

Feb. 16, 1971

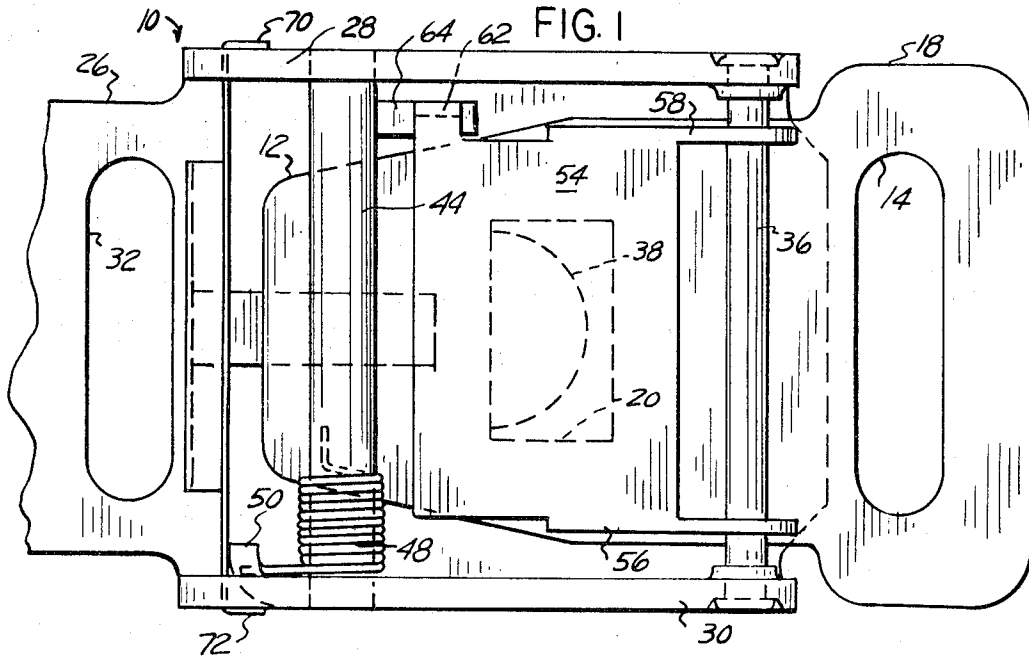
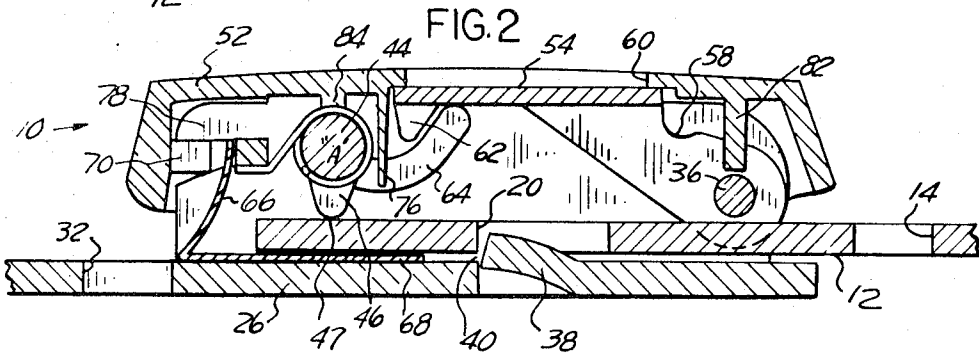
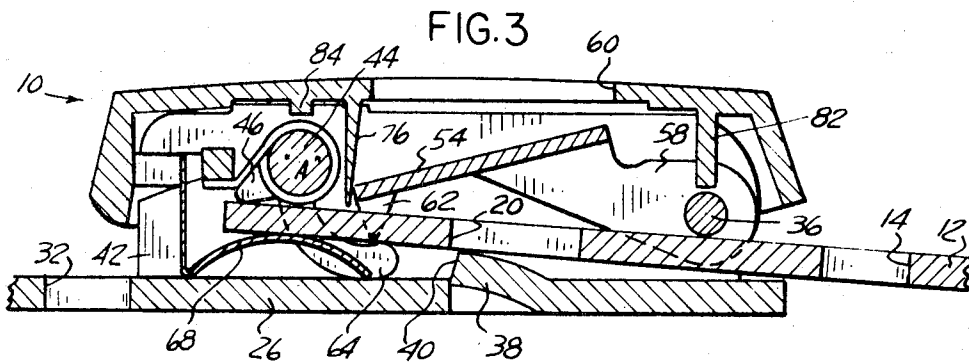
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3,562,877

