Nov. 5, 1968 D. J. HEMPHILL 3,408,707

BUCKLE FOR SAFETY BELTS

Filed June 19, 1967 2 Sheets-Sheet 1

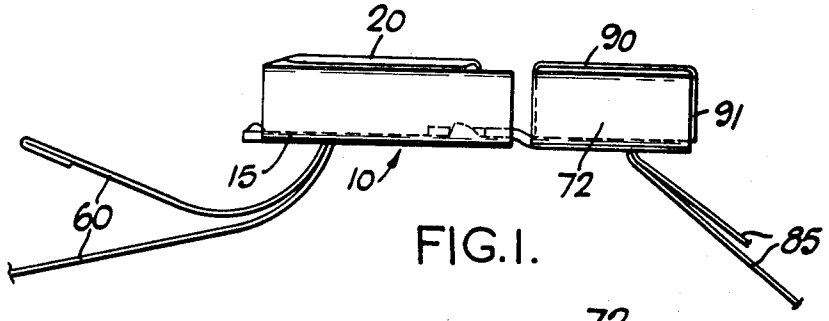

FIG. 1.

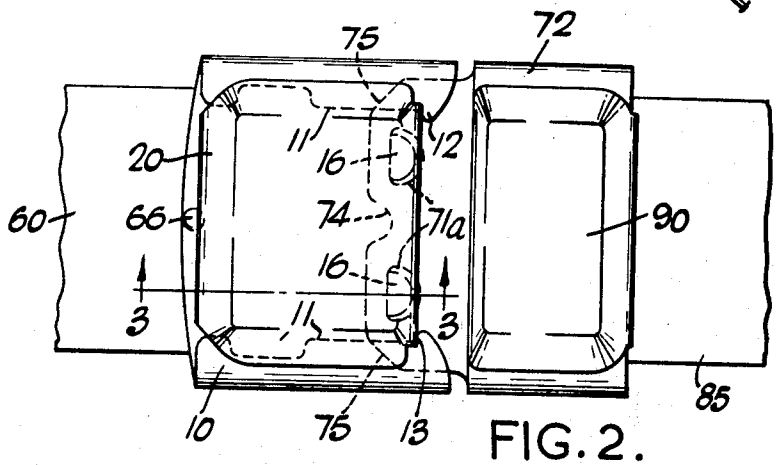

FIG. 2.

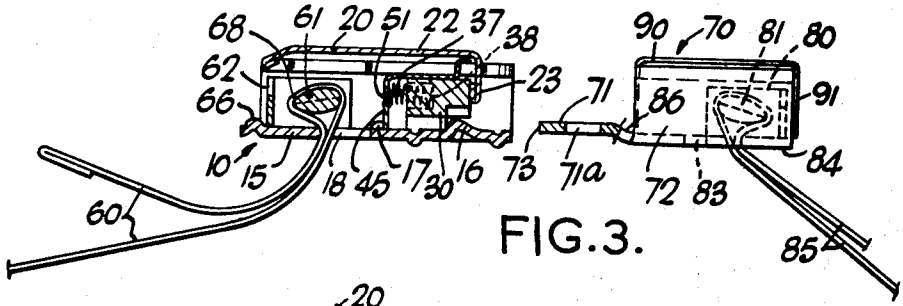

FIG. 3.

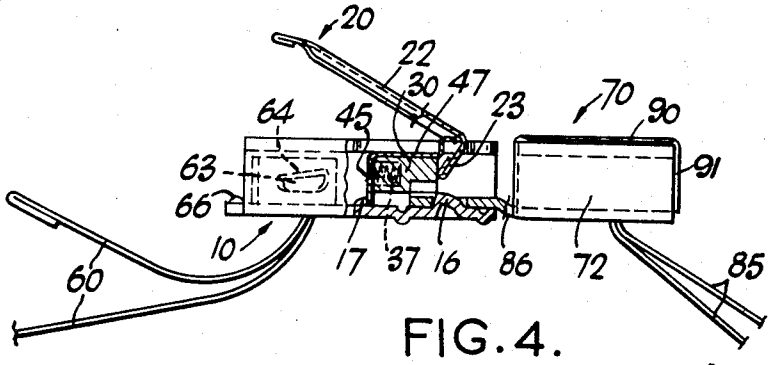

FIG. 4.

