July 23, 1968 E. L. BARCUS 3,393,433

SAFETY SEAT BELT BUCKLE

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Fig. 1

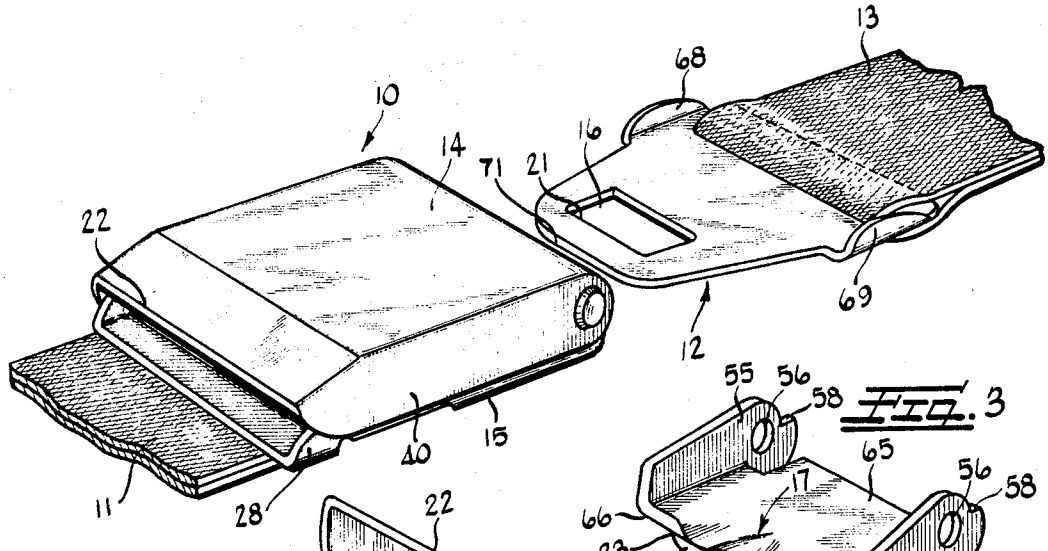


Fig. 3

Fig. 2

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Fig. 4

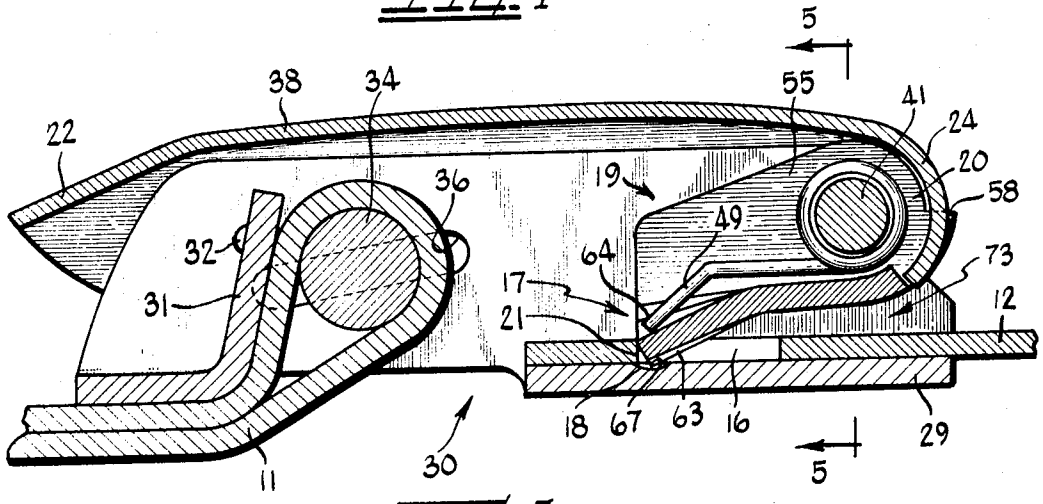


Fig. 5

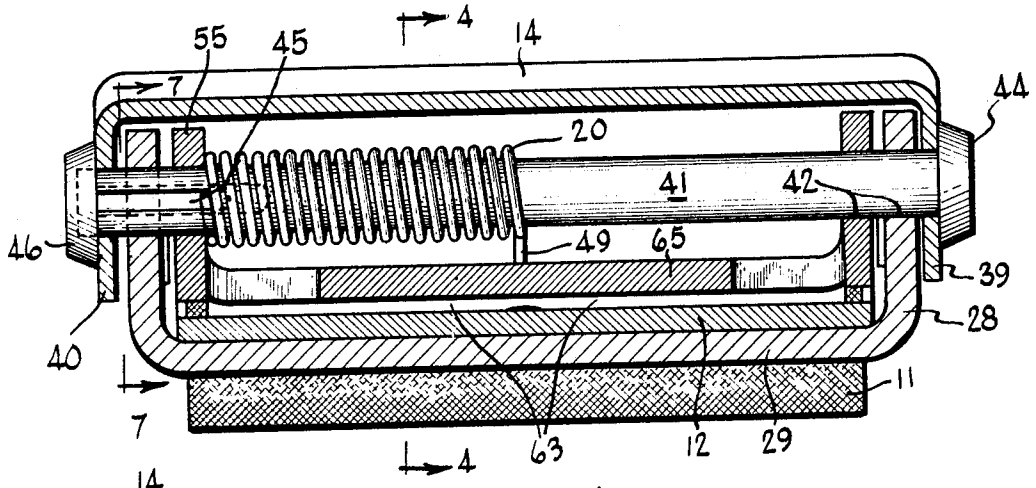


Fig. 6

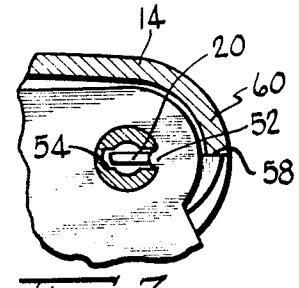


Fig. 7

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SAFETY SEAT BELT BUCKLE

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ABSTRACT OF THE DISCLOSURE

A safety belt buckle has a base to which one end of a belt may be attached and a tongue plate for attachment to another end of the belt. A spring biased latch member is pivotally mounted on a base to move a latch dog thereon between a release position in which the tongue plate can be retracted from the base, and a latching position in which the latch dog projects into an opening in the tongue plate and engages an abutment wall defining a portion of the opening. To assure latching, the latch dog is formed with a sinuously shaped leading wall with bends in one direction extending beyond one face of the tongue plate and a bend in the opposite direction extending beyond the opposite face of the tongue plate. Preferably, the sinuously shaped leading wall is sloped and abuts an edge of said abutment wall at three spaced regions. The base may be provided with a covered slot to receive the lower edges of the first mentioned bends when the latch dog is in the latching position.

This invention relates to a safety belt buckle, and more particularly to a safety belt buckle adapted for releasably fastening together the ends of straps, belts and the like.

In safety belt buckles, a tongue plate having an opening or recess is attached to one end of a belt and is latched to a base of the buckle by a latch dog carried on a pivotally mounted latch member. In some instances, a pair of spaced openings are provided in the tongue plate for receiving a pair of spaced dogs carried on the latch member. In other buckles, a single wide dog may be projected into a single, large aperture in a tongue plate. If the upper edge of the dog has a long, straight line of contact with the wall defining the latch opening, repeated and considerable usage of the buckle may cause a