MINIATURE BUCKLE

Filed Oct. 7, 1968

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 4

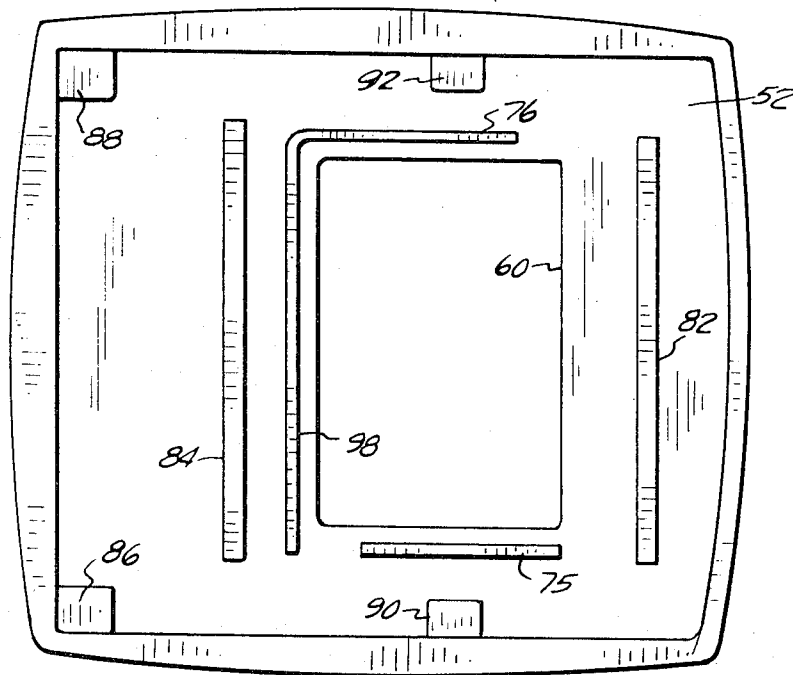
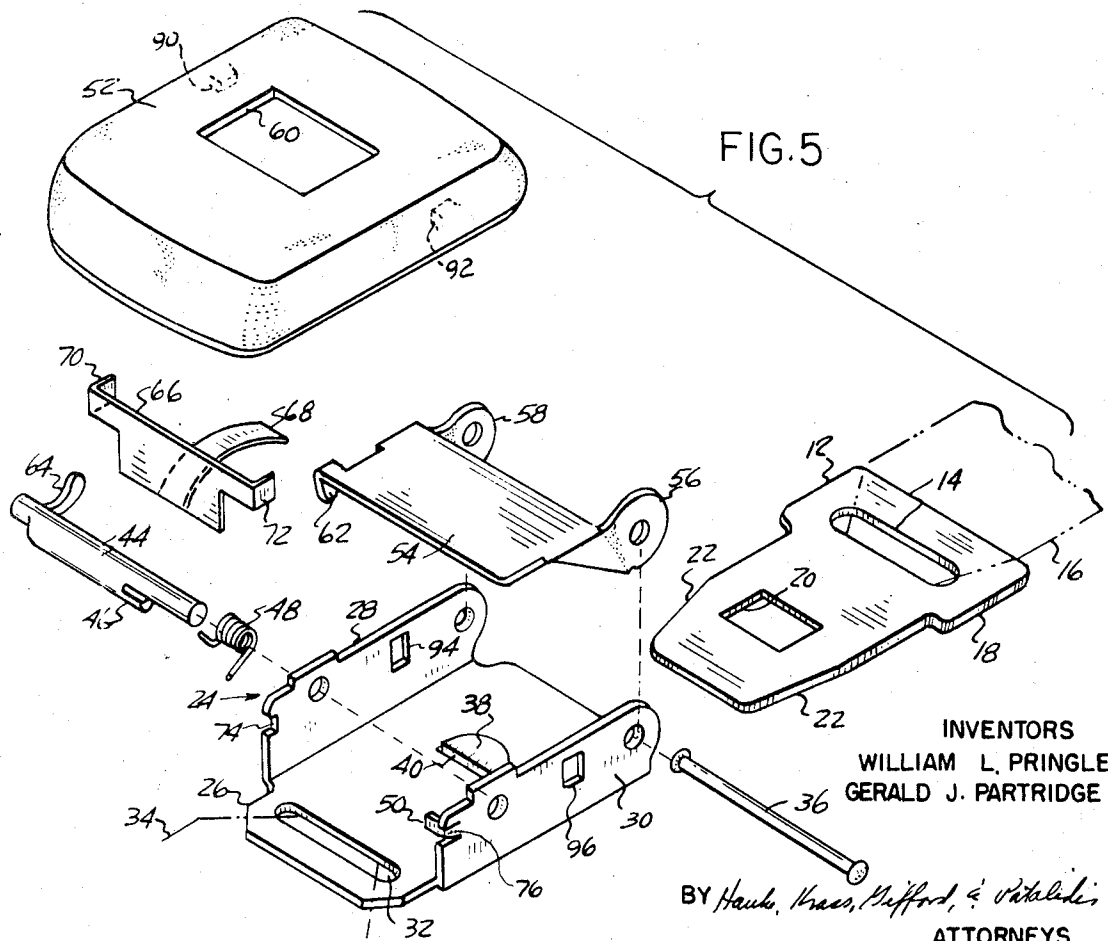


