United States Patent [19]

Jakob

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[54] **PUSH BUTTON BUCKLE**

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[52] **U.S. Cl.** ..... **24/230 A,** 297/389

[51] **Int. Cl.** **A44b 11/26**

[58] **Field of Search** 24/230 AL, 230 AV, 75, 77 R, 24/78, 230 A; 297/385, 389

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Primary Examiner—Donald A. Griffin

[57] **ABSTRACT**

A safety strap buckle of the type wherein a tongue plate attached to one strap section matingly engages a buckle attached to another strap section, where the buckle disclosed herein is provided by non-structural housing fixedly carrying a through-load member and including a push button operated latch assembly for selectively coupling tension loads between the through-load member and the tongue plate. The through-load member in addition to carrying the tension loads is provided with tongue plate guide and restraint means for bearing transverse loads on the buckle such that the housing itself serves merely as an encapsulating member. Assembly of the buckle is facilitated by a two part construction of the encapsulating housing, including a base part having a cavity therein for receiving a load member and the latch member including a push button actuator maybe carried by such load member in a unidirectional assembly operation which is completed by mounting a cover part of the housing to the base part.

18 Claims, 8 Drawing Figures

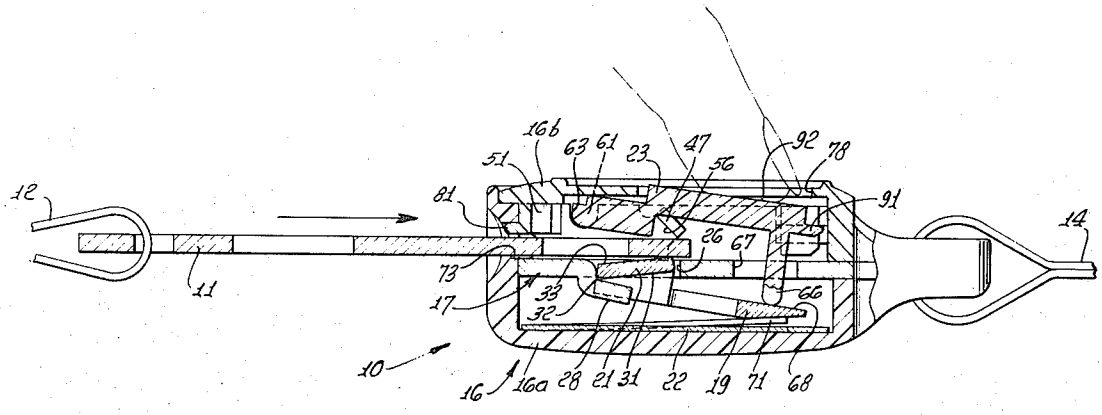


FIG. 1.

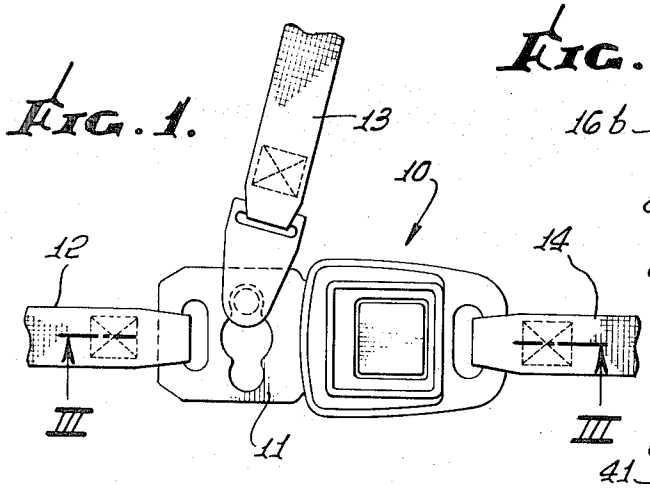


FIG. 2.

