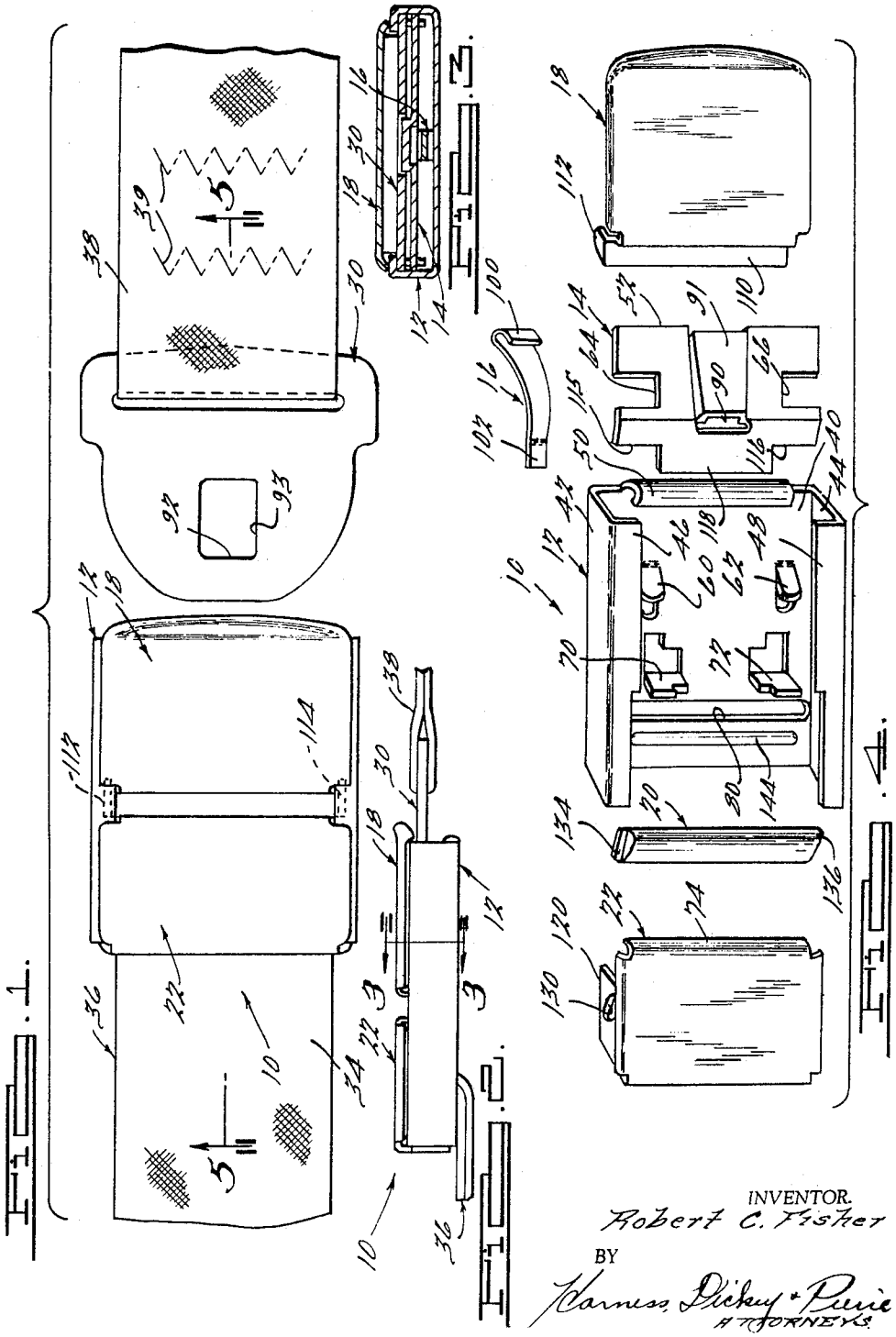
Sept. 27, 1966 R. C. FISHER 3,274,655

SAFETY BELT BUCKLE

Original Filed July 3, 1962 2 Sheets-Sheet 1

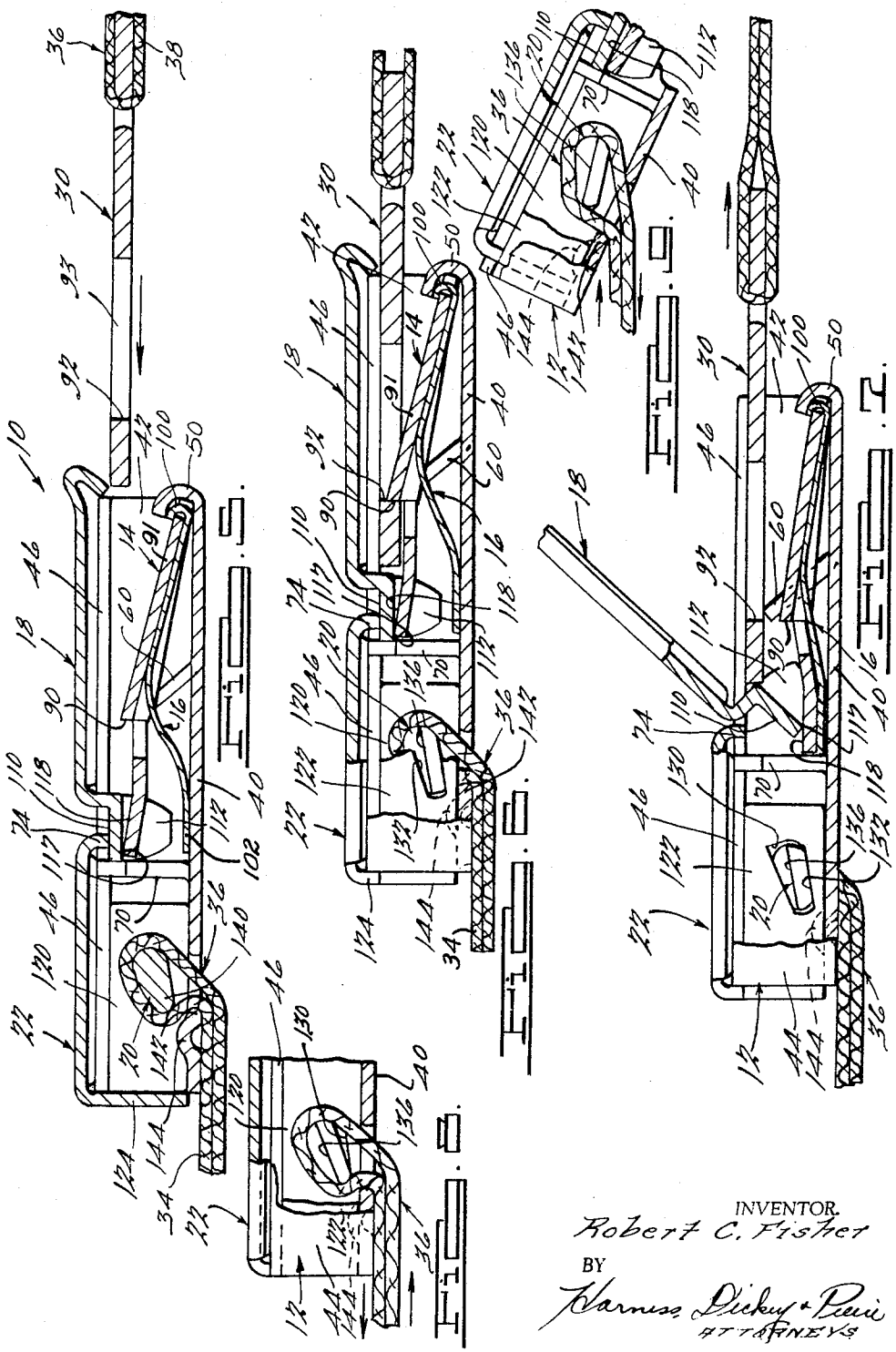


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SAFETY BELT BUCKLE

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Original application July 3, 1962, Ser. No. 207,262, now Patent No. 3,131,451, dated May 5, 1964. Divided and this application Mar. 12, 1964, Ser. No. 366,673
5 Claims. (Cl. 24—196)

This is a division of application Serial No. 207,262 filed July 3, 1962, now Patent Number 3,131,451.