groove or notch to form in this wall. Then, when the belts attached to the buckle and tongue plate are under tension, the dog may become embedded in this groove and the dog will be held against release with the usual amount of pull on the cover lever. For example, after exertion of a tension force of 2,500 lbs. on the buckle and tongue plate belts, the dog may be embedded to the extent that it will not release with operation of a push button or with a 30 lb. pull on a cover lever, even after the load is reduced to 150 lbs., and thus fail to meet certain safety standards.

Advantageously, the latch dog should project into the latch opening and have surfaces disposed above and beneath the upper edge of the opening to assure that a positive latching occurs. Also, it is preferred that the dog and tongue plate be related to reduce the prospect of rattling of one on the other.

Accordingly, a general object of the invention is to provide a new and improved seat belt buckle in which the latch dog is inserted for a considerable depth into the latch opening to assure a positive latching, yet which freely releases.

A further object of the invention is to achieve the foregoing object by a sinuously shaped latch dog having a sloped surface for abutting an edge of a wall defining the latch opening.

A further object of the invention is to provide a seat

buckle which has a latch dog fully projecting into the latch opening and yet has a smooth underside for sliding across the wearer's apparel.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings in which:

FIGURE 1 is a perspective view of a safety belt buckle constructed in accordance with and embodying the novel features of the present invention;

FIGURE 2 is an enlarged perspective view of the buckle of FIGURE 1 with the cover raised to an open release position;

FIGURE 3 is a perspective view of the latch member of the buckle shown in FIGURES 1 and 2;

FIGURE 4 is a longitudinal sectional view taken substantially along the line **4**—**4** of FIGURE 5;

FIGURE 5 is a sectional view taken substantially along line **5**—**5** of FIGURE 4;

FIGURE 6 is an enlarged, fragmentary, longitudinal, sectional view of the latch dog disposed in its latched position; and

FIGURE 7 is a fragmentary, sectional view taken along line **7**—**7** of FIGURE 5.