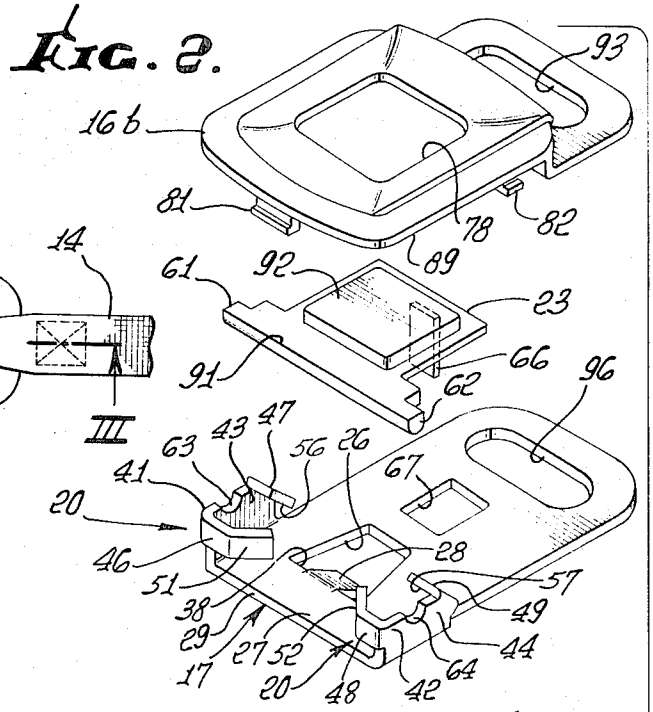
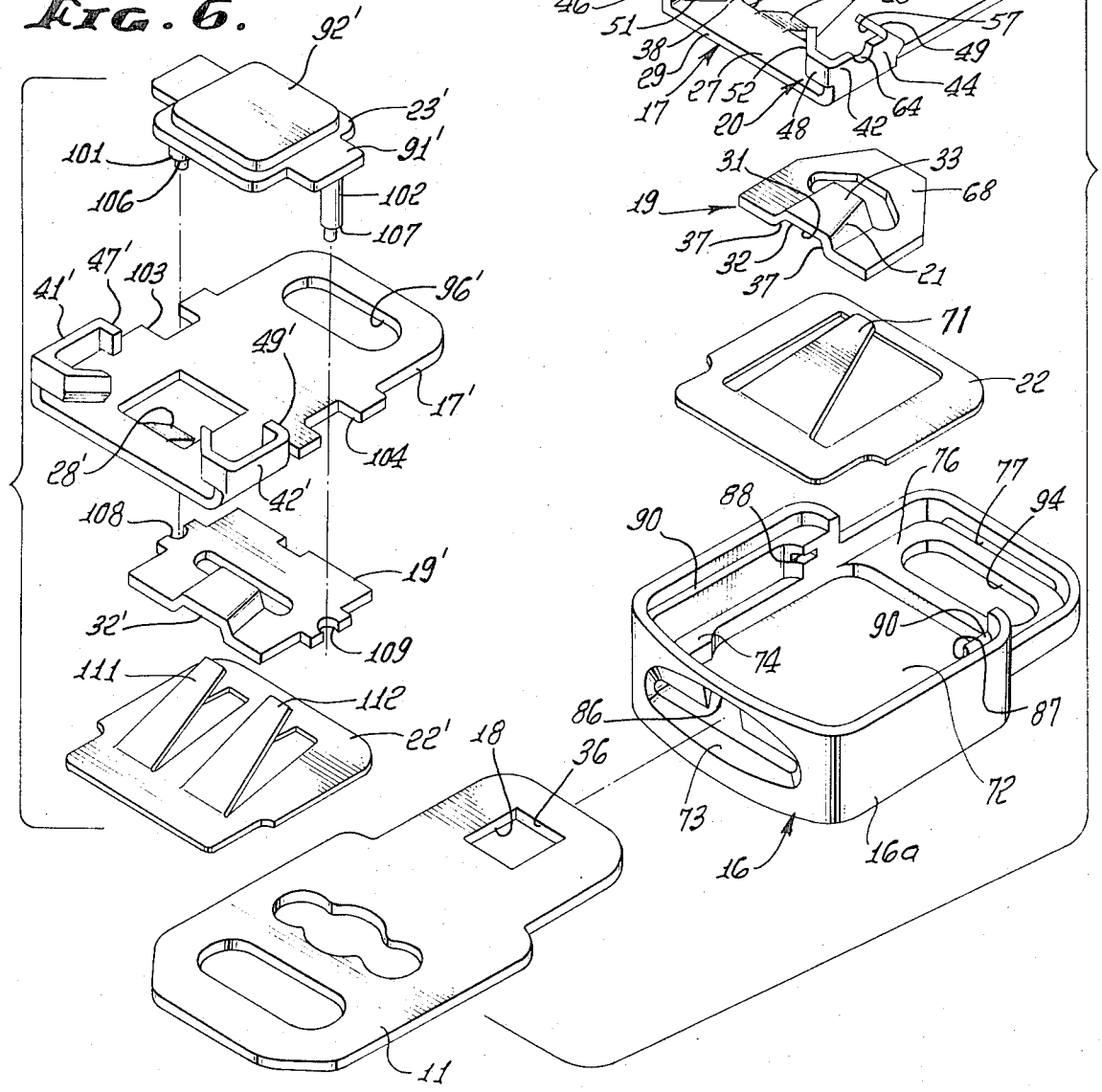


FIG. 6.



