BUCKLE FOR SAFETY BELTS

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ABSTRACT OF THE DISCLOSURE

A safety belt buckle having an apertured tongue member engageable with lugs in a socket member. A spring biased latch member is slidable above the tongue member to hold it against the lugs. A pivoted release member actuates the latch member into disengaged position and is assembled by sliding it along intumed flanges on the socket member.

This invention relates to a buckle for a safety belt, and has as its principal object the provision of a buckle that complies with the required standard of strength and effective operation, and is yet relatively cheap to manufacture. A major factor in the high production costs of existing safety belt buckles is the relatively large number of component parts and the time required to assemble these parts to provide the final buckle.

The known safety belt buckle constructions usually incorporate fastening devices such as pivot pins, rivets or screws to secure the components in assembly and the fitting of such devices requires substantial assembly time.

It is therefore a further object of the present invention to provide a safety belt buckle which is constructed to eliminate the use of conventional fastening devices by interfitting and interengaging the components one with the other to effect and maintain assembly of the buckle.

An important fact in determining the effectiveness of a safety belt buckle is to ensure that the buckle will withstand the extremely high acceleration forces encountered in an automobile accident. The major acceleration forces are in the direction of travel of the automobile immediately prior to the accident impact, and therefore the buckle must be constructed to withstand abnormal forces in this direction. In particular the force must act on the buckle in such a manner as to tend to, or actually effect release of the buckle.

There is therefore provided by the present invention a safety belt buckle comprising a tongue member, a socket member open at one end to receive the tongue member, said tongue and socket members having shoulders that interengage upon insertion of the tongue member into said open end of the socket member, said socket member having said shoulders formed in one side and a slot in the opposite side extending inwards from the other end thereof, a release member having portions inside and outside of the socket member each portion spanning the slot and defining on each of two opposite edges a notch which receives respectively the marginal portions of the socket member forming opposite side walls of the slot, said notches being proportioned to permit sliding and limited rocking movement of the release member relative to the socket member about an axis transverse to the slot, a latch member slidably mounted in the socket member between said one side and the slotted side for linear movement in the direction of insertion of the tongue member between a lock position maintaining the shoulders in interengagement and a release position to permit insertion and withdrawal of the tongue member, biasing means urging the latch member to the lock position, and a retainer member to maintain the release member, the latch member and the biasing means in assembly with the socket member in the desired operative relation.

Conveniently, the socket release member, latch member, biasing means and retainer member are adapted so that assembly thereof to the socket member is effected by insertion from said other end of the socket member, and maintained by snap action locking engagement of the retainer member with the socket.

This construction of the buckle avoids the necessity of providing pivot pins and other fastening devices to hold the components in assembly, and permits the components to be shaped so that they can be successively slid into position in the socket and all held in the correct operative relation by the interfitting of the components with one another and with the socket member.

It will also be noted that the movement of the latch member in the socket to permit release of the tongue member is in a direction at right angles to the normal direction of the acceleration forces encountered during an accident, and that the latch member has no freedom for movement in the direction of the acceleration forces. Accordingly the buckle provided by the present invention is highly effective under the most severe accident conditions, and exhibit no tendency to release.

This invention will be more readily understood from the following description of one practical arrangement of the safety belt buckle as illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a side elevation of the buckle in the locked condition with the separable socket and tongue attached to the ends of a safety belt;

FIGURE 2 is a plan view of the buckle in the locked condition as in FIGURE 1;

FIGURE 3 is a side elevation of the buckle with the socket and tongue separated and the socket in section along line 3—3 in FIGURE 2;

FIGURE 4 is a side elevation of the buckle with the socket and tongue locked together with the housing in section as in FIGURE 3;

FIGURE 5 is an exploded view of the buckle showing the constructional features of each component.

Referring now to the drawings and particularly FIGURE 5, the socket member 10 is of generally box shape being rectangular in cross section and open at each end. The slot 11 extends the full length of the upper wall of the socket, and terminates at one end with opposed abutments 12 projecting into the slot from each side thereof, to provide aligned shoulders 13 at right angles to said sides.

On the lower wall 15 of the socket, and towards the end having the abutments 12, there is provided the pair of lock lugs 16 upstanding from the inner surface of the lower wall 15. The lugs 16 are spaced equidistant from the adjacent end of the socket, each forming a perpendicular shoulder 16a and an inclined head-in face 16b. Spaced inwardly from the lock lugs 16 are retainer lugs 17 also projecting inwardly from said inner surface of the lower wall 15. The retainer lugs 17 also form perpendicular shoulders and inclined faces, with the perpendicular shoulders facing towards the corresponding shoulders of the lock lugs 16. Between the retainer lugs 17 and the other end of the socket is the transverse slot 18 in the lower wall 15, through which the end of the belt extends for securing to the socket.

