

[54] SEAT BELT BUCKLE ASSEMBLY

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[58] Field of Search 24/230, 201; 292/386; 43/42

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UNITED STATES PATENTS

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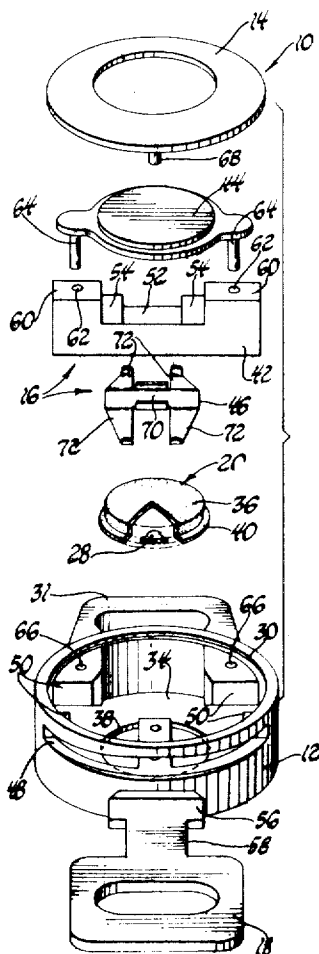
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[57]

ABSTRACT

A seat belt buckle assembly including a housing in which a latch bar is movably disposed to be moved by a push button between a latched position for engaging a tongue and a release position for allowing the tongue to be removed from the housing. A leaf type spring normally urges the latch bar upwardly toward the latched position. The novelty resides in the utilization of a cup-shaped diaphragm disposed in sealing engagement with the bottom wall of the housing to define a chamber with the bottom wall of the housing. The bottom wall of the housing has a hole therein and the diaphragm includes a flap which normally is disposed over the hole for sealing the opening in response to a sudden rise in pressure in the chamber which in turn results from the application of a predetermined force urging the latch bar to the release position but which allows flow through the opening during the application of a lesser force urging the latch bar to the release position whereby the buckle assembly is prevented from unlatching or releasing the tongue in response to sudden impact or like force.