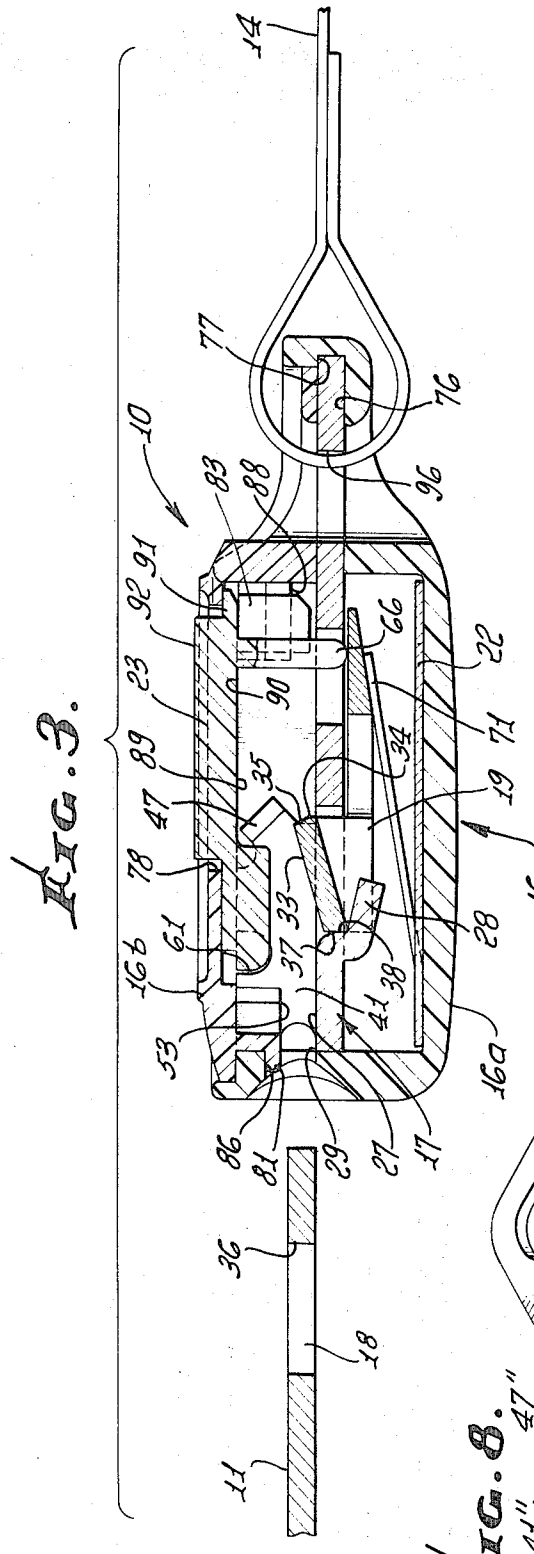


FIG. 3.

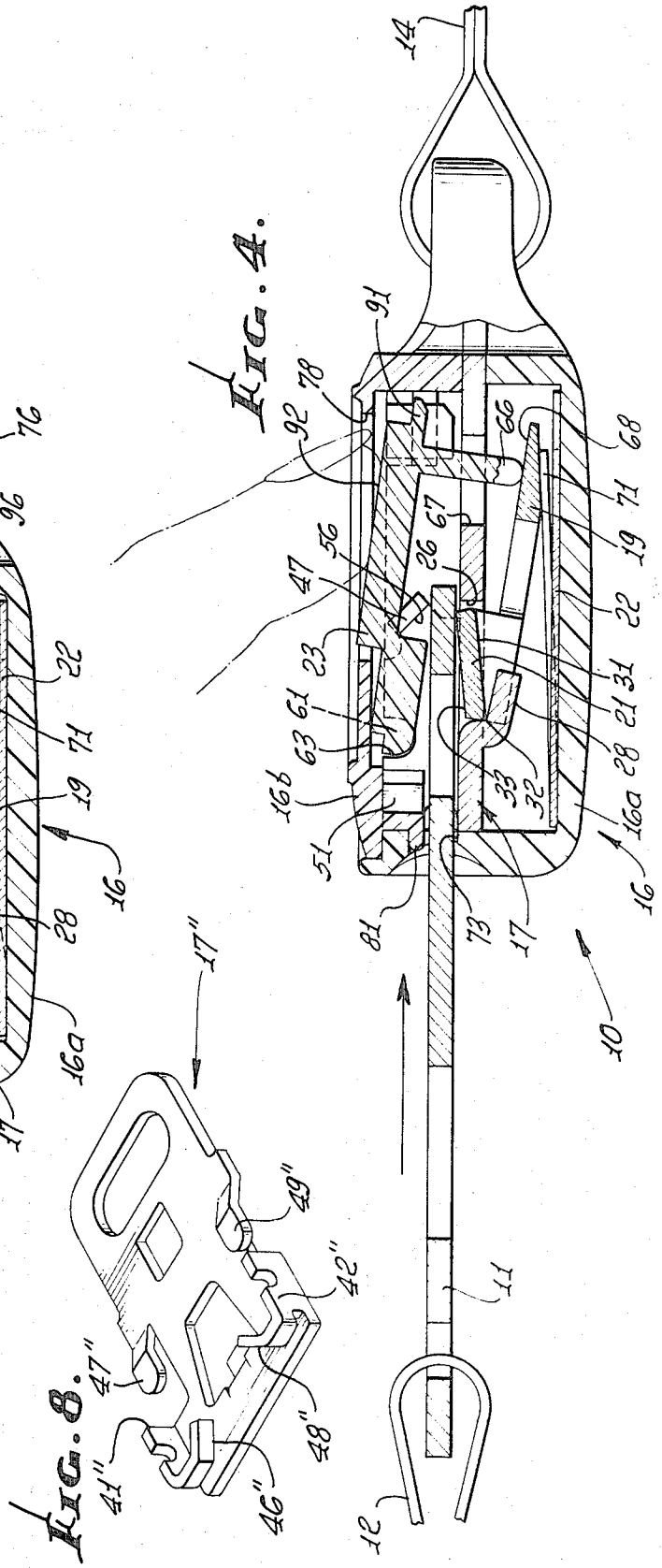


FIG. 4.

FIG. 8.