As shown in the drawings for purposes of illustration, the invention is embodied in a safety belt buckle **10**, in which very generally, the buckle is attached to one end **11** of a belt and a removable tongue plate **12** is fastened to another end **13** of the belt. To fasten these belt ends together, the tongue plate **12** is inserted in a slot between a cover **14** and a base **15** and then projected longitudinally along the base of the buckle to aligne a latch opening **16** (FIGURE 4) in the tongue plate with sinuously-shaped latch dog **17** carried on a latch member **19**. The latter is biased by a torsion spring **20** (FIGURE 2) to project the latch dog into the latch opening **16** to the extent that the lower edges of the latch dog extend into a groove **18** (FIGURE 2) in the bottom of buckle, and surfaces **23** on the dog abut a forward wall **21** defining a portion of the latch opening.

To move the latch member **19** to a release position, in which the latch dog is spaced above the latch opening, the illustrated buckle has its cover **14** in the form of a lever with a free end **22** adapted to be grasped and pivoted upwardly from the base to the position of FIGURE 2 against the biasing force of the spring **20**. A rear portion **24** (FIGURE 4) on the cover plate includes a pair of shoulders abutting the rear edge of the latch member **19** to pivot the latter to raise the latch dog to the release position shown in FIGURE 2.

In accordance with the invention, a positive latching is provided by a sinuously-shaped dog **17** abutting the tongue plate **12**. Spaced contact areas **23** abut an upper edge of the abutment wall **21** in the tongue plate and provide a good, full, positive latching while a sloped surface **25** on a leading wall of the latch dog is unlikely to form an embedding groove which will hold the dog against release movement, as will be explained in detail hereinafter. Another feature of the invention, which will be described in detail, is providing shoulders on the latch member to hold the tongue plate against the bottom wall of the buckle for the purposes of assuring a predetermined relationship between the sinuously-shaped leading wall and the tongue plate and also preventing rattling of tongue plate.

Proceeding now with a more detailed description of the individual elements, the buckle base **15** is, in this instance, in the form of a channel with a pair of upstanding flanges **26** and **28** (FIGURE 2) extending longitudinally along and generally perpendicularly to a central base plate **29** disposed between the flanges. At one end of the channel base, a belt opening **30** (FIGURE 4) is formed in the base plate and extends transversely across the base plate to the up-

standing flanges 26 and 28. A portion of the base plate 29 is bent upwardly at an acute angle at the belt opening of the central plate to form an upstanding lip 31. Inwardly directed tabs 32 are struck inwardly toward one another from the opposed side flanges 26 and 28 to form stops abutting the forward, generally vertical wall of the lip 31 for the purpose of holding the lip against bending forwardly, i.e., in a direction toward the free end 22 of the cover lever 14.

To clamp the end 11 of the belt to the base 15, a transverse knurled rod 34 is disposed above the belt opening 30 and between the side flanges 26 and 28 for frictionally clamping the belt against the rear, generally vertical wall of inclined lip 31. The opposite ends 35 (FIGURE 2) of the rod 34 are flattened and are mounted for free sliding movement in elongated slots 36 formed in the flanges at the location of the belt opening. The slots are inclined downwardly and forwardly so that, when the leading end of the belt is inserted through the opening and trained over the rod, the free end of the belt is nipped in the space between the knurled rod and the lip. Exertion of a tension force on the belt pulls the rod toward the lip and tightens the grip on the belt. When it is desired to adjust the belt size, the tension in the belt is released, and the rod 34 is moved rearwardly and upwardly in the slots, whereupon the belt can be slid about the rod to its adjusted position.

The cover lever 14 serves as a cover for the buckle and as a release lever to unlatch the dog 17 from the tongue plate 12 when the cover is pivoted to the open position (FIGURE 2). Herein, the cover lever 14 is in the form of a channel with a central, flat base plate 38 (FIGURE 2) disposed horizontally. A pair of longitudinally extending and transversely spaced side flanges 39 and 40 depend from the plate 38 and extend adjacent to and overlap the side flanges 26 and 28 of the buckle base 15 when the cover lever is closed (FIGURE 1). In this closed position, the inner, horizontal wall on the cover plate 38 abuts the upper longitudinal edges of the base flanges 26 and 28. At its rearward end of the cover, the portion 24 is arcuately curved downwardly toward the base 15.