FIG. 5



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MINIATURE BUCKLE

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11 Claims

ABSTRACT OF THE DISCLOSURE

A pushbutton actuated buckle assembly having an apertured tongue that is engageable with a lug in the base of the buckle to form a connection between the tongue and the buckle. A rotatable latch is supported in the buckle in a position such that the tongue, when inserted into the buckle, is received between the latch and the buckle base. A latch spring biases the latch toward a locking position in which it moves the tongue toward the base so that its aperture is joined with the lug. A lifting spring, between the tongue and the base, moves the tongue away from the base as the latch is rotated to a release position by depression of the pushbutton.

BACKGROUND OF THE INVENTION

This invention relates to pushbutton seat belt buckles, and in particular, to a buckle having a latch which is rotatable between a latching position in which it is operable to retain an apertured tongue engaged with a lug in the buckle base, and a release position in which it allows the tongue to be disengaged from the lug thereby facilitating separation of the tongue from the buckle.

Seat belt buckle devices for motor vehicles of the pushbutton type are being commercially employed in greater numbers. The reason is that the latch in the buckle disengages the tongue in response to a depression of a push button release member into the buckle as opposed to those buckles that have a release member that is lifted away from the buckle toward a position in which it can catch the occupant's clothes. One problem associated with pushbutton buckles has been to provide an arrangement of buckle components that allows a reduction in overall buckle size with a fewer number of elements, while still providing an effective coupling that can be quickly connected and disconnected.

SUMMARY OF THE INVENTION

The broad purpose of the present invention is to provide a pushbutton seat belt buckle assembly having a minimum number of parts and an over-all buckle size that is substantially reduced with respect to conventional, commercial seat belt buckle devices. The preferred buckle assembly employs an apertured tongue formed of a metal plate having a fraction of the size of conventional tongues. The buckle assembly also has a buckle mechanism that is engageable with the tongue to form a coupling.

The buckle mechanism includes a housing having a slot at one end for connecting a belt, an opening at its other end for receiving the tongue to a locking position adjacent the base of the buckle, a pushbutton that is supported above the base and a latch that is supported for rotation above the base. The arrangement is such that as the tongue is received into the buckle toward a position between the latch and the base, an aperture in the tongue approaches a lug in the base as the leading edge of the tongue raises the latch toward its release position. As the tongue mates with the lug, the latch rotates under a spring bias toward its latching position so that the latching surface on the latch, which is in abutment with the tongue, moves the tongue toward the base. The latch maintains the tongue

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connected to the base, while in its latching position, by preventing the tongue from being sufficiently separated from the base so that it can clear the lug.