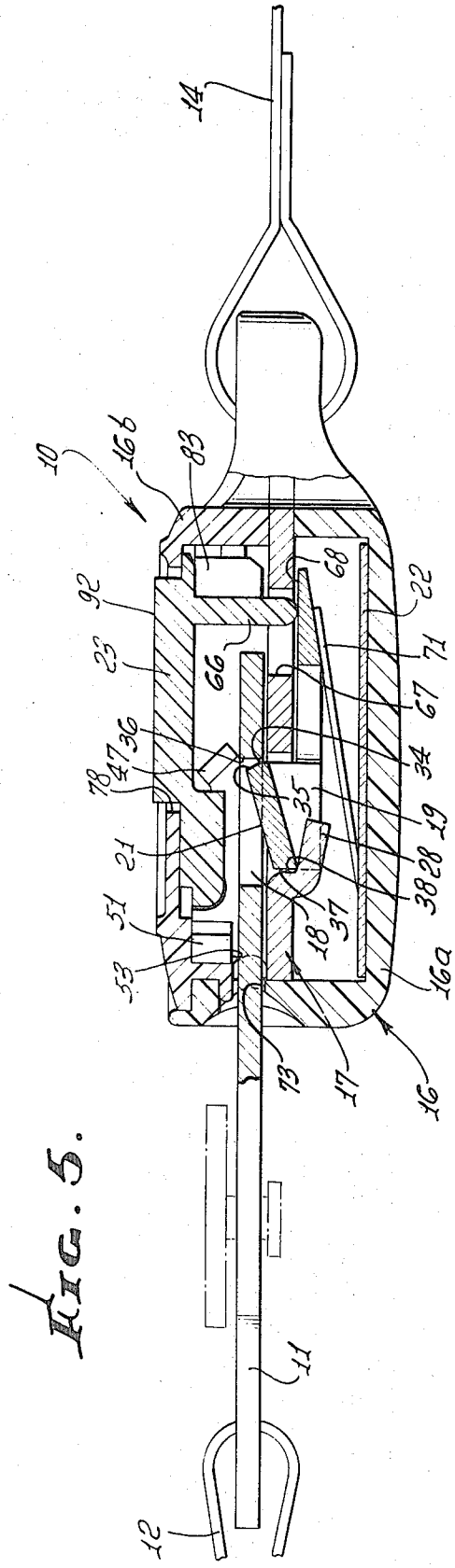

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FIG. 5.

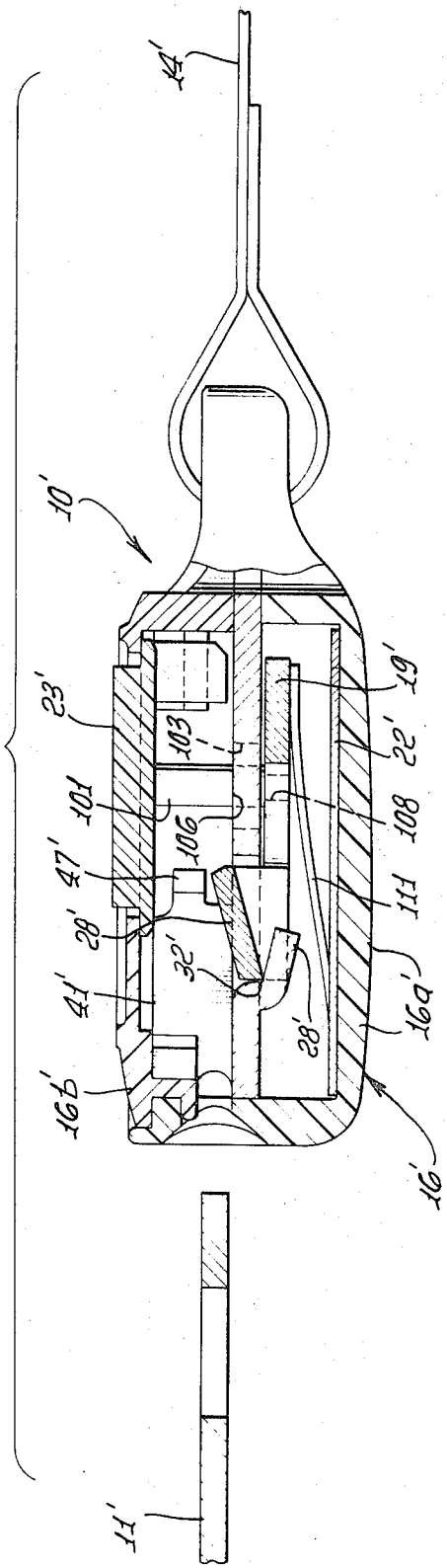
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FIG. 7.

PUSH BUTTON BUCKLE

This invention relates to an improved safety buckle and strap combination of the type wherein the buckle is provided with a bush button release.

Push button operated buckle assemblies in present use generally require the structural support of a housing or buckle base formed of a high strength metal. Such a construction leads to a rather heavy and thus awkward and uncomfortable assembly and it is therefore an object of the present invention to provide a lighter weight push button buckle configuration.

Previous attempts have been made to reduce the weight of buckle assemblies by the provision of a lightweight housing, for example formed of plastic, which carries the interconnecting metal members but does not bear the tension load between such members applied by the safety straps. Although such known buckles are probably adequate under most conditions for supporting a pure tension load between the interconnecting tongue and load members, it is believed that these known assemblies are subject to failure under the application of loads other than a direct tension load between the strap sections. For example industrial and vehicle safety standards require buckle assemblies to meet a variety of stringent load bearing tests covering a broad range of emergency conditions. For example, one such test requires that a person secured by buckle and strap assembly while in an overturned car, and thus with the person's weight being essentially carried by the strap assembly, be able to release the buckle within a certain acceptable range of manual pressure applied to the bush button latch. Other standard tests subject the buckle assembly while in a latched condition to transverse, lateral and tension loads and various combinations thereof so as to insure that an unusual combination of forces on the assembly will not cause an unintentional relase. In general, buckle configurations which have provided the lighter weight construction through the use of a plastic housing or the like, are not believed capable of withstanding these various load conditions, primarily because the housing itself in one way or another provides some structural load bearing function.