8 Claims, 5 Drawing Figures



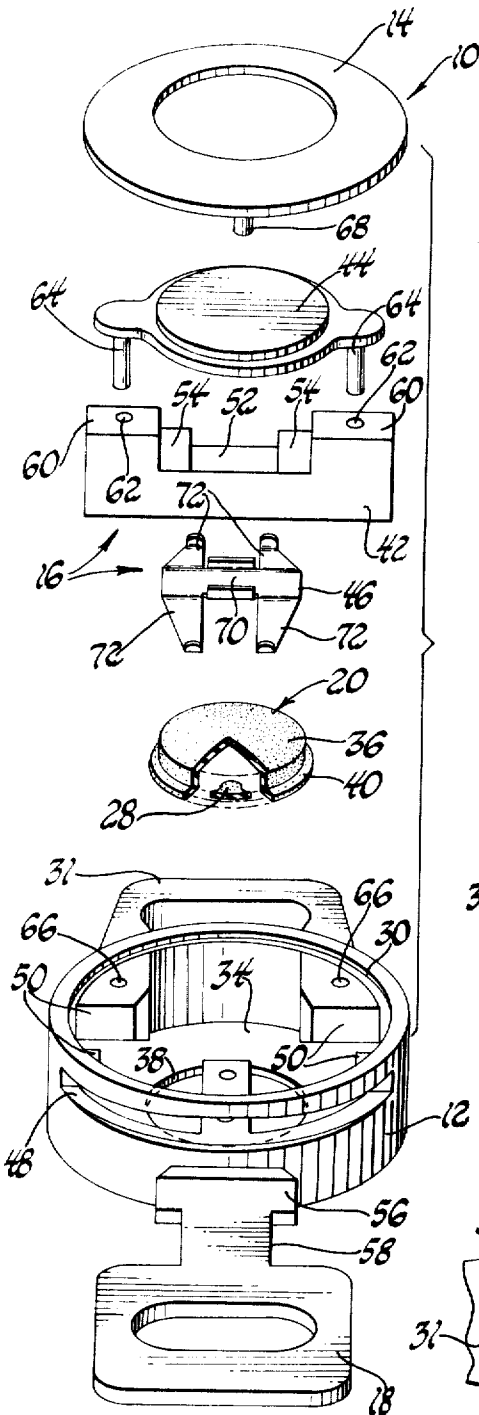


Fig. 1

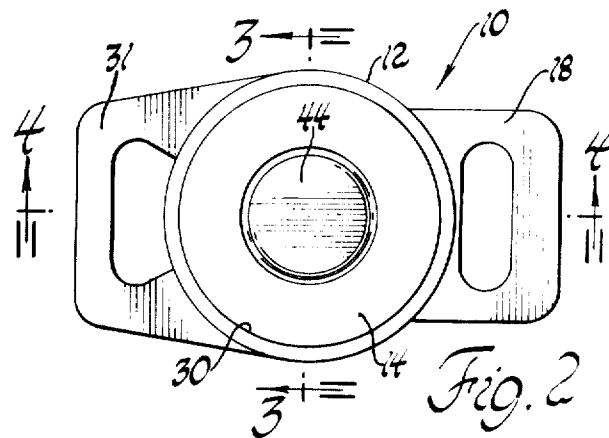


Fig. 2

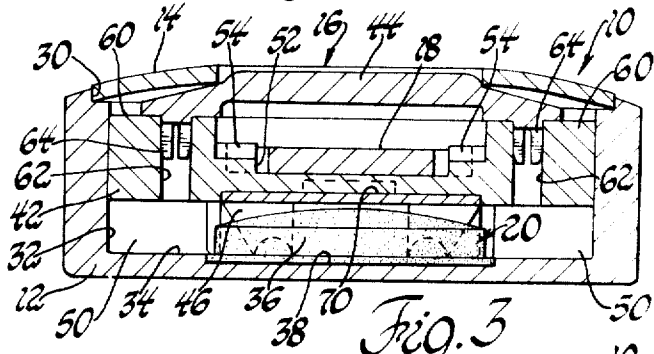


Fig. 3

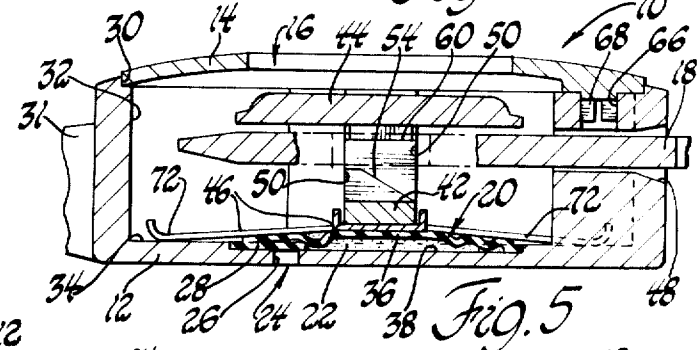
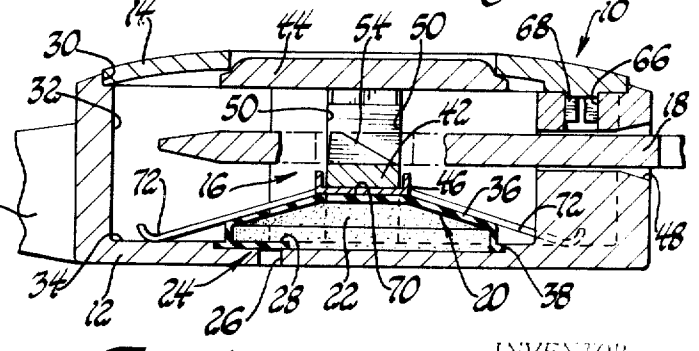