This invention relates generally to buckles, and more particularly to an improved buckle for automobile type safety belts.

Recognition of the part that automobile safety belts play in decreasing passenger injuries due to automobile upset and collision has emphasized the need for an improved safety belt buckle capable of withstanding the relatively severe loads to which the buckles of such safety belts are subjected, yet of aesthetically pleasing and economical construction.

The design of automobile safety belt buckles heretofore known and used has emphasized, primarily, the ability of the belt buckle to withstand the relatively severe loads to which such safety belts are subjected. Relatively little attention has been given to the refinement of such buckles to the point where they are aesthetically pleasing, economically constructed, and free of all unsatisfactory operating characteristics.

The safety belt buckle of the instant invention presents a material step forward in the safety belt buckle art since its design considers the many environmental and aesthetic factors which are necessarily a part of a totally satisfactory belt buckle. In addition, the safety belt buckle of the instant invention sets a new standard in terms of strength. The various optimum qualities of a safety belt buckle have been ingeniously integrated into a safety belt buckle that is relatively light in weight, relatively small in physical dimension, easy to open and close, and clean and smooth in appearance.

More particularly, it is desirable for a safety belt buckle to be relatively lightweight. One way to reduce the weight of such a buckle assembly is to reduce the gauge of the metal employed in the components of the buckle. However, any reduction in gauge necessitates careful stress analysis of the components of the belt buckle. As a result of such an analysis, it has been discovered that the gauge of the metallic components of the buckle can be minimized by substantially eliminating any couples acting on the components of the buckle.

Accordingly, one object of the instant invention is a safety belt buckle wherein loads are transmitted to and through the buckle without producing any substantial couples on the components of the buckle.

Safety belt buckles heretofore known and used have often employed relatively long, heavy, and therefore cumbersome release handles. This has been a requirement in such known buckles in order to obtain sufficient mechanical advantage to effect opening of the buckle under load. Thus, another object of the instant invention is a safety belt buckle having a relatively short, light and therefore easily assembled and operated release handle.

The cost of a safety belt buckle is directly related to the number of components employed therein. Thus, in addition to its own cost, each additional component complicates and therefore adds to the cost of assembly. Therefore, another object of the instant invention is a safety belt buckle having a minimum number of components.

It is well known that stamped parts can be produced

in large quantities at relatively low cost, as opposed to, for example, die casting or machined parts. Because the cost of the finished safety belt buckle is directly related to the cost of its components, it is an object of the instant invention to reduce the cost of the buckle by making the buckle entirely of stampings.

One deleterious feature of safety belt buckles heretofore known and used is that the latch portion of the buckle tends to be biased to an unlatched condition when the buckle is subjected to load, thus requiring springs or other devices to maintain the latch in the closed condition.

Accordingly, yet another object of the instant invention is a safety belt buckle wherein load tends to tighten the latch, thereby obviating the need for a spring or other form of latch retainer when the belt buckle is under load.

Another desirable feature that speeds and reduces the cost of assembly of a safety belt buckle is that the components thereof are self-retained, thereby eliminating fastening pins, screws or the like.

Yet another object of the instant invention is a safety belt buckle comprised of components that are self-contained, rendering assembly a relatively simple and quick procedure.

It is well known that a flanged channel has a relatively large strength to weight and size ratio. Accordingly, another object of the instant invention is to utilize a flanged channel as the load-accepting member of a safety belt buckle.

It often occurs that the occupant of a motor vehicle must release a safety belt by only one hand. This condition may obtain for example, when one hand of the occupant is pinned or otherwise disabled. Thus, it is desirable for a safety belt buckle to be openable by only one hand; or, in other words, a pull on the release handle should effect separation of the buckle and tongue.

Accordingly, another object of the instant invention is a belt buckle wherein operation of the release handle is in the proper direction to allow one-hand release.

It is desirable that the release handle of a seat belt buckle be movable in what may be termed a lever action as opposed to, for example, a scissors or camming action. Such a lever action increases the mechanical advantage of the release handle so that release force is a minimum under load. Such an action also increases the amount of movement necessary to effect unlatching, thereby minimizing the possibility of accidental unlatching, and permits the use of a short, relatively light release handle, minimizing the chance of accidental unlatching by a coat sleeve, etc.