One feature of the invention is in the manner the latch is supported in the buckle. Another feature is in the shape of the latching surface and its relationship to the motion of the latch.

The latching surface forms a segment of a cylinder that is formed about an axis that coincides with the axis of rotation of the latch. The latch is mounted with its axis at right angles to the motion of the tongue as it is inserted into or removed from the buckle. When rotated to its latching position, the latching surface of the latch is spaced from the base a distance slightly greater than the thickness of the tongue such that the tongue, in its locking position, is in contact with the latch on a line that is in a plane that is generally perpendicular to the base and passes through the axis of rotation of the latch.

Thus any force tending to separate the tongue from the base acts through the axis of rotation of the latch. Because of the absence of a moment arm between the tongue and the latch, the latch cannot be rotated toward either its release position or in the opposite direction solely by the tongue.

This arrangement which is illustrated in the preferred embodiment is opposed to similarly supported latches which have a latching surface that is formed about an axis that is parallel to but spaced from the axis of rotation of the latch. In such a construction, the latch has a tendency to be moved, by the tongue, either toward its release position or in the opposite direction toward an overlocked position. In the former instance, the arrangement is unsafe because of the self-releasing tendency. In the latter arrangement, the latch must push the tongue forward before it can be rotated toward its release position.

Still another feature of the preferred buckle is related to the means for normally releasing the tongue from the buckle. The pushbutton is connected to the latch such that when it is depressed into the buckle, the latch is rotated toward its release position which provides sufficient clearance with respect to the base to allow the tongue to be disengaged from the lug.

A curved lifting spring, disposed in the buckle between the base and the latch, is flattened by the tongue when it is in its locking position and the latch in its latching position. When the latch is rotated to its release position by the pushbutton, the lifting spring raises the tongue with respect to the base a sufficient distance to separate it from the lug. The lifting spring thus automatically places the tongue in a position in which it can be removed from the buckle by a direct motion toward the opening. It eliminates any manipulation of the tongue to disengage it from the lug.

Still other features and advantages of the present invention will be readily apparent to those skilled in the art to which the invention pertains upon reference to the following detailed description.

DESCRIPTION OF THE DRAWINGS

The description refers to the accompanying drawings in which like reference characters refer to like parts throughout the several views and in which:

FIG. 1 is an enlarged plan view of the preferred buckle assembly with the cover removed in order to show the arrangement of its internal components;

FIG. 2 is an elevational sectional view of the preferred buckle assembly showing the tongue in its locking position and the latch in its latching position;

FIG. 3 is a view similar to FIG. 2 but showing the pushbutton depressed with the latch rotated to its release

position to allow the lifting spring to raise the tongue from the base of the buckle;

FIG. 4 is a view showing the inside of the cover member; and

FIG. 5 is an exploded view of the preferred buckle assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Now referring to the drawings, the preferred seat belt buckle assembly comprises a buckle mechanism generally indicated at 10 adapted for connection to the end of a seat belt, and a tongue 12, adapted for connection for a second seat belt, engageable with the buckle mechanism 10.

The tongue 12 is formed of a flat section of steel and has an elongated slot 14 adjacent one end for connecting a belt 16 which is looped through the slot and joined to itself. The slot 14 extends across the width of a widespread section 18 of the tongue. The tongue also has a rectangular aperture 20 toward its leading end formed between a pair of tapered sides 22. The aperture 20 forms part of a locking section of the tongue.

The buckle mechanism 10 includes a generally channel-shaped metal shell, indicated at 24, formed of a single sheet of steel which is bent into a planar wall or base 26 and a pair of upturned sides 28 and 30. One end of the base 26 extends beyond the sides 28 and 30 and has an elongated slot 32 extending across its width for connecting the looped end of a seat belt 34.