Fig. 4



SEAT BELT BUCKLE ASSEMBLY

This invention relates to a seat belt buckle assembly of the type utilized in automobiles for retaining an occupant in a seated position within the automobile. Such seat belt assemblies usually include two straps or belts anchored to the vehicle body with one of the straps being connected to a tongue and the other strap being connected to a buckle whereby the two straps may be disposed over an occupant's lap and the tongue inserted into the buckle so as to be retained therein until being manually released by manipulation of the buckle mechanism. There are a large number of various buckle assemblies known to the prior art which are suitable for use in seat belt assemblies. The buckle assemblies of the type to which the instant invention pertains include some sort of latching means coacting with a tongue and being movable between latched and release positions so that the tongue is retained to the buckle in the latched position but may be removed from the buckle in the release position. For example, the latching means in many of the prior art assemblies includes a latching member movable between the release and latched positions by a manually actuatable lever or push button and with the latch member being biased toward the latched position.

Depending upon the design, the operating characteristics, the mass of the various components, the interrelationship of the various components, and the precision with which the components are manufactured, various of the prior art buckle assemblies are subject to inadvertent unlatching of the tongue, i.e., movement of the latching member out of latching engagement with the tongue without manual actuation of the operating means normally utilized to move the latching member out of the latched position. Many prior art buckle assemblies may be inadvertently unlatched by applying a sudden or high inertia impact force to the buckle whereby the latch member moves to the release position allowing the tongue to be removed from the buckle assembly. Such inadvertent unlatching of the buckle assembly is, of course, an undesirable feature in any seat belt buckle assembly.

Accordingly, it is an object and feature of this invention to provide an improved buckle assembly including a latching means movable between a latched position, for engaging a tongue, and a release position, for releasing the tongue, and control means reacting with the latching means for preventing movement of the latching means to the release position upon the application thereto of a predetermined force and for allowing movement of the latching means to the release position upon the application thereto of a lesser force having less magnitude than the predetermined force.

In correlation with the foregoing object and feature, it is another object and feature of this invention to provide such a buckle assembly wherein the control means includes a fluid chamber and fluid flow control means for limiting fluid communication with the interior of the chamber in response to the application of the predetermined force to prevent the latching means from moving to the release position and for allowing sufficient fluid communication with the chamber in response to the application of the lesser force to allow the latching means to move to the release position.

Other objects and attendant advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is an exploded perspective view of a preferred embodiment of the instant invention;

FIG. 2 is a plan view of the preferred embodiment of FIG. 1;

FIG. 3 is an enlarged cross-sectional view taken substantially along line 3—3 of FIG. 2;

FIG. 4 is an enlarged cross-sectional view taken substantially along line 4—4 of FIG. 2 and showing the latching means in the latched position; and

FIG. 5 is a cross-sectional view similar to FIG. 4 but showing the latching means in the release position.

Referring to the drawings wherein like numerals indicate like or corresponding parts, a seat belt buckle assembly constructed in accordance with the instant invention is generally shown at 10.

The assembly 10 includes a support structure defined by the housing 12 and the cap 14.

The assembly 10 also includes latching means generally indicated at 16. The latching means 16 is movably supported by the housing 12 for latching engagement with a tongue 18 when in the latched position illustrated in FIGS. 3 and 4 and movable to a release position as illustrated in FIG. 5 for releasing the tongue 18.

The assembly 10 also includes control means, generally indicated at 20, reacting with the latching means 16 for preventing movement of the latching means 16 to the release position, shown in FIG. 5, upon the application thereto of a predetermined force and for allowing movement of the latching means 16 to the release position upon the application thereto of a lesser force having less magnitude than the predetermined force. The control means includes or defines a fluid chamber 22 and fluid flow control means generally indicated at 24. The fluid flow control means 24 limits fluid communication with the interior of chamber 22 in response to the application of the predetermined force so as to prevent the latching means 16 from moving to the release position shown in FIG. 5. Also, the fluid flow control means allows sufficient fluid communication with the chamber 22 in response to the application of the lesser force to allow the latching means 16 to move to the release position.