Accordingly, it is a more specific object of the present invention to provide a buckle for a safety strap combination having the features of light weightness and push button actuation and at the same time meeting the diverse and stringent load bearing requirements necessary to insure the primary function of a strap buckle, that is safety.

It is still another object of the present invention to provide a safety strap buckle of the push button release type having a lighter weight and yet safer construction than known buckle assemblies and to provide these characteristics in accoardance with a buckle construction which is economical to manufacture because of its few number of parts and simple assembly operations.

These and further objects and various advantages of the buckle construction in accordance with the present invention will become apparent to those skilled in the art from the following detailed disclosure of exemplary embodiments thereof. Reference will be made to the appended sheets of drawings in which:

FIG. 1 is plan view of the push button buckle of the present invention in combination with a system of safety straps and cooperating tongue plate;

FIG. 2 is an exploded perspective view of an exemplary safety belt construction in accordance with the present invention showing the various elements thereof in a preassembled relation and showing the mating tongue plate;

FIGS. 3, 4 and 5 are section views taken generally along a plane III—III of the buckle system shown in FIG. 1, with FIG. 3 illustrating the condition of the various latching components of the buckle prior to entry of the tongue plate, FIG. 4 illustrating the movement of these components during entry or retraction of the tongue plate relative to the buckle, and finally FIG. 5 showing the condition of the latching mechanism with the tongue plate in a latched disposition;

FIG. 6 is an exploded perspective view of an alternative exemplary embodiment of the load member and latch means constructed in accordance with the present invention for mounting within the buckle housing shown in FIG. 2;

FIG. 7 is a section view of a buckle assembly and cooperating tongue plate constructed in accordance with the alternative embodiment for the load member and latch means illustrated in FIG. 6; and

FIG. 8 is a second examplary embodiment of the load member.

Referring to FIGS. 1, 2 and 3, it is observed that a push button buckle 10 in accordance with the present invention is of the type which matingly receives a tongue plate 11 wherein both the tongue plate 11 and buckle 10 are adapted to be attached to safety strap sections 12, 13 and 14. In this manner the buckle provides releasable coupling of a lap strap 14 jointly to a lap strap 12 and shoulder strap 13 secured to the tongue plate 11. More particularly in accordance with the present invention, buckle 10 comprises a nonstructural housing 16 preferably formed of a light weight plastic material having some degree of resiliency, a load member 17 fixedly carried in housing 16 and serving to bear the entire load existing between tongue plate 11 and strap 14 such that none of the applied load force passes through the housing 16 itself. A latch member, separate from load member 17, is disposed within the housing 16 and is movable relative to said load member 17. In addition to the load bearing function of load member 17; after the present occurrence of "member 17" add--may--, member 17 may also provide a mounting support for carrying the movable latch member for selective releasable engagement with an aperture 18 of tongue plate 11, wherein the latch member includes a latch plate 19 having a raised catch portion 21. As more fully described herein, latch plate 19 is mounted in a generally underlying relationship to load member 17 and is hingedly supported thereby for movement between a latching position and a release position relative to aperture 18 of tongue plate 11. A leaf spring member 22 serves as a biasing means for urging latch plate 19 into its latching position shown in FIG. 5 and a push button 23 also carried and supported by load member 17 functions to selectively manually move latch plate 19 away from load member 17 against spring member 22 toward a release position as shown by FIG. 4. To guide tongue plate 11 into and out of the buckle and restrain it in a plane overlying member 17, the load member is formed with integral guide and restraint means indicated at 20.

Now with specific reference to FIGS. 2, 3, 4 and 5, load member 17 is formed with a generally planar body

including a catch guiding opening 26 therein shaped to matingly receive and guide raised catch portion 21 of latch plate 19. Plate 19 is disposed in a generally underlying relationship with load member 17 so that catch portion 21 protrudes through aperture 26 and in the latched condition extends above a tongue plate receiving surface 27 of member 17. To provide for articulation of latch plate 19 between its latched and released positions, it is hingedly supported by an integral tab 28 of member 17 bent to extend beneath opening 26 from an edge thereof adjacent an forward edge 29 of member 17 as best illustrated by FIG. 3. A recess 31 formed by and thus underlying raised catch portion 21 of latch plate 19 rests on and is supported by tab 28 such that the generally planar portion of latch plate 19 underlies member 17 and the entire plate is pivotally supported about and edge 32 of recess 31. Catch portion 21 may be thus moved to a latching position by pivoting plate 19 upwardly against the underside of member 17.