Accordingly, yet another object of the instant invention is a safety seat belt buckle having a release handle that operates with a lever action.

It is a natural tendency for an occupant of a motor vehicle to grasp a safety belt buckle in one hand and insert the tongue of the belt thereinto with the other hand. Thus, it is desirable for the release handle of the belt buckle to remain in a closed condition upon insertion of the tongue, allowing the occupant to grasp the buckle portion with only one hand. Thus, another object of the instant invention is a safety belt buckle wherein the release handle does not open upon insertion of the tongue into the buckle, allowing the buckle to be held in one hand while being assembled.

Obviously, it is undesirable for a safety belt buckle to be falsely latched. Thus, another object is a belt buckle that precludes spurious engagement of the tongue therewith.

Yet another object is a safety belt buckle having a relatively clean and low profile.

Safety belts must withstand relatively high inertia or "G" forces attendant to a head-on collision or collision

with a relatively immovable object. Thus, yet another object of the instant invention is a safety belt buckle wherein inertia or "G" forces tend to tighten the latch, as opposed to opening the latch.

Safety belt buckles are subject to jostling in a motorist's lap or to minor impacts with hands, articles carried on the automobile seat, etc. Thus, it is desirable for the belt buckle to be so designed that such actions or impacts do not effect release of the adjustment mechanism and loosening of the belt.

Accordingly, another object of the instant invention is a belt buckle wherein the adjusting mechanism cannot be spuriously released to permit loosening of the belt.

Consonant with the foregoing object, it is desirable to be able to shorten a safety belt without necessitating release of the adjusting mechanism thereof. Accordingly, yet another object of the instant invention is a safety belt buckle that permits shortening of the safety belt without requiring release of the adjusting mechanism.

Experience has shown that premature wear of the webbing of a safety belt is aggravated by the use of knurled, grooved or otherwise roughened surfaces within the belt buckle. It is an object of the instant invention to eliminate such knurled, grooved or otherwise abraded surfaces, thereby to reduce abrasion of the belt webbing.

The overall height of a safety belt buckle is dictated in part by the profile of the tension bar employed in the adjusting mechanism. Therefore, another object of the instant invention is an adjusting mechanism for a safety belt buckle having an improved tension bar of relatively low profile, thereby to minimize the overall height of the buckle.

Safety belt buckles are obviously of no utility unless the occupant of a motor vehicle uses the safty belt. When such buckles are cumbersome and have protruding components that can possibly catch and tear clothing, the safety belt will not be utilized.

Accordingly, still another object of the instant invention is a buckle for a safety belt that is relatively clean and smooth and has no parts projecting through the sides thereof so as to minimize the possibility of catching and tearing clothing.

Other objects and advantages of the instant invention will be apparent from the following specification, claims and drawings, wherein:

FIGURE 1 is a top view of the safety belt buckle of the instant invention with the tongue removed therefrom;

FIG. 2 is a side elevational view of the safety belt buckle of the instant invention with the tongue assembled;

FIG. 3 is a cross sectional view taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is an exploded perspective view of the safety belt buckle of FIGURE 1;

FIG. 5 is a cross sectional view taken substantially along the line 5—5 of FIGURE 1;

FIG. 6 is a cross sectional view similar to FIG. 5 with the tongue engaged within the buckle;

FIG. 7 is a view similar to FIG. 5 with the release handle and latch plate rotated to the release condition;

FIG. 8 is a fragmentary view of the adjustment slide showing the belt bar rotated to facilitate shortening of the belt; and

FIG. 9 is a fragmentary view similar to FIG. 8 showing the adjustment slide and buckle in condition to permit lengthening of the belt.

As best seen in FIG. 4 of the drawings, a safety belt buckle **10**, in accordance with an exemplary embodiment of the instant invention, comprises a base **12**, a latch plate **14**, a latch spring **16**, a handle **18**, a belt bar **20** and a rear slide **22**. The foregoing components are assembled in interlocking relationship on the base **12** and are self-retained in the assembled condition, as will be described. A tongue **30** (FIGURE 1) is adapted to be releasably accepted and retained within the buckle **10**. An end portion **34** of a belt **36** is adapted to be adjustably looped around the bar **20** and an end portion **38** of the belt **36** is secured to the tongue **30** as by stitching **39**.