The fluid flow control means 24 includes an opening 26 into the chamber 22 as well as a flap 28. The flap 28 is normally disposed over the opening 26 in response to a sudden rise in pressure in the chamber 22, which sudden rise in pressure results from the application of the predetermined force, but which also allows fluid flow through the opening 26 during the application of the lesser force. The housing 12 includes means comprising the loop 31 for attachment to a seat belt webbing or the like.

The housing 12 has an aperture 30 thereinto and a cavity 32 extending into the housing 12 from the aperture 30 to a base wall 34 which is disposed opposite the aperture 30. The wall 34 has the opening 26 therein and the control means 20 includes a diaphragm 36 disposed in sealing engagement with the base wall 34. The wall 34 and the diaphragm 36 therefore define the chamber 22. The diaphragm 36 is disposed in a recess 38 in the base wall 34 and is retained therein preferably by an adhesive. The diaphragm 36 includes a flange 40 extending thereabout which is adhesively secured to the base wall 34 in the recess 38.

The latching means 16 includes the latch bar or member 42, the manually actuated means 44 and the biasing means 46. The manually actuated means 44 comprises a push button operatively connected to the latch member 42 for moving the latch member to the release position illustrated in FIG. 5. Biasing means 46 comprises a leaf-type spring member reacting between the base wall 34 of the housing and the latch member 42 for urging the latch member toward the latched position illustrated in FIG. 4. The cap 14 has an aperture therein which is disposed over the push button 44 and the cap 14 is disposed in the aperture 30.

The housing 12 has a slot 48 extending thereinto from the exterior thereof and into the cavity 32 for receiving the tongue 18. The slot 48 extends into the housing 12 in a direction generally transverse to the direction in which the cavity 32 extends into the housing 12.

The biasing member 46 is positioned on one side of the latch member 42 and the push button 44 is positioned on the other side of the latch member 42.

The housing 12 includes surfaces 50 in the cavity 32 extending upwardly from the base wall 34 toward the aperture 30 for receiving the latch member 42 and for limiting movement of the latch member 42 to movement substantially parallel to the surfaces 50. In other words, the surfaces 50 guide the upward

and downward movement of the latch member 42 between the latched and released positions.

The side of the latch bar 42 on which the push button 44 is positioned is defined by a central recessed channel 52. A pair of inclined ramps 54 extend upwardly from the channel 52 in a direction away from the slot 48. The tongue 18 with a head 56 and the shank 58 may be inserted through the slot 48 so that the head 56 engages the ramps 54 to move the latch member 42 toward the release position until the head 56 passes over the ramps 54 and the latch member 42 moves to the latched position where the head 56 is disposed behind the ramps 54 and the shank 58 is disposed in the channel 52 as shown in FIG. 4. Although it will be appreciated that the control means for preventing the inadvertent unlatching of the buckle assembly of this invention may be utilized with various buckle designs, an alternative to the embodiment disclosed in this application is one wherein the tongue 18, instead of having a head 56, has an aperture therein and the latched member 42 has a single ramp which moves downwardly and snaps into engagement with the aperture in the tongue to prevent the tongue from being removed from the buckle assembly. Thus, it is only necessary that the latch member 42 include one inclined ramp extending upwardly in the direction away from the slot through which the tongue is inserted and that the tongue have a recess or opening to define a shoulder, such as the shoulders defined by the head 56, so that as the tongue is inserted into the buckle it engages the ramp to move the latch member downwardly toward the release position until the shoulder passes over the ramp whereby the latch member moves upwardly to the latched position in mechanical interlocking engagement with the shoulder to retain the tongue in the housing.

The latch member 42 includes a shoulder or platform 60 disposed outwardly of each of the ramps 54 and the push button 44 engages the shoulder 60 in that the shoulder 60 has holes 62 therein and the push button 44 has downwardly extending pegs 64 press fitted into the holes 62. It will be recognized, however, that the pegs 64 may be slidably disposed in the holes 62.