To piovtally mount the cover lever 14 on the buckle base 15, a pivot pin 41 extends transversely of and projects through aligned openings 42 (FIGURE 5) in each of the side flanges 26, 28, 39 and 40. The pivot pin 41 is disposed generally parallel to the buckle base plate 29 between the overhead cover and the lower buckle base. The pivot pin is formed with an integral, upset head 44 at one end and with an elongated slot 45 at the other end of the pin. A releasable cover cap 46 is force fitted into the slotted end of the pivot pin to hold the latter against axial movement from the openings 42. The coiled torsion spring 20 encircles the pivot pin and has one end fitted into the elongated slot 45. Its other end 49 extends radially from the pivot pin to engage the upper side of the latch member 19 to bias the latter to its latching position, as illustrated in FIGURE 4. The torsion spring 20 is wound up on the pin by partially inserting the pin into the cover 14 and using a driving key (not shown) which is inserted through the opening 42 in the side flanges 40 and 28 and into the slot 45, to rotate the pivot pin about its longitudinal axis. After winding, the pivot pin 41 is slid axially (FIGURE 5) to bring the open side of the elongated slot 45 into alignment with an inward projection 52 formed in the wall at the opening 42 in the flange 40. The projection 52 seats in the slot 45 and holds the pivot pin against rotating and unwinding the torsion spring. Rather than having the slot 45 extend entirely across the width of the pin, the pivot pin is strengthened by providing an outer wall 54 on the pin diametrically opposite the slot 45.

The latch member 19 for latching the tongue plate 12 is a generally channel-shaped member (FIGURE 3) having transversely spaced flanges serving as trunnion arms 55 with aligned apertures 56 for journaling the latch member on the pivot pin 41. The trunnion arms are disposed adjacent the side flanges 26 and 28 of the base and have terminal abutments 58 which extend radially and upwardly about the pivot pin 41 and into rectangular slots in the portion 24 of the cover 14, to abut the cover at the shoulders formed by the upper, transverse edges 60 (FIG. 7) of the slots. The radially directed end 49 of the torsion spring 20 biases the abutments 58 against these edges 60 of the cover to urge the cover lever 14 to its closed position with its flanges disposed to substantially, fully overlap the flanges of the base.

In accordance with the present invention, the sloped surface 25 on sinuously shaped leading wall 61 of the latch dog 17 is abutted against an upper edge 62 (FIGS. 4 and 6) of the abutment wall 21 when the latch dog is in its latching position. The dog's leading wall 61 is formed with a pair of downwardly extending bends 63 disposed on opposite sides of a central upwardly extending bend 64. These bends are formed by a punch press operation which deforms the front, central portion of a generally flat horizontal plate 65 disposed between the side flanges 55 on the latch member.

When the latch dog 17 is in its latching position, the undersurface of the plate 65 forms a pair of spaced shoulder surfaces 66 on opposite sides of the sinuously shaped latch dog. These shoulder surfaces 66 are biased against and engage the upper face of the tongue plate 12. To assure latching, the downward bends 63 are formed with sufficient depth to project through the opening 16 in the tongue plate and to insert their lower arcuate edges 67 at least partially in the groove 18 in the central plate 29 of the base; and the upwardly extending bend 64 projects its upper arcuate edge above the upper face of tongue plate 12. The abutting edge 62 of the tongue plate wall 21 engages the latch dog at contact areas 23 which are in a generally horizontal plane defined by the shoulder surfaces 66 on the underside of the latch member.

To prevent the abutment edge 62 on the tongue plate from embedding in the latch dog, the leading wall 61 of the latch dog is sloped downwardly at the surface 25 to slide along the edge 62 upon pivoting of the latch member to the release position. More specifically, the sloped surface 25 is formed to extend downwardly and away from the abutment wall so that the lower portion of the latch dog may swing upwardly past the abutment edge 62 without undue interference. Furthermore, the dog is preferably heat treated, making it harder than the tongue so that the tongue does not embed in the dog. Preferably the sloped surface 25 is formed by a coining operation during the formation of the sinuously shaped latch dog. The upper edge of the sloped surface constitutes the contact areas 23 and the sloped surface extends downwardly and rearwardly therefrom. The sloped surface could be formed by other methods such as by grinding. The angle of inclination or slope of the surface 25 to the vertical is quite small so that the abutting edge 62 will not cam the latch dog upwardly to its release position but rather will firmly abut and give a good latching engagement. The surface 25 is sloped such that during the release movement of the dog it slides substantially tangentially across the abutment edge 62 as the latch member pivots upwardly about the axis of the pivot pin 41.