As best seen in FIGS. 4 through 8 of the drawings, the base **12** of the buckle **10** is of channel-like lateral cross sectional configuration defined by a web portion **40** with flange portions **42** and **44** at the opposite edges thereof. The flange portions **42** and **44** of the base **12** have inwardly folded edges **46** and **48** thereon, respectively, that extend generally parallel to the web portion **40** thereof.

The web portion **40** of the base **12** has a reentrantly folded latch retainer **50** at one end thereof that pivotally accepts an edge portion **52** of the latch plate **14**. The latch plate **14** is both supported for rotation relative to the base **12** and retained against movement outwardly of the base **12** by the retainer portion **50** thereof.

A pair of tongue strippers **60** and **62** are struck upwardly from the web portion **40** of the base **12** and are receivable in a pair of complementary cutouts **64** and **66** in the latch plate **14**, respectively. The tongue strippers **60** and **62** serve to position the tongue **30** against the underside of the edge portions **46** and **48** to retain the tongue **30** in this position upon retraction of the latch plate **14**, as will be described.

The base **12** is provided with a second pair of ears **70** and **72** that are struck upwardly from the web portion **40** thereof for the retention of the rear slide **22** and to position the handle **18** and latch plate **14**. A frontal lip **74** of the rear slide **22** is engageable over the ears **70** and **72** upon assembly, as will be described.

The base portion **12** is provided with a laterally extending slot **80** for the acceptance of the end portion **34** of the belt **36**, which is looped about the bar **20**.

The latch plate **14** has a latch face **90** on an offset portion **91** that is struck outwardly from the surface of the latch plate **14**. The latch face **90** is engageable with a complementary latch surface **92** on the periphery of an aperture **93** in the tongue **30** to effect locking of the tongue **30** within the buckle **10**.

The latch plate **14** is normally biased toward the latched condition by the leaf spring **16**, one end portion **100** of which is disposed about the offset portion **91** of the latch plate **14**, and the other end portion **102** of which engages the web portion **40** of the base **12**.

The handle **18** has an offset portion **110** that is accepted under the lip portion **74** of the slide **22**, thereby to substantially close the top of the buckle **10**. The offset portion **110** of the handle **18** has a pair of ears **112** and **114** that are accepted in complementary cutouts **115** and **116** on the latch plate **14**, thereby to retain the handle **18** in the position shown in the drawings.

As can best be seen by comparing FIGS. 5, 6 and 7, the handle **18** pivots on the underside of the folded edge portions **46** and **48** on the base **12**, so as to bring an edge portion **117** thereof into engagement with an inner end portion **118** of the latch plate **14**, thereby to cam the latch plate **14** about the latch retainer **50** on the base **12** toward the open condition.

As best seen in FIGS. 5 through 9, the belt bar **20** is supported by a pair of inwardly extending ears **120** and **122** on the slide **22** that extend inwardly from a downwardly depending rear portion **124** of the rear slide **22**.

As best seen in FIGS. 7, 8 and 9, the bar **20** is retained in a pair of truncated triangular apertures **130** and **132** in the ears **120** and **122**, respectively. The bar **20** is of generally tear-shaped cross section with coined or flattened end portions **134** and **136** that are accepted in the apertures **130** and **132**, respectively.

As best seen in FIG. 5 of the drawings, the end portion **34** of the belt **36** is looped over the bar **20** and extends downwardly through the aperture **80** in the web portion **40** of the base **12**. It is to be noted that, as shown in FIG. 6, when the belt buckle **10** is under load, an edge portion **140** of the bar **20** substantially overlies a frontal edge portion **142** of the web **40** of the base **12**. Also, the bar **20** is supported by the apertures **130** and **132**

in spaced relation to the web portion **40** of the base **12** an amount approximately equal to the thickness of the belt **36** so that, upon the application of load to the belt **36**, the bar **20** and the portion **142** of the base **12** move into mutually reinforcing relation and also effect a slight pinch of the belt **36** therebetween.