A pin 36 at the other end of the base is supported in a pair of holes pierced into the sides 28 and 30 above the base a distance slightly greater than the thickness of the tongue 12. The pin 36 and the shell thus form an opening for receiving the tongue 12 between the base 26 and the pin 36 by a motion generally parallel to the base to a locking position adjacent the base and between the sides 28 and 30. In its locking position, the major portion of the tongue that extends beyond its enlarged section 18 is disposed in the shell adjacent the base 26.

The base 26 is formed with an upturned lug 38 that provides a locking means that is engagable with the aperture 20 of the tongue when it is in its locking position. An abutment surface 40 on the lug is substantially perpendicular with respect to the base 26 and extends at right angles with respect to the sides 28 and 30 so as to be engagable with the aperture 20 to prevent the tongue from being moved from its locking position and toward the opening in the buckle by a direct motion that is parallel to the base.

Referring to FIGS. 2 and 3, the lug 38 and the aperture 20 are separable only by a motion of the tongue normal to the base. In FIG. 3, the tongue is shown as being separated from the base a sufficient distance so that it clears the lug 40 and can be removed from the buckle by a motion toward the opening in the buckle.

A latch 44 is journaled in a pair of holes punched into the sides 28 and 30 of the shell such that it is rotatable about an axis that is parallel to the pin 36 and transverse to the motion of the tongue as it is inserted into or removed from the buckle. The latch is rotatable between a latching position, shown in FIG. 2, and a release position, shown in FIG. 3. The latch 44 is spaced above the base and the position of the leading end of the tongue when it is in its locking position. The latch 44 has a longitudinally extending lip 46 formed with a cylindrical latching surface 47 that is engagable with the upper surface of the tongue across its width along a line that is parallel to the pin 36. The latching surface 47 is formed about the axis of rotation of the latch indicated at A.

As best shown in FIG. 2, when the latch is in its latching position, the lip 46 maintains the tongue in its locking position by preventing it from being separated a sufficient distance from the base to clear the lug 38. In its release position, the lip 46 of the latch is spaced from the base

26 a sufficient distance to allow the tongue to be moved toward the latch to disengage the lug 38 from the aperture 20.

A coil spring 48, wrapped around one end of the latch 44, has one end anchored to the latch and its other end in abutment with a lug 50 carried on the side 30 of the shell. The spring 48 biases the latch towards its latching position.

A cover 52 is mounted on the sides 28 and 30 of the shell. A pushbutton 54 is supported on a pair of arms 56 and 58 which are pivotally connected to the pin 36 so that the pushbutton can be moved toward and away from the base 26 between an upper position illustrated in FIG. 2, and a lower position illustrated in FIG. 3. The pushbutton 54 is accessible through an opening 60 in the cover to permit the application of a force to depress the pushbutton toward the base 26.

A lug 62 extends toward the base from the underside of the forward end of the pushbutton 54 and is engagable with an arm 64 carried on the latch 44. The arm 64 rotates with the latch and defines its extreme rotated positions. As best shown in FIG. 2, in the latching position of the latch, the arm 64 is in abutment with the lower side of the pushbutton. In this position, upward motion of the pushbutton 54 is limited by the lower side of the cover 52. The spring 48 provides means for biasing the pushbutton towards its upper position by means of the arm 64.

To rotate the latch 44 toward its second extreme or release position, the pushbutton must be depressed so that the lug 62 cams the arm 64 toward the base 26 and causes the latch 44 to rotate until the arm 64 abuts the base 26. It can be seen that as the latch is rotated by the pushbutton, the lip 46 rotates away from both the base and the opening through which the tongue is inserted into the buckle.

An arcuate lifting spring 66 has a resilient lifting section 68 disposed between the base 26 and the latch 44. As the tongue 12 is moved into its locking position, the lifting section 68 is flattened between the tongue and the base. The lifting section 68 then biases the tongue 12 away from the base and toward the latch and is so formed that when the lip 46 of the latch is in its release position the spring raises the tongue a sufficient distance from the base to clear the lug 38. Thus the lifting spring 66 provides means for automatically raising the tongue from the base 26 as the pushbutton 54 is depressed.

