of similarly shaped, irregularly contoured opposite side walls 29. At the forward, or right-hand end of the handle 15, the side walls 29 are formed with an aligned pair of bores 30 adapted for registration with an aligned pair of bores 31 that are formed in the forward and upper portions of the pair of side walls 21 of the frame 16. A pair of headed pivot pins 32, or the like, extend through the pairs of openings 30, 31, and are peened at their inner ends, or otherwise held against longitudinal displacement, whereby to retain the handle 15 in assembled relationship to the frame 16.

As is shown in FIGURE 1, the spacing between the side walls 29 of the handle 15 is such that they are receivable between and immediately adjacent the side walls 21 of the frame 16. The web portion 28 of the handle 15 then covers the strap bar 24 and locking bar 17, and other parts within the frame 16 whereby a very neat appearance is obtained. Additionally, as can be seen in the solid outline position of the handle 15 in FIGURE 2, and from FIGURE 3, those edge portions 29a of the greatest depth of the side walls 29 of the handle 15 are adapted to seat on the web 20 of frame 16 to provide a stop for downward movement of the handle so as to avoid interference of the handle with the parts contained in the assembly 14. To this end, the lower edges of the side walls 29 of the handle have a reversely curved portion 29b to provide a relief or clearance for the locking bar 24 and the portion of the strap 13 wrapped around the bar.

When the assembly 14 is grasped by the user, there is a natural tendency for the palm of the hand to overlie the handle 15. This position of the palm would interfere with raising movement of the handle if the handle

were mounted in such a way as to be cammed upwardly in response to insertion of the tongue or link 11. Accordingly, the locking bar 17 is mounted in the assembly 14 so as to have a degree of lost motion, allowing it to be cammed upwardly without effecting any movement of the handle 15 or frame 16. On the other hand, the mounting of the locking bar 17 is such that it is immediately lifted by lifting movement of the handle 15, whereby to permit uncoupling of the parts.

More specifically, the opposite side walls 21 of the frame 16 are formed with a pair of congruently shaped and congruently aligned, generally arcuate slots 35, which receive the opposite ends of the locking bar 17. Similarly, the opposite side walls 29 of the handle 15 are formed with an opposite pair of elongated slots 36 that are preferably, although not necessarily, of the same shape as the slots 35. Both pairs of slots 35 and 36 are generally arcuate in overall configuration with a center of curvature at the pivotal axis of the handle 15. As the pair of handle slots 36 are disposed in registration with the pair of frame slots 35, the locking bar 17 extends through all four slots. The locking bar may be held in assembled relation by any suitable means, as, for example, by being formed with a head 37 at one end and by having a circumferential groove 38 formed in its other end to receive a snap ring 39 beneath which a washer 40 may be disposed.

A suitable spring means is provided in the assembly 14 for normally biasing the handle 15 downwardly. In the presently preferred embodiment of the invention, this takes the form of a cantilevered leaf spring 41 having one end secured, as by riveting, for example, to a tab 42 that is upstruck from the material of the web 20 of the frame 16. The spring 41 is thus spaced above the web 20 of the frame 16 to extend forwardly with its free end portion disposed on top of the locking bar 17. The locking bar is thus forced into the lower ends of the pair of slots 36 to normally bias the handle downwardly.

The cover or handle 15 can be moved to its open latch-releasing position (shown in phantom in FIGURE 2) only by raising the locking bar 17 against the force of the spring 41. This is accomplished by pivoting the handle upwardly whereby the lower ends of the handle slots 36 lift the locking bar 17 within the slots 35 of the frame. Upon release of the handle 15 by the operator, the spring 41 will automatically drive the handle to a lowermost position until the edge portions 29a of the handle engage the web of the frame 16. At or before this time, the ends of the locking bar will engage the lowermost ends of the frame slots 35.