It is also to be noted that a rib **144** is displaced upwardly from the web portion **40** of the base **12** to aid the lip **74** in limiting movement of the slide **22** relative to the base **12** under load. The rib **144** also precludes slip of the belt **36** when the buckle **10** is subjected to severe loads.

The seat belt buckle **10** of the instant invention is assembled by first engaging the end portion **100** of the latch spring **16** about the offset portion **91** of the latch plate **14**, as seen in FIG. 5. The assembled latch plate **14** and spring **16** are then inserted under the edge portions **46** and **48** of the base **12**, and moved inwardly of the base **12** to the position shown in FIG. 5 of the drawings. The offset portion **110** and ears **112** and **114** of the release handle **18** are then inserted under the edge portions **46** and **48** of the base **12**, the ears **112** and **114** sliding over the latch plate **14** until they are received within the cutout portions **115** and **116** thereof, respectively. When the ear portions **112** and **114** drop into the cutouts **115** and **116**, respectively, the handle is retained from outward movement from the base **12**.

The bar **20** is next assembled with the slide **22** by inserting the end portion **134** thereof into the aperture **130** in the ear **120** of the slide **22**, thence snapping the opposite end portion **136** of the bar **20** into its complementary aperture **132**. The end portion **34** of the belt **36** is inserted through the slot **80** in the base **12**, thence about the bar **20**. The assembled bar **20**, slide **22** and end portion **34** of the belt **36** are then inserted into the open end of the base **12** from the left, as seen in the drawings, the ears **120** and **122** being accepted between the edge portions **46** and **48** and the web portion **40** of the base **12**. The assembled slide **22** and bar **20** are moved inwardly of the base **12** until the lip portion **74** of the slide **22** snaps over the upstanding ears **70** and **72**. The dimensional relationship of the lip portion **74** and the height of the ears **70** and **72** are such that resilience of the slide **22** accommodates the aforementioned snapping of the lip portion **74** over the ears **70** and **72**. After the slide **22** is moved to the assembled condition, as shown in FIG. 5 of the drawings, the edge or lip portion **74** precludes disassembly of the slide **22** on the base **12**.

It is to be noted that couples acting on the safety belt buckle **10** are minimized, since load is transmitted to the tongue **30** from the end portion **38** of the belt **36**, thence from the latch surface **92** on the aperture **93** in the tongue **30** to the latch face **90** on the latch plate **14**. The load is then transmitted substantially in a straight line generally parallel to the tongue **30** to the edge portion **52** of the latch plate **14**, thence to the reentrantly folded edge portion **50** on the web **40** of the base **12**. Load is then transmitted through the web **40** of the base **12** and flange portions **42** and **44** of the base **12** to the opposite end portion **142** thereof, thence to the end portion **34** of the belt **36**.

It is to be noted that the release handle **18** of the buckle **10** is of relatively light gauge material and relatively short in length. Thus, it is not cumbersome and is relatively easily operated.

As best seen in FIG. 4 of the drawings, the belt buckle **10** of the instant invention comprises only seven components, including the tongue **30**, each of which is made by a stamping or coining process.

In accordance with yet another feature of the instant invention, the latch plate **14** is biased toward a latching condition relative to the latch surface **92** of the tongue **30** upon the application of load to the buckle **10**. The relatively small moment acting on the latch plate **14** tends to rotate the latch plate clockwise, as seen in FIG. 6 of the drawings, thereby relieving the operating spring **16** of its function of holding the latch plate **14** in the engaged condition with the tongue **30** when the buckle **10** is subjected to load.

As discussed hereinbefore, the latch plate **14**, handle **18**, bar **20** and slide **22** are retained on the base portion **12** of the buckle **10** by mutually interlocking engagement. Thus, the use of retaining pins, screws, or other elements having the single function of retaining the components of the buckle **10** in an assembled condition is eliminated.

From the foregoing description, it should be apparent that the base member **12** forms the basic load-carrying and supporting component of the buckle **10** and that the base **12** comprises a flanged channel of relatively large strength-to-weight ratio. Thus, the properties of the flange channel are utilized to maximize the strength of the buckle **10**, while minimizing the size and weight thereof.