The lifting spring 66 has a pair of ears 70 and 72 that hook in a pair of recesses 74 and 76 formed in the ends of the sides 28 and 30, respectively, of the shell.

As best shown in FIG. 4, the cover 52 has a pair of downwardly directed guide sections 75 and 76 which are supported partially around the depressed portion of the pushbutton. The cover 52 also has a rib 82 that is supported slightly above and parallel to the pin 36 to protect the pin in the event of an accident so that the pushbutton can still be moved to release the tongue. The cover also has a downwardly depending rib 84 that is supported slightly above and parallel to the latch member 44 to protect it against distortion in the event of an accident. A pair of lugs 86 and 88 carried by the cover snap into the recesses 74 and 76 in the shell behind the ears 70 and 72 of the lifting spring. The cover also has a pair of inwardly directed protrusions 90 and 92 formed on its sides which snap into a pair of openings 94 and 96, respectively, in the sides of the shell in order to retain the cover member on the shell.

In operation and referring to FIGS. 2 and 3, when the tongue is separated from the buckle mechanism 10, the latch 44 is normally in its raised position illustrated in FIG. 2. In this position of the latch, the lifting spring 66 assumes the bowed shape shown in FIG. 3. As the tongue is inserted into the buckle mechanism 10 through the opening between the pin 36 and the base 26 and moved generally parallel to the base, its leading edge en-

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gages the lip 46 of the latch. Continued insertion of the tongue rotates the latch from its latching position, illustrated in FIG. 2, toward its release position illustrated in FIG. 3, until the aperture 20 in the tongue engages the lug 38. When the aperture 20 has cleared the lug 38, the lip 46 of the latch member then returns toward its latching position under the influence of the spring 48. As it moves toward the base, the latch pushes the tongue 12 toward the base 26 to complete the engagement with the aperture 20 and the lug 38 to flatten the lifting portion 68 of the spring. In this locking position, the tongue 28 is locked against motion parallel to the base and toward the opening in the buckle by the abutment established between the aperture and the abutment surface 40 of the lug 38, and is locked against motion normal to the base 26 by its engagement with the latching surface of lip 46 and the pin 36. Any motion of the tongue toward the latch produces a component on the latching surface that acts toward the axis of rotation of the latch.

To release the tongue 12 from the buckle assembly, the user depresses the pushbutton 54 so that it is moved toward the base and rotates the latch 44 in the clockwise direction as viewed in FIGS. 2 and 3. As the lip 46 is rotated away from the base, the lifting section 68 of the spring moves the tongue away from the base 26 and toward the latch 44. This release motion is continued until the aperture 20 of the tongue clears the lug 38 so that the user can remove the tongue from the buckle by a direct motion toward the opening between the pin 36 and the base 26.

Thus it can be seen that I have described a pushbutton that is composed of relatively few components, that is preferably assembled in a size that is substantially reduced with respect to conventional commercial buckles. The preferred buckle assembly is easy to uncouple when the pushbutton is depressed, because of the lifting spring, and provides a buckle without a tendency to either unlock or to overlock by a force supplied on the latch solely by the tongue, because of the profile of the latching surface.

Having thus described my invention, I claim:

1. A seat belt buckle assembly, comprising:

(a) a tongue having a planar section and an aperture in said planar section;

(b) a buckle having:

(1) a planar base;

(2) an opening for receiving the tongue by a motion of the tongue, generally parallel to the base, to a locking position adjacent the base;

(3) a lug extending normally from the base and being engageable with the aperture in the tongue to lock the tongue, in its locking position, against motion of the tongue parallel to the base and toward said opening, said tongue being separable from the lug by relative motion between the tongue and the base, normal to the base;

(4) a latch supported in the buckle for rotation between first and second positions about an axis that extends parallel to the base and transversely to the motion of the tongue as it is received through the opening, the latch being operative in its first position to maintain engagement of the lug and the aperture of the tongue, and inoperative in its second position to maintain engagement of the lug and the aperture of the tongue;

(5) first bias means urging the latch toward its first position;

(6) a pushbutton supported for motion toward and away from the base;

(7) second bias means, between said latch and said base, engageable with said tongue in its locking position to urge it away from the base;

(8) means connecting the pushbutton to the latch so that a motion of the pushbutton towards the

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base rotates the latch from its first position to its second position and allows the second bias means to move the tongue away from the base a sufficient distance to disengage the lug from the aperture of the tongue, and

(9) said latch has a latching surface forming a portion of a cylinder having its axis corresponding with the axis of rotation of the latch, said latching surface being engageable with the tongue when the tongue is in its locking position and the latch in its first position.