With reference to FIG. 3, raised catch portion 21 is provided with a camming surface 33 sloping upwardly away from edge 32 of recess 31 and terminating at a catch abutment 34 generally at right angles to camming surface 33 for engaging an abutment surface 32 of aperture 18 in tongue plate 11. Camming surface 33 serves to allow a leading edge of tongue plate 11 upon entry into the buckle to force raised catch portion 21 of latch plate 19 downwardly to a position flush with surface 27 of member 17. Abutment 34 of catch portion 21 has a slight bevel 35 on an upper edge thereof to facilitate release from tongue plate 11.

To transmit the force carried by catch abutment 34 of catch portion 21 to load member 17 when tongue plate 11 is in a latched condition as illustrated in FIG. 5, raised catch portion 21 is provided with abutment surfaces 37 opposite from catch abutment 34 and adjacent lateral edges of recess 31 for matingly engaging shoulders 38 of load member 17 defined by opening 26 adjacent each side of tab 28. In this manner tension loads are directly and positively transmitted from abutment surface 36 of tongue plate 11 to shoulders 38 of load members 17 by movable and low inertia latch plate 19.

Further in accordance with the present invention, load member 17 fixedly carries guide and restraint means 20 in the form of integral ears 41 and 42 for guiding and restraining tongue plate 11 in a plane adjacent and overlying tongue receiving surface 27 of member 17. Integral ears 41 and 42 are disposed along opposite lateral edges of member 17 and adjacent longitudinally forward edge 29 as illustrated. Each of ears 41 and 42 has an upright standing wall 43 and 44 respectively, providing lateral restraint in cooperation with opposite lateral edges of tongue plate 11. Furthermore, each ear is formed with a pair of longitudinally spaced apart integral tabs 46, 47 and 48, 49 turned laterally inwardly so as to provide surfaces overlying and vertically spaced from tongue receiving surface 27 of member 17. Together these overlying integral tabs 46 through 49 serve to restrain tongue plate 11 when engaged with member 17 in a latched condition from deflection from its parallel planar orientation with surface 27. Such deflection if permitted might result in a false release of the tongue plate from catch portion 21. A first pair of integral tabs 46 and 48 on opposite ears 41 and 42 are disposed adjacent forward edge 29 of member 17 and are provided with end portions 51 and 52 angulated away from edge 29 toward the other pair of tabs 47 and 49 as illustrated. By this configuration tabs 46 and 48 define restraint surfaces, one of which is shown as surface 53 in FIG. 5, having both lateral and longitudinal dimensions for enhancing the restraint of tongue plate 11 in the transverse direction. These lower surfaces of end portions 51 and 52 may be provided as illustrated with beveled edges confronting forward edge 29 for facilitating the guiding of tongue plate 11 into member 17.

The other pair of integral tabs 47 and 49 of ears 41 and 42 respectively are as illustrated in the embodiment of FIGS. 2 through 5 each formed with lower surfaces 56 and 57 respectively, sloping upwardly in the direction of the first pair of tabs 46 and 48 to further facilitate entry of tongue plate 11 into its engaged position. Lower edges of surfaces 56 and 57 cooperate with the lower surfaces of tas 46 and 48 to further restrain tongue plate 11 from transverse deflection. For this reason tabs 47 and 49 are disposed intermediate the longitudinal ends of member 17 and preferably at a location laterally adjacent aperture 26 of member 17. As will be more fully apparent from the description herein, once load member 17 is assembled within housing 16, the foregoing construction including integral ears 41 and 42 renders load member 17 the sole structural support for restraining tongue plate 11 when engaged with the buckle.

To provide for manual selective release of tongue plate 11 from a latched condition, the latch member is responsive to a push button 23 carried by load member 17 for pivotal movement about a pair of spaced coaxial arms 61 and 62 supported in a pair of cooperating bearing surfaces 63 and 64 formed in opposing ears 41 and 42 of load member 17, and thus providing means for pivotally carrying the push button. The button may also be pivotally mounted in the sidewalls of the housing 16. Button 23 fixedly carries a lever extension 66, in this instance integral with the button, which in the assembled position as shown in FIG. 4 extends through an access opening 67 in member 17 to and for engaging a surface abutment 68 of latch plate 19 spaced from pivot edge 32 of catch portion 21 so as to provide a moment of force on plate 19 about the pivotal axis thereof. In this manner button 23 is supported by member 17 in a position overlying tongue plate receiving surface 27 and as best illustrated in FIG. 4 is responsive to a manual actuation force to pivot abut arms 61 and 62 causing extension 66 to depress abutment 68 of latch plate 19 away from member 17 which in turn moves raised catch portion 21 from a latching position to a release position flush with surface 27. Operating against extension 66 and push button 23, an upwardly sloping centrally located leaf 71 of spring biasing member 22 engages a surface of latch plate 19 opposite surface abutment 68 resiliently urging plate 19 toward load member 17. In its biased state latch plate 19 is urged against an under surface of member 17 and thus this under surface serves as a stop to further upward movement of raised catch portion 21. This condition is illustrated by FIGS. 3 and 5.

In its preferred form housing 16 of the buckle is formed in two parts, a base part 16*a* and a cover part 16*b*. Load member 17, the latch plate 19, spring member 22 and push button 23 are all cooperatively formed so as to allow for unidirectional assembly into housing base part 16a for economical mass manufacture.