As best seen in FIG. 7 of the drawings, the release handle **18** of the buckle **10** is movable counterclockwise or in a direction opposite to the direction of movement of the tongue **30** upon movement of the release handle **18** to the release condition. Thus, an occupant of the motor vehicle is merely required to pull on the handle **18** to effect separation of the tongue **30** from the base portion **12** and handle **18** of the buckle. This is an important feature not found in many commercially available seat belt buckles.

As best seen in FIG. 7 of the drawings, the edge portion **117** of the release handle **18** is relatively close to the pivot point of the offset portion **110** on the underside of the edges **46** and **48** of the base portion **12** relative to the total length of the handle **18**. Thus, the handle **18** operates as a lever having a relatively large mechanical advantage so that the end portion **118** of the latch plate **14** can be biased downwardly against the frictional force acting between the latch face **90** and the latch surface **92** so that the tongue **30** can be freed from the base portion **12** by a relatively light force, even though the buckle **10** is subjected to a substantial load.

As can be seen by comparing FIGS. 5 and 6, insertion of the tongue **30** into the base portion **12** of the buckle does not require movement of the release handle **18**. As the tongue **30** moves into the base **12**, it is guided by the edge portions **46** and **48** of the base **12** and the strippers **60** and **62** so as to bias the latch plate **14** downwardly, allowing the latch face **90** thereon to clear the tongue **30**, thence move upwardly into the latching condition with the latch surface **92** on the tongue **30** under the bias of the operating spring **16** when the tongue **30** is fully inserted into the base portion **12**. Thus, the safety belt buckle **10** can be easily grasped in one hand, facilitating insertion of the tongue **30** with the other hand.

It is to be noted that the frontal edge portion of the handle **18** is reentrantly folded to form a guide that directs the togue **30** into the proper aligned position under the edge portions **46** and **48** of the base **12**. Also, the reentrantly folded latch retainer **50** on the web **40** of the base **12** tends to guide the tongue **30** into proper alignment for insertion. The foregoing reentrantly folded surfaces thus form an obvious opening in the buckle **10** for the acceptance of the tongue **30**. Further, should the tongue **30** be inserted under the release handle **18**, but on top of the edge **46** and **48** of the base **12**, spurious latching is precluded, since the latch face **90** on the latch plate **14** cannot effect latching with the surface **92** on the tongue **30**.

As discussed hereinbefore, it is desirable that high inertia or "G" forces operative on the latch plate of a buckle do not tend to spuriously open the buckle and effect release of the tongue thereof. As can be seen by inspection of, for example, FIG. 6, the tongue **30** is disposed over the latch plate **14**. Thus, "G" forces having an upward vector operable on the latch plate **14** due to,

for example, impact of an automobile with an object, tend to move the latch plate **14** upwardly, thus tending to retain the latch plate **14** and latch face **90** thereof in engagement with the complementary latch surface **92** on the tongue **30**.

As can be seen by inspecting FIG. 9 of the drawings, lengthening of the belt **36** requires both movement of the slide **22** inwardly of the base **12** and tilting of the buckle **10** relative to the end portion **34** of the belt **36**. When the belt buckle **10** is so tilted and the slide **22** is moved inwardly as by a longitudinal squeeze, lengthening of the belt **36** can be effected with one hand by merely pulling on the buckle **10**. It is also to be noted that by gripping the buckle **10** at opposite ends thereof in order to lengthen the belt **36**, the slide **22** is moved to the release position.

Shortening of the belt **36** is effected by merely pulling on the top or free end portion **34** of the belt **36**, which action tends to rotate the locking bar **20** upwardly to the position shown in FIG. 8, so that the upper surfaces of the flattened end portions **134** and **136** engage the upper edge portions of the apertures **130** and **132** in the slide ears **120** and **122**, respectively. When in the position, the angular relationship of the belt bar **20** is such that the belt moves freely over the bar **20** to permit shortening of the belt **36**. It is to be noted that the shortening operation does not require movement of the slide **22** to the release condition required to effect lengthening of the belt **36**. This mode of operation again reflects an awareness of the actual condition that obtains in a motor vehicle, since it is normal for an occupant to assemble the tongue **30** with the belt buckle **10** or base portion **12** of the buckle **10**, thence effect shortening of the belt to a desired length comfortable to the motorist. Shortening of the belt **36** can thus be effected by only one hand working against the opposite end of the belt.