Since the path of movement of the locking bar 17, during pivotal movement of the handle 15, is essentially circular about the pivotal axis of the handle as a center, the rear edges 35a of the frame slots have a center of curvature which is preferably on the pivotal axis of the handle to provide adequate clearance for the locking bar movement with a minimum of free play. The rear edges 36a of the handle slots may have a greater clearance if desired, although I have found it preferable that they be congruently shaped to the edges 35a.

The tongue or link 11, at its rear end (to the right as seen in the drawings), is formed with an upstanding pair of ears 43 spaced apart a distance substantially equal to the spacing between the side walls of the frame 16. Between these ears, the link 11 is formed with a transversely extending slot 44 adapted to receive a bight of the strap 12, the end of the strap being secured as by stitching to a confronting portion of the strap 12. The ears 43 of the link provide a convenient handhold during coupling and uncoupling of the link with the assembly 14. Forwardly of the ears 43, the link is of a width to be received between the sidewalls 29 of the handle and provided with a transversely extending raised portion or ridge 45 that includes a canted, forwardly facing cam surface 46 and a generally vertical and rearwardly facing locking surface 47. The surface 46 effects lost motion

of the locking bar 17 within the two pairs of slots 35 and 36 during insertion of the tongue 11 while the locking surface 47 effects wedging of the locking bar into the lower end of the frame slots 35 when the coupled parts are under tension.

To lock the buckle 10, and thereby couple the belt ends 12, 13 together, the leading end of the link 11 is inserted into the forward end of the frame assembly 14, so that the camming surface 46 of the ridge 45 abuts the underside of the locking bar 17, as shown in FIGURE 3. As the link 11 is thus inserted, the camming surface 46 raises the locking bar 17 in the arcuate slots 35 and 36. Hence, the ridge 45 of the link 11 readily passes beneath the locking bar 17. Moreover, insertion of the link 11 into the frame assembly 14 causes no displacement whatever of the handle 15. The latter enhances the ease of installation of the link, since blocking of the handle 15 by the hand of the operator during use in no way hampers insertion of the link into the buckle frame.

When the ridge 45 of the link 11 has passed inwardly beyond the locking bar 17, the spring 41 then forces the locking bar back down into the lower portion of the two pairs of arcuate slots 35 and 36. Then, when tension is applied on the straps 12 and 13, the locking surface 47 of the ridge jams or wedges the opposite end of the locking bar 17 into the lower end portions of the frame slots 35, or into the lower end portions of the pair of handle slots 36, or simultaneously into the lower end portions of both the slots 35 and 36. While the slots 35 and 36 may be congruently shaped and congruently disposed, as has been mentioned, the arrangement is preferably such that when the locking surface 47 jams against the locking bar 17, the ends of the bar are firmly seated at least in the lower ends of the frame slots 35 whereby the stresses are more directly assumed by the frame, and undue stress on the pivot pins 32 is avoided.

The shape of the leading edges of the lower ends of the frame slots 35 is such that any attempt to withdraw the link 11 causes the locking surface 47 to cam the locking bar 17 downwardly, rather than upwardly in the slots. To this end, the leading edge portions 35b of the slots are shaped to provide an acute angle wedge defined by tangents drawn to the points of contact between the locking bar 17, the locking surface 47, and the edge portions 35b. Moreover, in the presently preferred embodiment of the invention, a small ridge 51 projects from each of the leading edges 35b, i.e., essentially midway along the front edges of the arcuate slots, to further resist any tendency for the locking bar 17 to rise when the belt is in tension.

Referring now particularly to FIGURE 2, the manner in which the buckle 10 is unlocked by the handle 15 to release the link 11 from the frame 16 will become apparent. By pivoting the handle 15, the locking bar 17 is lifted along the arcuate slots 35 to its phantom position in FIGURE 2. This enables the ridge 45 of the link 11 to pass freely beneath the locking bar 17 for withdrawal of the link from the frame 16. The effort required to pivot the handle 15 and thereby raise the locking bar 17 even while the belt is under load, may be controlled by selection of the wedge angle provided by the locking surface 47 and the leading edges of the arcuate slots 35.