In particular base part 16a is formed with a cavity 72 and a tongue plate receiving opening 73 extending through an endwall thereof. Cavity 72 is shaped to receive in succession spring biasing member 22 with leaf 71 sloping upwardly away from opening 73, load member 17 with latch plate 19 hingedly supported on tab 28 with the guide entry formed by ears 41 and 42 of member 17 communicating with housing opening 73 and opposite lateral edges of the under surface of member 17 resting on shoulders 74 defined in the housing cavity. An end of load member 17 opposite forward edge 29 rests on a shoulder 76 of base part 16a and lip 77 thereof resiliently retrains this end of member 17. Push button 23 is received next with extension 66 passed downwardly through opening 67 and push button pivot arms 61 and 62 resting in bearing surfaces 63 and 64 of member 17. Finally, a housing cover provided by part 16b, having a push button access aperture 78, is mounted in place and secured to housing base part 16*a* by a forward and a pair of lateral resilient retaining tabs 81, 82 and 83 respectively, engaging cooperating shoulders 86, 87 and 88 respectively, formed in part 16a as best illustrated in FIGS. 2 and 3. A lower circumferential edge 89 of cover part 16*b* rests on an upper circumferential shoulder 90 of part 16*a*. As indicated above, housing 16 is formed of a plastic having a slight resiliency, such that tabs 81, 82 and 83 undergo some deformation during assembly of housing cover part 16b.

Cover part 16*b* retains push button 23 by a circumferential stop surface surronding aperture 78 and cooperating with an upper surface 91 of push button 23 surrounding a raised portion 92 which extends upwardly into aperture 78 of the housing cover. Accordingly, all of the foregoing components may be vertically dropped into housing base part 16*a* in a unidirectional assembly operation with housing cover part 16*b* being snapped in place to encapsulate the various parts within the plastic housing.

Housing base part 16a and housing cover part 16*b* are formed with transversely registering openings 93 and 94 adjacent ends thereof opposite tongue plate receiving opening 73 for access to a strap receiving aperture 96 formed in load member 17. It is observed that all of the load placedon buckle 10 by strap 14 is carried by an edge of aperture 96 of load member 17 and not by any of the surrounding portions of housing 16.

In order to disassemble buckle 10, housing cover 16 may be released from base part 16*a* by inserting a slender tool, such as a screwdriver, under the corners of housing cover aperture 78 adjacent tabs 82 and releasing these tabs by lever tool action.

An alternative exemplary embodiment of the buckle in accordance with the present invention is illustrated in FIGS. 6 and 7, wherein push button 23′ rather than being pivotally mounted as in the case of the embodiment shown in FIGS. 2 through 5, is carried by a latch plate 19′ and guided by load member 17′ for transverse reciprocation. In particular, push button 23′ is formed with integral laterally spaced downwardly depending pins 101 and 102 extending through cutouts 103 and 104 formed in laterally opposite edges of member 17′ intermediate opening 26′ and aperture 96′. Pins 101 and 102 of push button 23′ are formed at the lower ends thereof with shoulders 106 and 107 fixedly engaging abutment edges circumferentially surrounding pin receiving notches 108 and 109 formed in opposite lateral edges of latch plate 19′ for downwardly urging plate 19′ away from load member 17′.

It is observed that ears 41′ and 42′ of load member 17′ are in this instance formed with intermediate tabs 47′ and 49′ extending in an upright plane rather than having a sloping lower surface as in the case of load member 17 of FIGS. 2 through 5.

Push button 23′, load member 17′, latch plate 19′ and a spring bias member 22′ in this instance formed with a pair of upwardly sloping laterally spaced leaves 111 and 112 are all disposed by a unidirectional assembly operation as described in connection with the buckle of FIGS. 2 through 5, within a two part plastic housing 16′ as shown in FIG. 7.

The remaining construction and functioning of the buckle shown in FIGS. 6 and 7 is the same as described above in connection with FIGS. 2 through 5. Latch plate 19′ is hingedly supported by integral tab 28′ of member 17′ such that push button 23 when manually depressed effects a pivotal articulation of plate 19′ in response to a moment of force applied to the plate at notches 108 and 109 which are longitudinally spaced from the pivotal edge 32′ of the latch plate. Entry, latching, and release of tongue plate 11′ into and by buckle 10′ as shown in FIG. 7, is thus the same as described above in connection with buckle 10.

In the second alternative embodiment of a load plate 17″, the ears 41″ and 42″ laterally restrain the tongue plate 11 and carry tabs 46″ and 48″. Intermediate tabs 47″ and 49″ are not carried by ears 41″ and 42″ but are struck from the load member plate providing surfaces overlying and spaced from the plate for receiving the forward end of tongue plate 11 to prevent movement of the tongue plate from planar contact with the load member 17″.

It will be apparent to those skilled in the art that other modifications and variations of the buckle may be made without departing from the scope of the inventions.

I claim:

1. In a safety strap combination of the type wherein an apertured tongue plate attached to one strap section matingly engages a buckle attached to a second strap section, said buckle comprising:

a non-structural housing, a through-load member disposed within and in fixed relation to said housing and adapted to be connected at one end to the second strap section, and a latch member disposed within said housing and movable relative to said load member for selective releasable engagement with said tongue plate, whereby an applied tension load passes directly through said tongue plate and load member without passing through said housing, said buckle being further defined by said load member having a generally planar body including an aperture formed therein, said latch member including a movable latch plate having a raised catch portion and said buckle additionally including biasing means, said latch plate being disposed in a generally underlying relationship with said load member with said catch portion protruding through the opening thereof for being selectively received in said tongue plate aperture, said spring biasing means urging said catch plate toward said load member.