The housing 12 has bores 66 extending thereinto adjacent the cavity 30 and the cap 14 has posts 68 extending therefrom and press fitted into the bores 66 for attaching the cap 14 to the housing 12.

The biasing member 46 includes a central cradle 70 and a pair of spring arms 72 extending on an angle from each side of the cradle 70. The distal ends of the spring arms 72 have arcuately upturned portions engaging the base wall 34 of the housing 12.

As alluded to above, the control means of the instant invention for preventing inadvertent unlatching of a buckle assembly may be utilized with various buckle assemblies; however, it has been illustrated in this application with a buckle assembly of the type described and claimed in co-pending application Ser. No. 878,649 filed Nov. 21, 1969 now U.S. Pat. No. 3,522,640 in the name of Thomas E. Lohr and assigned to the assignee of the instant invention.

As is clear from the foregoing description, the tongue 18 may be inserted through the slot 48 so that the head 56 thereof engages the ramps 54 to move the latch member 42 downwardly until the head 56 moves past the ramps 54 to allow the latch member 42 to move upwardly under the biasing of the spring member 46. The tongue 18 will remain in the latched position as shown in FIG. 4 until the push button 44 is depressed downwardly to move the latch member 42 downwardly whereupon the tongue 18 may be removed from the housing 12.

Very frequently the buckle assembly may be subjected to a suddenly applied high inertia force which without the control means 20 would allow the latch member 42 to move downwardly from the latched position to the release position shown in FIG. 5 where the tongue 18 would be free to be removed from the housing 12. The control means 20, however, prevents such inadvertent unlatching of the assembly by

preventing movement of the latch member 42 downwardly to the release position upon the application thereto of a predetermined suddenly applied high inertia force and allows movement of the latching member 42 to the release position upon the application thereto of a more smoothly and gradually applied lower inertia force than the predetermined force. When the assembly is in the latched position illustrated in FIG. 4 and a force is applied either to the push button 44 or to the latch member 42 which urges the latch member 42 toward the release position under a predetermined or very rapid acceleration, the pressure in the chamber 22 rapidly builds up and forces the flap 28 into sealing engagement with the wall 34 about the opening 26 so that no air may flow out of the chamber 22; thus, preventing the latch member 42 from moving downwardly. On the other hand, if a force of less magnitude is applied to the push button 44 or the latch member 42 to move the latch member 42 downwardly under less acceleration, there is no such comparable buildup of pressure in the chamber 22 and the air flows out of the chamber 22 by leaking past or under the flap 28 and through the opening 26. In some cases this flow of fluid may actually lift the flap 28 upwardly a slight amount. Thus, the diaphragm 36 with the base wall 34 defines a fluid chamber and the flap 28 and the opening 26 define a fluid flow control means all of which prevents the movement of the latch member 42 to the release position when a force of predetermined magnitude is applied to the latch member 42 urging it to the release position but which allows the latch member 42 to move to the release position when a force of less magnitude than the predetermined magnitude is applied to the latch member 42 urging it toward the release position. This is described in terms of force because as is known in elementary physics, force equals mass multiplied by acceleration and it therefore requires a predetermined applied force to move the latch member 42 downwardly to cause a sufficiently rapid build-up of pressure in the chamber 22 to force the flap 22 into sealing engagement with the wall 34 about the opening 26 to prevent fluid flow out of the chamber 22. On the other hand, if a force of less magnitude is applied to the latch member 42 urging it downwardly, fluid is free to leak past or under the flap 28 and out through the opening 26 thereby allowing the latch member 42 to freely move to the release position. Said another way, if the latch member 42 is subjected to a very high acceleration downwardly there is a rapid build-up of pressure in the chamber 22 to cause the flap 28 to remain in sealing engagement about the opening 26 whereas if the latch member 42 is subjected to a lesser downward acceleration, the fluid leaks past the flap 28 and out through the opening 26.