The generally L-shaped release member 20 is provided with one notch 21 on either side at the junction of the long and short legs 22 and 23 of the L. The width of the release member on either side of the notches is greater than the width of the slot 11 in the socket, so that the notches 21 receive the respective edge portions of the socket defining the slot 11. The dimensions of the notches
are such that during assembly of the release member 20 to the socket 10, the notches 21 engage the edge portion of the slot 11, at the end remote from the abutments 12, and the release member is slid along the slot until it engages the shoulders 13 of the abutments 12. The short leg 25 of the release member 20 is disposed within the socket, with the long leg 22 outside, normally lying against the slotted upper wall of the socket. After assembly the release member 20 has freedom for angular or rocking movement against the shoulders 13, the width of the notches relative to the thickness of the slot defining edge portions of the socket limiting the extent of this movement.

The latch member 30 is of generally rectangular shape, having a length and height to fit neatly within the socket, and permit free sliding movement therein only in the longitudinal direction of the socket, without tilting or skewing. The underside of the latch member has a pair of recesses 31 extending transversely thereacross, defined by converging side walls 32a; so that the recesses 31 are narrower at the rear face 32 of the latch member, the guide recesses 33 extending partly across the latch member from the rear face 35 at a level above the recesses 31 and open thereinto. The guide recesses 33 also have converging side walls 34 each parallel to the corresponding side wall of the adjacent recess 31.

The flat front face 35 of the latch member engages the short leg 23 of the release member and is urged thereto by the springs 37. The front face 35 is notched so that each end of the rear face 32a are blind and provide locating seats for the springs 37. As a safety feature two springs arranged concentrically may be located in each hole 38 so that failure of one spring will not adversely affect operation of the buckle.

The spring 39 extends through the central aperture 40 to engage the short leg 23 of release member, and apply a force thereto to normally maintain the long leg 22 in engagement with the upper side of the socket. The springs 37 and 39 are maintained in a compressed condition by the retaining member 45.

The retaining member 45 has a transverse portion 46 of a height and width to neatly fit in the socket and a longitudinal portion 47 of a width to completely span the slot 11 in the socket. The front of the longitudinal portion 47 is joggled to form a step 48 of reduced width that extends through the slot 11. The ears 49 project from the edges of the slot 11, and together with the longitudinal portion 47 bearing on the underside of the upper wall of the socket, locate the retaining member against rocking movement in the socket. When the lower edge of the transverse portion 46 of the retaining member is forced, in a snap action, over the tab and lugs 17 the bottom edge 50 of the retaining member 47 holds the release member 20 against the shoulder 13, and the springs 37 and 39 in compression against the latch member 30, to urge the latter against the short leg 23 of the release member 20. Dimples 51 are provided in the transverse portion 46 of the retaining member 45 to locate the ends of the springs 37 and 39.

The components are assembled to the socket 10 by first engaging the notches 21 of the release member 20 with the edge portion of the slot 11 in the socket, at the end remote from the abutments 12, and with the short leg 23 within the socket. The release member is then slid along the socket until it engages the shoulders 13 of the abutments 12. The latch member 30 with the springs 37 and 39 located therein is then inserted into the socket, also from the end remote from the abutments 12. Finally the retaining member 45 is inserted into the same end of the socket, with the ears 49 bearing on the upper face of the socket. The retaining member is slid along the socket until the lower edge of the transverse portion 46 rides up the inclined faces of the retaining lugs 17, and snaps over the lugs to engage the perpendicularly shoulders thereof.

It is thus seen that the components are all assembled without any rivets, screws, pins or other fastening devices and may therefore be assembled very quickly and cheaply.

The safety belt 60 is secured to the socket 11 by the adjuster bar 61 mounted in the socket by the channel shaped carrier 62. The bar 61 is of tear drop shape in cross section with half of the section cut away at each end to form projections 63. The projections 63 are received in aperture 64 in each end of the carrier 62, the aperture being of the same shape as the projection 63, but of larger dimensions to permit limited movement of the bar 61 without allowing rotation thereof. The length of the projections 63 is no greater than the thickness of the material of the carrier 62 so that the movement of the bar is not hampered by contact of its ends with the sides of the socket.

The adjuster bar 61 is assembled to the carrier by deflection of the carrier so that the projections 63 may be snapped into the apertures 64. The carrier and bar are then assembled to the socket by insertion thereinto from the end adjacent the slot 18, the carrier being snapped past the dimple 66 in the lower wall 15 of the socket. The carrier and bar assembly has limited freedom to slide in the socket, determined by the dimple 66 and the vertical portion 46 of the retaining member.

The belt is inserted into the socket through the slot 18, passed around the adjuster bar 61 and then out through the slot so that the free end portion of the belt is between the edge 67 of the slot 18 and the smaller edge 68 of the tear drop shaped bar 61. Thus, when the belt is under tension in use, the free end portion is wedged between the edges 67 and 68 and the greater the belt tension the greater the wedging pressure.

The position of the buckle on the belt is adjusted by applying a pull to the free end of the belt which will move the adjuster bar relative to the carrier and the carrier relative to socket to relieve the wedging pressure and permit the buckle to slide along the belt.

The tongue member 70 has a planar insert portion 71 and an anchor portion 72. The insert portion 71 has two laterally spaced D shaped apertures 71a arranged with their straightsides in alignment, and parallel to the leading edge 73 of the insert portion. The apertures 71a are proportioned and positioned to receive the lock lugs 16 of the socket 11.