2. The buckle of claim 1 further defined by said latch plate having one end hingedly supported by said load

member for pivotal movement of said catch portion between a release position recessed within said load member opening and a latched position protruding through said opening for receipt by said tongue member aperture.

3. The buckle of claim 2 further defined by said load member having an integral tab extending beneath said opening from an edge thereof, said latch plate being disposed in cooperation with said load member to provide the hinged support for pivotal movement of said plate.

4. The buckle of claim 3, said raised catch portion of said ltach plate defining a recess on the lower surface thereof, said latch plate being disposed with said load member tab matingly engaging said recess portion and said latch plate having abutment surfaces adjacent said recess engaging shoulders of said load member opening adjacent said tab to couple a tension load between said tongue plate and load member.

5. The buckle as defined in claim 1 further comprising a push button member pivotally mounted above said load member, said push button engaging said latch plate for manually selectively moving said plate and catch portion from a latched position to a release position.

6. A safety buckle for receiving and engaging a tongue plate, the buckle and tongue plate each attached to a safety strap, the buckle comprising:

A non-structural housing having a tongue plate receiving opening, a through-load member fixedly carried by said housing and adapted to be connected at an end opposite to said housing opening to one of the safety straps, a latch member disposed within said housing and movable relative to said load member for releasably engaging said tongue plate and coupling the tension forces between said tongue plate and said load member, said load member fixedly carrying restraint means for laterally and transversely restraining said tongue plate in a plane adjacent and overlying said load member.

7. The buckle of claim 6 wherein said restraint means comprise a pair of integral ears disposed along opposite lateral edges of said load member and each ear including at least one tab overlying the load member upper surface in vertically spaced apart relation.

8. The buckle of claim 7 wherein each ear includes two longitudinally spaced apart tabs overlying said load member, a first pair of said tabs disposed adjacent the end of said load member near the buckle housing tongue plate receiving opening, and the other pair of tabs spaced intermediate the load member ends, said other pair of tabs having a lower surface sloping upwardly in the direction of said first pair of tabs to facilitate entry of the tongue plate into the buckle.

9. The buckle of claim 7 wherein each ear includes two longitudinally spaced apart tabs overlying said load member, a pair of said tabs disposed adjacent the end of said load member near the housing tongue plate opening and the other pair disposed intermediate the load member ends, said first pair of tabs having end portions bent away from said housing opening toward said other pair of tabs to enhance the transverse restraint of said tongue plate and to facilitate entry thereof in the buckle.

10. A safety belt buckle for reciving and engaging a tongue plate having a retaining shoulder comprising:

a non-structural housing;

a through-load member received in said housing and adapted to be connected at one end to a safety strap;

a latch member disposed within said housing and movable relative to said load member for engaging and restraining said tongue plate when said tongue plate is received in said buckle;

a manually-operated release button for movement toward and away from said load member; and

biasing means carried by said housing continuously urging said latch member into a latched position, whereby said tongue plate is longitudinally restrained by said latch member when received in said housing and released by said latch member upon operation of said release button, said through-load member including means for engaging and restraining said tongue plate against transverse and lateral movement when said tongue plate is received in said housing.

11. The buckle of claim 10 wherein said means for laterally restraining said tongue plate when said tongue plate is received in said housing comprises a pair of upturned ears mounted on said through-load member.

12. The buckle of claim 11 wherein said push button includes laterally extending pivot arms and said through-load member ears includes means for pivotally supporting said release button arms.

13. The buckle of claim 12 wherein said release button includes means extending toward said load member and in engagement with said latch member whereby pivotal movement of said release button moves said latch member from said latched position so as to release tongue plate.

14. The buckle of claim 10 wherein said release button is carried by said latch member for movement of said latch member from the latched position upon manual operation thereof so as to release said tongue plate.

15. The buckle of claim 14 wherein said latch member comprises a latch plate pivotally supported by said load member and including a catch portion for engaging and restraining said tongue plate against longitudinal movement when said tongue plate is received in said hosing, said latch plate including laterally spaced apart notches, said release button including a pair of laterally spaced apart downwardly depending pins fixedly received in said notches of said latch plate whereby manual depression of said release button effects pivotal movement of said latch plate so as to move said catch portion from the latch position so as to release said tongue plate.

16. The buckle of claim 10 wherein said housing comprises two parts, a base in which said load member and latch member and biasing member are received, and a cover having an aperture therein for access to said release button, said cover having retaining tabs engageable with tab receiving shoulders on said base; said biasing means, latch means including said release button, load member, and cover cooperating with said base for unidirectional assembly therein with said cover retaining tabs engaging said base shoulders so as to secure said biasing means, load member and latch member in said housing.

17. The buckle of claim 16 further defined by said housing base, housing cover and load member having registering apertures through which a safety strap is adapted to pass so as to connect said load member to the safety strap.

18. The buckle of claim 10 wherein said means for engaging and restraining said tongue plate against transverse and lateral movement when said tongue plate is received in said housing comprising at least one tab struck from said through-load member, said tab including a surface overlying and spaced from said load member for receiving the forward end of the tongue plate therebelow to prevent transverse movement of the tongue plate from planar contact with said through-load member.

* * * * *