To prevent false locking of the link 11 within the frame assembly 14 when the link is turned upside down to reverse the ridge 45, the ridge is provided with a central recess 58. This produces a blocking shoulder on the underside of the ridge 45 which prevents false locking engagement between the locking bar 17 and ridge, if the ridge and link are reversed, as the bar 17 is prevented from dropping into the space between the ridge surfaces 46 and 47. When the link is right side up, the recess 58 also provides ample clearance for the rivet securing the spring 41 to the tab 42 of the frame.

It will be apparent from the foregoing that, while a particular form of my invention has been illustrated and described, various modifications can be made without de-

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parting from the spirit and scope of my invention. Accordingly, I do not intend that my invention be limited, except as by the appended claims.

I claim:

1. In a belt buckle, the combination comprising:
 - a frame assembly;
 - a link plate;
 - a spring biased elongated locking bar within said frame assembly movable between link locking and link releasing positions, said locking bar having its longitudinal axis parallel to the plane of said link plate;
 - a first raised surface extending obliquely from said link plate for camming said locking bar to the link releasing position;
 - a second raised surface upon said link plate for camming said locking bar to the link locking position;
 - a spring biased handle pivotally secured to said frame assembly and movable between extended and retracted positions;
 - and means to move said locking bar to the link releasing position when said handle is pivoted to an extended position with respect to said frame assembly.
2. A belt buckle comprising:
 - a link plate;
 - a buckle frame having a pair of side walls;
 - a handle having a pair of side walls, said handle being pivotally secured to said buckle frame;
 - an elongated locking bar extending through said pairs of side walls of said handle and said frame, said locking bar having its longitudinal axis parallel to the plane of said link plate;
 - means secured to said frame for spring biasing said locking bar to a designated position along said path;
 - a ridge extending transversely of the width of said link plate, said ridge having one surface for camming said bar out of the path of said link plate during installation of said link plate into said frame, said ridge having a second surface for camming said locking bar to block said link plate against withdrawal;
 - and means embodied by said handle for moving said locking bar along said prescribed path and out of the link plate blocking position upon pivoting said handle with respect to said frame.
3. A buckle comprising:
 - a link plate;
 - a buckle frame;
 - a handle pivotally secured to said buckle frame;
 - an elongated locking bar extending through said handle and frame and movable at its end along a pair of substantially arcuate slots in said frame; each of said slots having forward and rear edges, said locking bar having its longitudinal axis parallel to the plane of said link plate;
 - a spring extending from said frame and biasing said locking bar to its lowermost position within said slots;
 - a ridge in said link plate extending transversely of the width of said plate, said ridge having a first surface for camming said locking bar upwardly within said arcuate slots during installation of said link plate within said frame; said ridge having a second surface for wedging said locking bar downwardly within said arcuate slots between said second surface and the forward edges of said slots;
 - and means embodied by said handle for moving said locking bar upwardly against the forces of said spring to clear said link plate ridge when said handle is pivoted with respect to said frame.
4. A buckle comprising:
 - a channeled buckle frame having a pair of side walls and a first pair of arcuate slots, one slot in each side wall of said frame;
 - a channeled handle having a pair of side walls pivotally secured to the side walls of said frame, said side walls being provided with;