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BUCKLE FOR SAFETY BELTS

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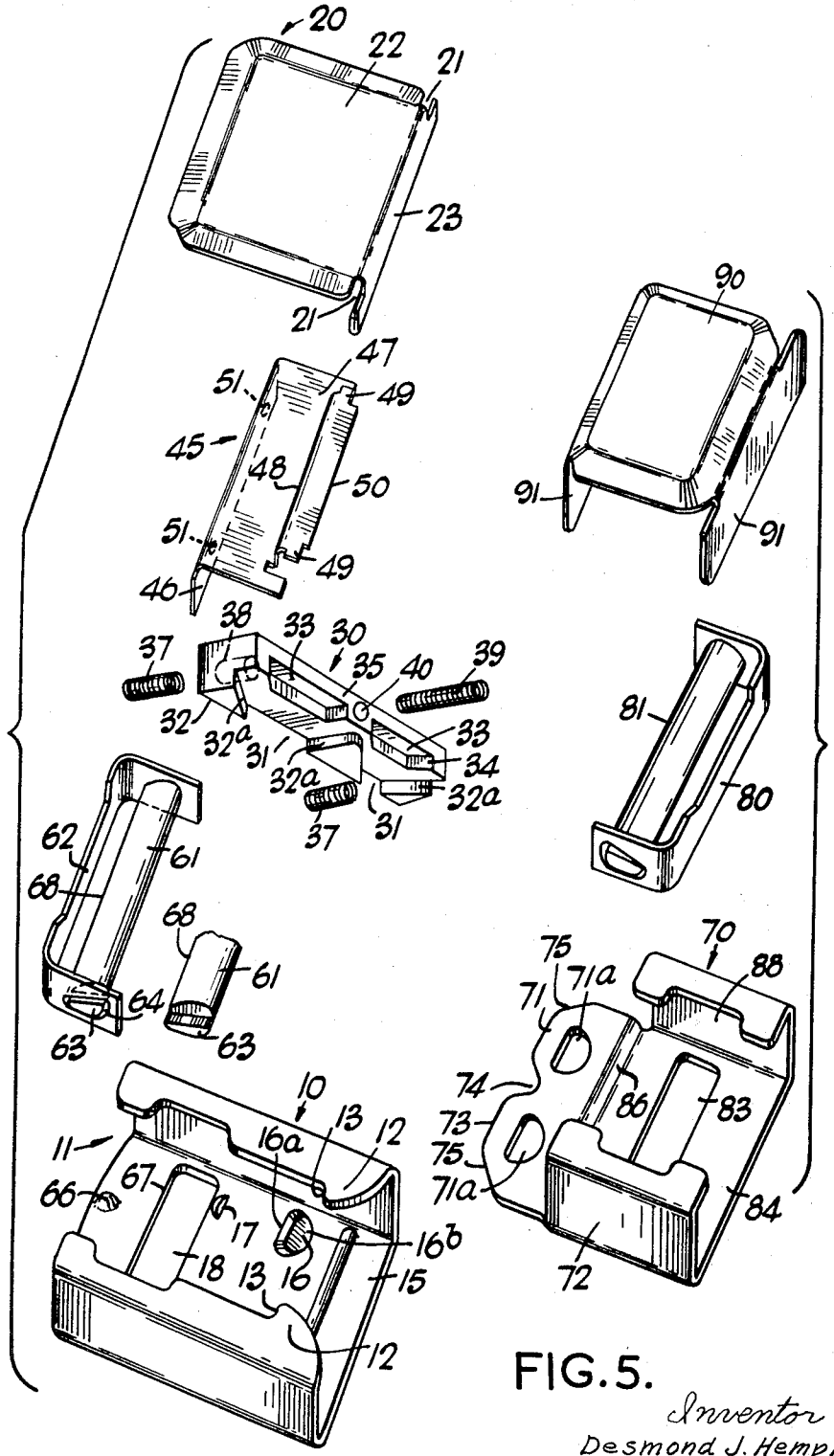

FIG. 5.

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BUCKLE FOR SAFETY BELTS

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5 Claims. (Cl. 24—230)

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 inturned 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 fasteneing 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 not 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 inwardly 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 wtihdrawal 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 inter-fitting 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 form a perpendicular shoulder **16***a* and an inclined lead-in face **16***b*. 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 securement 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 **23** 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 **32***a*, 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 front 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 theretowards by the springs **37**. The circular holes **38** adjacent each end of the rear face **32***a* 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 retainer 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 laterally beyond the edges of the slot **11**, and together with the longitudinal portion **47** bearing on the under face of the upper wall of the socket, locate the retainer member against rocking movement in the socket. When the lower edge of the transverse portion **46** of the retainer member is forced, in a snap action, over the retainer lugs **17** the front edge **50** of the retainer 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 retainer 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 slit 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 retainer member **45** is inserted into the same end of the socket, with the ears **49** bearing on the upper face of the socket. The retainer member is slid along the socket until the lower edge of the transverse portion **46** rides up the inclined faces of the retainer lugs **17**, and snaps over the lugs to engage the perpendicular 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 retainer 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 be slid 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 **71***a* arranged with their straight sides in alignment, and parallel to the leading edge **73** of the insert portion. The apertures **71***a* are proportioned and positioned to receive the lock lugs **16** of the socket **11**.

The leading edge **73** has a central notch **74** and inclined ends **75** shaped and positioned to mate with the recesses **33** in the latch member **30** during insertion into the socket, and with the recess **31** upon engagement of the apertures **71***a* 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 aperture **71***a* 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 joggled 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 **71***a* in the insert portion into alignment with the lock lugs **16**, the insert portion moves downwardly so that the lugs **16** enter the apertures **71***a*, with the straight side of the apertures engaging the perpendicular shoulders **16***a* 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 **71***a* 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 away from the lower wall **16** of the socket into the guide recesses **33** to effect disengagement of the apertures **71***a* from the lugs **16** and thereby release the safety belt 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.

I claim:

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 one side and a slot in the opposite side extending inwardly 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 receive respectively the marginal portions of the socket member forming opposite sidewalls 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.

2. A safety belt buckle comprising a tongue member, a socket member, said tongue and socket members having shoulders that interengage upon insertion of the tongue member into the socket member, said socket member being open at one end to receive the tongue and 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 retainer 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.

4. 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 retainer 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 retainer member and release member in assembly with the socket member with the release member engaging the abutments.

5. A safety belt buckle as claimed in claim **4**, wherein the latch member is disposed between the short leg of the release member and the transverse portion of the retainer member with the spring means compressed between said transverse portion and the latch member to urge the latch member into the lock position engaging said short leg of the release member.

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