The upwardly extending bend 64 has its upper edge extending considerably above the horizontal plane of the shoulder surfaces 66 and hence, in latching, it extends above the top of the tongue plate. At the same time the lower edge of this upwardly extending bend projects into the latch opening 16 so that the upper rim wall of the latch opening at the abutment wall 21 may abut the bend 64 intermediate its upper and lower edges at the area 23. When the tongue plate engages the bend 63, the latch dog engages the tongue plate at three widely spaced areas. The forces are thus distributed along a plane at the underside of the central plate of the latch member so that there is no concentration of forces as would cause the buckle to fail.

It will be recalled that the groove **18** admits the lower edges **67** of the downward bends **63** so that the shoulder surfaces **66** may engage the upper surface of the tongue plate **12**. Because the torsion spring **20** biases the latch member **19**, counterclockwise as viewed in FIGURES 2 and 4, the shoulder surface **66** may engage the upper surface of the tongue plate **12** on opposite sides of the latch opening **16** and bias the tongue plate **12** against the lower plate **29** of the buckle. The holding of the tongue plate **12** against the plate **29** prevents undesirable rattling of the tongue plate and assures positive latching.

In accordance with a feature of the preferred embodiment of the invention the groove **18** does not extend through the base plate **29**, and hence it covers the lower edge of the latch dog **17** while leaving the underside of the base plate **29** smooth and unapertured at the location of the dogs. The buckle base is therefore free to slide over the wearer.

The tongue plate **12** may take different forms but herein is in the form of a flat plate with upstanding short side flanges **68** and **69** (FIGURE 1) on opposite sides of a transverse opening **70** for receiving the end **13** of the belt which is doubled back and sewed to itself rearwardly of the tongue plate. From the side flanges, the tongue plate tapers inwardly to a forward end **71** to permit easy insertion while guiding the tongue to the proper latching position.

To latch the tongue plate **19** to the buckle, the end **71** of the tongue plate is inserted in the slot **73** (FIGURE 4) between the rear end of the latch member and the plate **29**. When the end **71** strikes the undersurfaces of the bends **63** of the dog **17**, it cams the latch member **19** up to pivot it away from the base plate **29**. The cover lever **14** remains closed as the shoulders **58** on the latch member **19** merely separate from the shoulders on the cover lever **14** at the upper ends of the cover lever. The lower forward edges **17** of the dog slide along the top of the tongue plate until the latch opening **16** is registered with the dog **17**, whereupon the torsion spring **20** snaps the dog **17** into the latch opening **16** and downwardly extending bends **63** project through the latch opening **21** and into the groove **18**. At the same time the central upward bend is arranged so that the leading wall extends centrally both above and below the upper edge of the abutment wall **21** in the tongue plate and thereby assures an abutment during periods of high stress or flexure of the parts, and also if there be some misalignment due to tolerance accumulations. The tongue plate remains latched by the latch member **19** until the cover lever **14** is pulled upwardly from the latch opening, at which time, the tongue plate is free for retraction from the slot **73**.

From the foregoing, it will be seen that the seat buckle is constructed with unique latch member having a latch dog for fitting into a single latch opening and shaped to prevent the embedding of the latch member in the tongue plate. By providing spaced areas of contact between the latch dog and the tongue plate rather than a straight edge contact and by forming arcuate or tapering surfaces on the latch dog, the latch member readily releases with a nominal amount of pull on the cover lever thereof, though the belts may be subjected to a substantial tension force.

While a preferred embodiment has been shown in the drawings and described herein, it is not intended to limit the invention by such disclosure but, rather, it is intended to cover all modifications and alternative constructions coming within the spirit and scope of the invention as defined in the appended claims.