The invention has been described in an illustrative manner, and it is to be understood that the terminology which has been used is intended to be in the nature of words of description rather than of limitation.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A buckle assembly comprising: a support structure, latching means movably supported by said support structure for latching engagement with a tongue in a latched position and movable to a release position for releasing the tongue; and control means reacting with said latching means for preventing movement of said latching means to said release position upon the application thereto of a predetermined force and for allowing movement of said latching means to said release position upon the application thereto of a lesser force having less magnitude than said predetermined force, said control means including a fluid chamber and fluid flow control means for limiting fluid communication with the interior of said chamber in response to the application of said predetermined force and for allowing sufficient fluid communication with said chamber

in response to the application of said lesser force to allow said latching means to move to said release position.

2. A buckle assembly comprising: a support structure, latching means movably supported by said support structure for latching engagement with a tongue in a latched position and movable to a release position for releasing the tongue; and control means reacting with said latching means for preventing movement of said latching means to said release position upon the application thereto of a predetermined force and for allowing movement of said latching means to said release position upon the application thereto of a lesser force having less magnitude than said predetermined force, said control means including a fluid chamber and fluid flow control means for limiting fluid communication with the interior of said chamber in response to the application of said predetermined force and for allowing sufficient fluid communication with said chamber in response to the application of said lesser force to allow said latching means to move to said release position, said fluid flow control means including an opening in said chamber and a flap normally disposed over said opening for sealing said opening in response to a sudden rise in pressure in said chamber resulting from the application of said predetermined force and for allowing fluid flow through said opening during the application of said lesser force.

3. An assembly as set forth in claim 2 wherein said support means includes a wall, said wall having said opening therein, a diaphragm disposed in sealing engagement with said wall, said wall and said diaphragm defining said chamber.

4. A buckle assembly comprising: a support structure, latching means movably supported by said support structure for latching engagement with a tongue in a latched position and movable to a release position for releasing the tongue; and control means reacting with said latching means for preventing movement of said latching means to said release position upon the application thereto of a predetermined force and for allowing movement of said latching means to release position upon the application thereto of a lesser force having less magnitude than said predetermined force, said control means including a fluid chamber and fluid flow control means for limiting fluid communication with the interior of said chamber in response to the application of said predetermined force and for allowing sufficient fluid communication with said chamber in response to the application of said lesser force to allow said

latching means to move to said release position, said latching means including a latch member and manually actuated means operatively connected to said latch member for moving said latch member to said release position.

5. An assembly as set forth in claim 4 wherein said latching means further includes biasing means reacting between said support means and said latch member for urging the latter toward said latched position.

6. An assembly as set forth in claim 5 wherein said manually actuated means includes a push button movably supported by said support means.

7. An assembly as set forth in claim 6 wherein said support means comprises a housing having an aperture thereto, a cavity extending into said housing from said aperture to a wall opposite said aperture, a slot extending thereto from the exterior thereof to said cavity for receiving a tongue, and means for attachment to a seat belt or the like; said latch member comprises an elongated latch bar disposed in said cavity; said housing including surfaces in said cavity extending from said wall toward said aperture for limiting movement of said latch bar to movement substantially parallel to said surfaces; said push button being positioned in said cavity for moving said latch bar between said latched position for engaging and retaining a tongue in said cavity and said release position for allowing the tongue to be removed from said cavity; said biasing means comprises a biasing member urging said latch bar to move to said latched position; said biasing member being positioned on one side of said latch bar and said push button being positioned on the other side of said latch bar; and a cap connected to said housing and disposed over said aperture; one of said cap and said wall having an aperture therein overlying said push button for access to said push button and said biasing member reacting against the other of said cap and said wall.

8. An assembly as set forth in claim 7 wherein the side of said latch bar on which said push button is positioned includes an inclined ramp extending upwardly in a direction away from said slot in said housing whereby a tongue having a recess to define a shoulder may be inserted through said slot to engage said ramp to move said latch bar toward the release position until the shoulder passes thereover and the latch bar moves to the latched position where the shoulder is disposed behind said ramp to retain the tongue in said housing.

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