2. A seat belt buckle assembly as defined in claim 1, in which the means for connecting the pushbutton to the latch comprises the latch having an arm in abutment with the underside of the pushbutton at a point spaced from the axis of rotation of the latch member so that the arm is pivoted as the pushbutton is moved toward the base, thereby rotating the latch member from its first position toward its second position.

3. A seat belt buckle assembly as defined in claim 2, in which the arm moves the pushbutton away from the base as the latch is rotated from its second position toward its first position by said first bias means.

4. A seat belt buckle assembly as defined in claim 1, in which the latch is engageable with the tongue in its locking position at a point that is beyond the aperture with respect to the opening in the buckle.

5. A seat belt buckle assembly as defined in claim 1, including a pin supported on said buckle parallel to the axis of rotation of the latch and spaced from said base to define the opening for receiving the tongue, and wherein said pushbutton is supported on said pin for pivotal motion.

6. A seat buckle assembly as defined in claim 1, in which the locking position of the tongue is between the base and the latch, and the latch is supported in the buckle to limit the distance the tongue can be moved away from the base by the second bias means.

7. A seat belt buckle assembly comprising:

(a) a tongue having a locking aperture;

(b) a buckle housing having:

(1) an inner wall with a planar surface;

(2) a latch supported for rotation about an axis extending parallel and spaced with respect to the surface of said wall, said latch being rotatable between first and second positions with respect to said wall;

(3) an opening in the housing for receiving the tongue to a locking position between the latch and the wall;

(4) a lug on the wall engageable with the locking aperture of the tongue to lock the tongue against motion parallel to the wall when the tongue is in its locking position, said lug being disengageable with respect to the locking aperture by a motion of the tongue normal to the wall and toward the latch;

(5) means carried on the latch providing a latching surface forming a portion of a cylinder having its axis coinciding with the axis of rotation of the latch, said latching surface being formed to prevent the tongue from being moved from its locking position toward the latch a sufficient distance to disengage the lug with respect to the aperture when the latch is in its first position, and to allow the tongue to be moved from its locking position toward the latch a sufficient distance to disengage the lug with respect to the aperture when the latch is in its second position;

(6) means biasing the latch toward its first position; and

(7) pushbutton means mounted on the housing for a release motion and connected to the latch so as to rotate the latch from its first position

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toward its second position as the pushbutton is moved in its release motion.

8. A seat belt buckle assembly as defined in claim 7, in which the latch is formed such that as the tongue is inserted through the opening of the buckle in a motion towards its locking position, the latch is moved by the tongue from its first position towards its second position to allow the tongue to be disposed in its locking position.

9. A seat belt buckle assembly comprising: a tongue having a planar section with an aperture therethrough; a buckle having a planar base with a lug extending normally from the base and an opening through which said tongue may be inserted in a direction generally parallel to said base to a locking position where the aperture in said tongue is engaging said lug to prevent the removal of said tongue from said buckle, said tongue being separable from the lug by relative motion between the tongue and the base in a direction normal to said base, a latch rotatably supported in said buckle for rotation between a first position engaging said tongue for maintaining said tongue in said locking position and a second position for allowing said tongue to be removed from said lug, said latch including a latching surface extending substantially across and engaging said tongue when in said first position,

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first biasing means for urging said latch toward said first position, a pushbutton supported for motion toward and away from said base and operatively connected to said latch for moving said latch from said first position to said second position upon movement of said pushbutton toward said base.

10. An assembly as set forth in claim 9 including a leaf-type spring disposed over said base for urging said tongue away from said base when in said locking position.

11. An assembly as set forth in claim 9 wherein said latching surface forms a portion of a cylinder.

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