It is claimed that:

1. In a safety belt buckle, the combination comprising a channel shaped base having a central plate and a pair of spaced, upstanding flanges extending longitudinally along the opposite edges of said central plate, a channel shaped cover lever having a pair of longitudinally extending flanges extending adjacent and parallel to said side flanges of said base, a pivot pin spanning both pairs of flanges at one end of the base and mounting the cover lever on the base for pivotal movement between open and closed positions, a latch member pivotally mounted on the pivot pin, a tongue plate insertable between said latch member and said base and slidable longitudinally along said base, means including an abutment wall defining a single latch opening in said tongue plate, a latch dog on said latch member having a sinuously shaped leading wall with at least two downwardly extending bends on opposite sides of an upwardly extending bend, said latch member being movable between a release position in which said tongue plate can be retracted from said base and a latching position in which said downwardly extending bends project into said latching opening and the top of said upwardly extending bend projects above the top of said abutment wall, said sinuously shaped leading wall abutting said abutment wall at spaced locations in said latching position thereby latching the tongue plate to the base, means biasing said latch member to its latching position, means on said latch member for normally engaging said cover lever and urging said cover lever to its closed position, said latch member being disengaged from said cover lever upon said latch member being moved against said biasing means by said tongue plate upon insertion thereof, thereby permitting said latch member to move to admit said tongue plate while said cover plate remains in its closed position.

2. The combination of claim **1** in which said central plate has a transverse groove for receiving the lower edge of said downwardly extending bends and in which surfaces on said latch member engage and hold said tongue plate against said central plate.

3. The combination of claim **1** in which said leading wall on said latch dog has its lower portion beveled downwardly and rearwardly to facilitate pivoting of the latch dog past said abutment wall upon movement of the latch member to its release position.

4. In a safety belt buckle, the combination comprising a channel shaped base having a central plate and a pair of longitudinally extending side walls extending along the opposite edges of the central plate, an elongated channel shaped cover lever having a pair of opposite side walls extending adjacent and parallel to said side walls on the channel base, and a pivot pin spanning one end of the channels and mounting the cover on said base for pivotal movement between open and closed positions, a tongue plate movable longitudinally relative to said base, a latch member pivotally mounted on said pivot pin and having an abutment wall at a single latch opening therethrough, a latch dog carried on said latch member, which is movable between a release position allowing retraction of said tongue plate from said base and a latching position in which said tongue plate is held against removal from said base, means biasing said latch member to its latching position and acting through the latter to bias said cover lever to its closed position, said latch dog having a leading wall with at least two downwardly extending bends spaced on opposite sides of an upwardly extending bend, a transverse groove in said central plate, the lower edge of said downwardly extending bends projecting into said groove when said latch member is in its latching position, and the upper edge of said upwardly extending bend disposed above said tongue plate and its lower edge projecting into said elongated opening in said tongue plate when said latch member is in its latching position, said leading wall abutting said abutment wall when said latch member is in its latching position.

5. The combination of claim **4** in which said central plate is smooth and uninterrupted by said groove on the side adjacent the wearer of the buckle.

6. The combination of claim 4 in which said bends engage said tongue plate at at least three spaced areas of contact along the upper rim of said abutment wall.

7. The combination of claim 5 in which shoulders on said latch member abut the top of said tongue plate in said latching position and urge the latter against the central plate.

8. The combination of claim 7 in which said shoulders and said abutment areas on said bends are in a horizontal plane at the upper surface of said tongue plate.

9. The combination of claim 8 in which the portions of said bends disposed beneath said horizontal plane are sloped downwardly and away from said abutment wall thereby facilitating the swinging of the bends upwardly past the abutment wall upon movement of said latch dog to its release position.

10. In a safety belt buckle, a base for attachment to one end of a belt, a cover carried by said base, a tongue plate for attachment to another end of a belt and insertable between said cover and base plate, said tongue plate having opposite faces and an abutment wall defining one side of a latch opening in the tongue, a spring biased latch member pivotally mounted on said base, a latch dog on said latch member having a sinuously shaped leading wall with oppositely extending bends, said latch member being movable between a release position in

which said tongue plate can be retracted from said base and a latching position in which at least one bend extending in a first direction projects through said latch opening and beyond one face of the tongue plate and in which at least one bend extending in the other direction projects beyond the other face of the tongue plate, said leading wall abutting said abutment wall when said latch dog is in its latching position to said base.

11. A safety belt buckle in accordance with claim 10 in which a sloped surface is formed on the sinuously shaped leading wall of said latch dog and abuts an edge of said abutment wall.

12. A safety buckle in accordance with claim 11 in which shoulders on said latch member abut a face of said tongue plate when the latter is latched to the base, and in which said sinuously shaped leading wall abuts said edge of said abutment wall in at least three spaced areas of contact.

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