The leading edge 73 has a central notch 74 and incised ends 75 shaped and positioned to mate with the recesses 33 in lateral extension beyond the slot 11, and to receive the portions 30 during insertion into the socket, and with the recess 31 upon engagement of the apertures 71a with the lock lugs 16. This mating of the leading edge of the insert portion and the recesses of the latch member, guides the tongue during insertion into the socket to ensure alignment of the apertures 71a with the lugs 16. Also this mating action, and the pressure applied to the insert portion by the springs 37 and 39, prevents rattling when the buckle is closed.

The anchor portion 72 is of the same general cross sectional shape as the socket 11 but is substantially shorter in length. The carrier 80 and adjuster bar 81 are identical with the carrier 62 and bar 61 forming part of the socket assembly, and co-operate with the slot 83 in the underside 84 of the anchor portion 72 to secure the belt 85 to the tongue member 70. The underside 84 is jogged at the junction 86 of the insert portion 71 and anchor portion 72 so that the socket 10 and the tongue member 70 present a co-planar under-surface when the buckle is closed.

The slotted upper side 88 and open ends of the anchor portion 72 are closed by the channel shaped cover plate 90. The dimensions of the plate 90 are such that it is assembled to the anchor portion 72 in a snap action with the flange portions 91 of the plate seated in the open ends of the anchor portion.

In operation the insert portion 71 of the tongue member is inserted into the end of the socket member 10 adjacent the lock lugs 16 to enter the guide recesses 33 in the latch member 30.
Continuation of the inserting movement of the tongue member moves the latch member longitudinally of the socket in a direction away from the lock lugs 16 and against the action of the springs 37. During this movement of the latch member the release member retains its normal position with the long leg 22 thereof bearing against the outer surface of the upper wall under the action of the spring 39.

Upon the latch member being moved sufficiently to bring the apertures 71a in the insert portion into alignment with the lock lugs 16, the insert portion moves downwardly so that the lugs 16 enter the apertures 71a, with the straight side of the apertures engaging the perpendicular shoulders 16a on the lugs. This lowering of the insert portion brings it into alignment with the recesses 31 and thereby allows the springs 37 to move the latch member back towards the short leg 23 of the release member so that the forward part of the insert portion of the tongue is received within the recesses 31. In this position the insert portion 71 cannot lift upwardly from the lower wall of the socket to effect disengagement of the apertures 71a from the lug 16, and thus the safety belt buckle is securely locked.

To effect release of the buckle the free end of the long leg 22 of the release member is raised to effect pivotal movement of the release member about the abutments 12, whereby the short leg of the release member moves the latch member along the socket against the spring pressure, until the insert portion 71 of the tongue member is clear of the recesses 31. Thus the insert portion may now move upwardly from the lower wall 16 of the socket into the guide recesses 33 to effect disengagement of the apertures 71a from the lugs 16 and the insert portion of the buckle. Upon removal of the lifting force on the long leg 22 of the release member, the springs 37 and 39 return the latch member 30 and release member 20 to their normal positions.

1. A safety belt buckle comprising a tongue member, a socket member open at one end to receive the tongue member, said tongue and socket members having shoulders that interengage upon insertion of the tongue member into said open end of the socket member, said socket member having said shoulders formed in the lower wall of the socket adjacent said one end, a slot in the upper wall of said socket member extending the full length thereof, aligned abutments extending into the slot from opposite sides thereof adjacent said one end of the socket, a release member having portions inside and outside of the socket member each spanning the slot and defining therebetween two notches which receive respectively the marginal portions of the socket member forming the opposite side walls of the slot, said notches being proportioned to permit, during assembly, sliding entry of the release member into the slot from said other end of the socket to engage the abutments and also permit, when assembled, limited rocking movement of the release member relative to the socket member about an axis extending between the abutment, a latch member slidably mounted in the socket member between said upper and lower walls for linear movement in the direction of insertion of the tongue member between a lock position partly overlying the tongue member when the shoulders are in interengagement and a release position to permit insertion and withdrawal of the tongue member, spring means urging the latch member to the lock position, the portion of the release members inside the socket being arranged to effect the movement of the latch member to the release position in response to angular movement of the release member, and a retaining member inserted into the socket from the other end thereof to maintain the release member, the latch member and the biasing means in assembly with the socket member with the release member engaging the abutments.

3. A safety belt buckle as claimed in claim 2, wherein the latch member is shaped to fit within the socket with freedom for movement only in the longitudinal direction of the socket, and the latch member is recessed on the underside to receive portion of the tongue member when the shoulders are in interengagement and prevents upward movement of the tongue away from the lower wall of the socket to disengage the shoulders.

5. A safety belt buckle as claimed in claim 2, wherein the release member is of L-shape with the notches at the junction of the two legs and the shorter leg the portion inside the socket, and the retaining member has a transverse portion extending between the upper and lower walls of the socket and a longitudinal portion extending from the transverse portion towards the one end of the socket and engaging the short leg of the release member, the transverse portion engaging shoulders on the lower wall to maintain the retaining member and release member in assembly with the socket member with the release member engaging the abutments.

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