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- a second pair of slots, one slot in each side wall of said handle, said second pair of slots being in alignment with said first pair of slots;
 - a locking bar having its ends extending through and movable along said arcuate slots;
 - spring means for biasing said locking bar to its lowermost position within said arcuate slots;
 - a buckle link adapted to be inserted within and latched to said buckle frame;
 - and a ridge in said link extending parallel to said locking bar, said ridge having a forwardly facing surface for camming said locking bar upwardly within said arcuate slots during insertion of said link into said frame, said ridge having a second rearwardly facing surface for wedging said locking bar downwardly within said slots.
5. In a safety belt buckle, the combination comprising:
 - a channeled frame member having a pair of side walls and a first pair of arcuate slots, one in each side wall of said frame;
 - a channeled handle having a pair of side walls and pivotally secured to said frame member for movement between open and closed positions, said side walls being provided with;
 - a second pair of arcuate slots in registration with said first pair of arcuate slots;
 - a locking bar having its ends supported for movement along said arcuate slots;
 - a cantilevered spring secured at one end to said frame member and simultaneously biasing said handle to its closed position and said locking bar to its lowermost position within said arcuate slots;
 - a link plate adapted to be inserted within said frame member;
 - and a ridge in said link plate extending parallel to said locking bar, said ridge having a first surface for camming said locking bar upwardly within said arcuate slots during insertion of said link plate into said frame member, said ridge having a second surface for camming said locking bar to its lowermost position within said slots after installation of said link plate within said frame member.
 6. A combination as set forth in claim 5, including means extending from the underside of said ridge for preventing locking engagement between said ridge and said locking bar if said link plate is inserted down into said frame member.
 7. A combination as set forth in claim 5, including a central recess in said ridge to provide a blocking shoulder on the underside of said ridge.
 8. A safety belt bucket, comprising:
 - a channeled buckle frame having a pair of side walls and a first pair of arcuate slots, one in each side wall of said frame;
 - a channeled handle having a pair of side walls pivotally secured to the side walls of said frame, said handle being movable between open and closed positions, said handle being provided with;
 - a second pair of arcuate slots, one in each side wall of said handle, said second pair of slots being in registry with said first pair of slots, both said first and said second pair of arcuate slots having first edges with centers of curvature along the pivotal axis of said handle;
 - a locking bar having its ends extending through and movable along said arcuate slots;
 - a spring extending from said frame member and simultaneously biasing said handle to its closed position and said locking bar to its lowermost position within said slots;
 - a link plate adapted to be installed within said frame;
 - a ridge in said link plate extending substantially across the width of said plate and parallel to said locking bar, said ridge having a first forwardly facing surface for camming said locking bar upwardly within

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- said arcuate slots during installation of said link plate within said frame member, said ridge having a second rearwardly facing surface for camming said locking bar to its lowermost position within said arcuate slots during attempted withdrawal of said link plate from said frame member;
- 5 and a projection extending from second arcuate edges of said slots nearer the forward end of said frame and above said locking bar when said bar is in its lowermost position.
9. A safety belt buckle as set forth in claim 8, including a central recess in the ridge of said latch plate to provide a blocking shoulder on the underside of said ridge.
10. A buckle comprising:
- 15 a buckle frame;
- a handle pivotally secured to said buckle frame;
- a locking bar extending through said handle and frame and movable at its ends along a pair of substantially arcuate slots, each of said slots having forward and rear edges, the centers of curvature of the rear edges
- 20 of said arcuate slots being on the pivotal axis of said handle;
- a spring extending from said frame and biasing said locking bar to its lowermost position within said slots;
- a link plate;
- 25 a ridge in said link plate extending transversely of the width of said plate, said ridge having a first surface for camming said locking bar upwardly within

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- said arcuate slots during installation of said link plate within said frame, said ridge having a second surface for wedging said locking bar downwardly within said arcuate slots between said second surface and the forward edges of said slots;
- and means embodied by said handle for moving said locking bar upwardly against the forces of said spring to clear said link plate ridge when said handle is pivoted with respect to said frame.
- 10 11. A combination as set forth in claim 1, including common spring means for normally biasing said locking bar to its link locking position and said handle to its retracted position.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,145,442

August 25, 1964

Ray Brown

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, lines 50 and 60, for "frame;", each occurrence, read -- frame, --; column 6, lines 24 and 58, strike out the semicolon, each occurrence.

Signed and sealed this 9th day of February 1965.

SEAL)

test:

ERNEST W. SWIDER
Testing Officer

EDWARD J. BRENNER
Commissioner of Patents