The bar **20** is substantially free of knurled, abraded or otherwise roughened surfaces, which tend to accelerate wear of the belt **36**. The novel configuration and orientation of the bar **20**, in combination with its disposition in spaced relation to the web portion **40** of the base **12** and overlying the portion **142** of the base **12**, all are mutually complementary to facilitate holding of the belt **36** under load without requiring such knurled or roughened surfaces.

As can best be seen from FIGS. 1, 2 and 3, the belt buckle **10** of the instant invention is relatively clean and entirely free of protruding surfaces or components. Thus, the buckle **10** does not tend to catch clothing or otherwise present sharp surfaces that might limit use of the buckle **10**.

From the foregoing description, it should be apparent that the safety belt buckle **10** of the instant invention can be fabricated from sheet metal having the same analysis. Therefore, electrolysis between adjacent components is precluded, obviating a defect experienced in safety belt buckles heretofore known and used when such buckles were exposed to, for example, salt spray or the like.

As discussed hereinbefore, lengthening of the seat belt requires both tipping of the buckle **10** and inward movement of the slide **22** thereof to carry the belt bar **20** to a position inwardly of the buckle **10**. This orientation of the belt bar **20** relative to the width of the slot **80** in the web portion **40** of the base **12** precludes spurious release of the end portion **34** of the belt **36** due to accidental tipping of the buckle **10**.

Yet another feature of the buckle **10** of the instant invention is that the belt bar **20** is of substantially flat cross-sectional configuration, thereby to allow a relatively low and clean profile for the buckle **10**, which adds to its aesthetic appeal, as well as minimizing the overall size and weight thereof.

It is to be understood that the specific construction of the improved safety belt buckle herein disclosed and described is presented for the purpose of explanation and illustration and is not intended to indicate limits of the invention, the scope of which is defined by the following claims.

What is claimed is:

1. In a safety belt buckle comprising a base member, means for attaching one portion of the belt to said base member, an improved mechanism for adjustably securing a looped portion of the belt to the base member comprising

a slide supported by said base member for movement relative thereto and having

a pair of laterally spaced ears thereon with

a pair of truncated triangular apertures therein, respectively, and

a belt bar having

flat opposite end portions supported within the apertures of said slide, respectively, tensioning of one side of the looped portion of said belt effecting rotation of said belt bar so that the end portions thereof engage one side of the apertures in said slide thereby to facilitate shortening of said belt, tensioning of the other side of the looped portion of the belt effecting rotation of said belt bar so that the end portions thereof engage the opposite sides of the apertures in said slide thereby to hold the belt against slippage.

2. In a safety belt buckle comprising a base member having a slot for the acceptance of a looped portion of the belt and means for attaching another portion of the belt to said base member, an improved mechanism for adjustably securing the looped portion of the belt to the base member comprising

a slide supported by said said base member for movement relative thereto and having

a pair of laterally spaced ears with

a pair of apertures therein, respectively, and

a belt bar having

opposite end portions supported within the apertures of said slide, respectively, and

an intermediate portion with

angularly related top and bottom side portions, tensioning of one side of the looped portion of said belt effecting shortening of said belt, tensioning of the other side of the looped portion of the belt effecting a bite between the belt bar and a portion of said base adjacent the slot therein to hold the belt against slippage, concomitant movement of said slide toward said base and rotation of said buckle to a position wherein the other side of the looped portion of the belt and the bottom side portions of said belt bar are substantially aligned, permitting lengthening of said belt.

3. A belt adjustment mechanism for a safety belt buckle in accordance with claim **1** wherein said belt bar is of tear drop cross section intermediate the flat end portions thereof defined by a large arcuate edge portion and a relatively smaller edge portion with generally flat non-parallel side faces therebetween.

4. A belt adjustment mechanism for a safety belt buckle in accordance with claim **3** wherein said belt is looped about the relatively large edge portion of said belt bar.

5. A belt adjustment mechanism for a safety belt buckle in accordance with claim **3** wherein the flat end portions extend parallel to one of the side faces of said bar.

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