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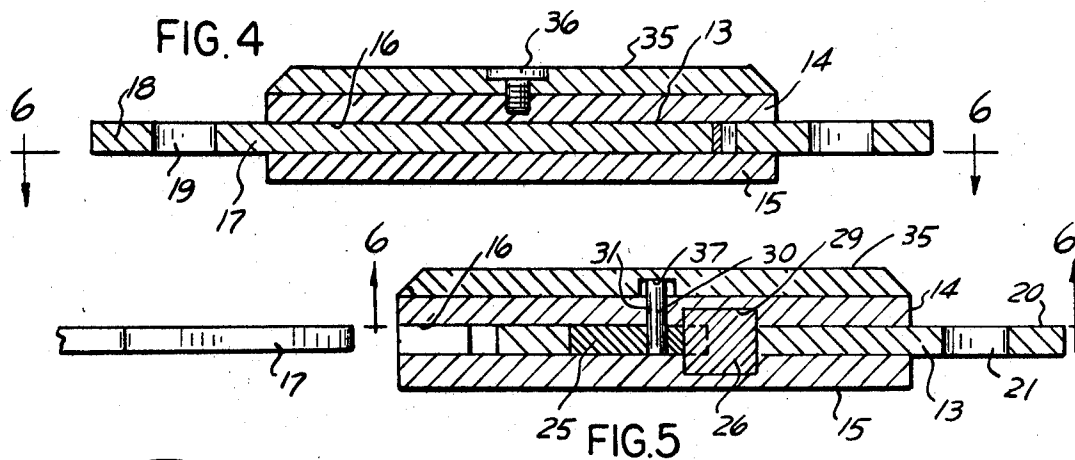
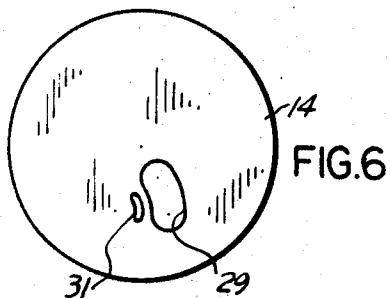
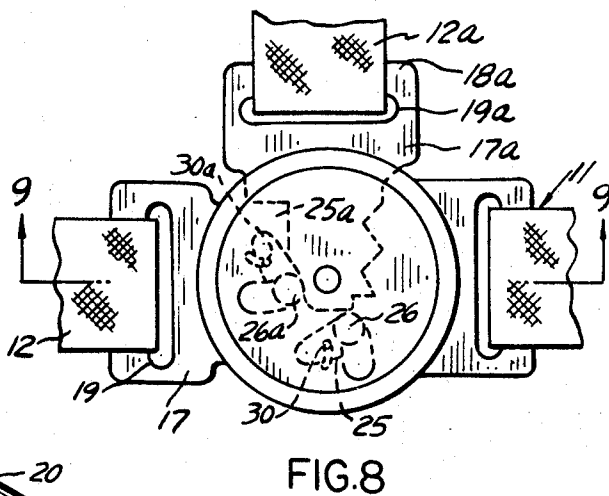
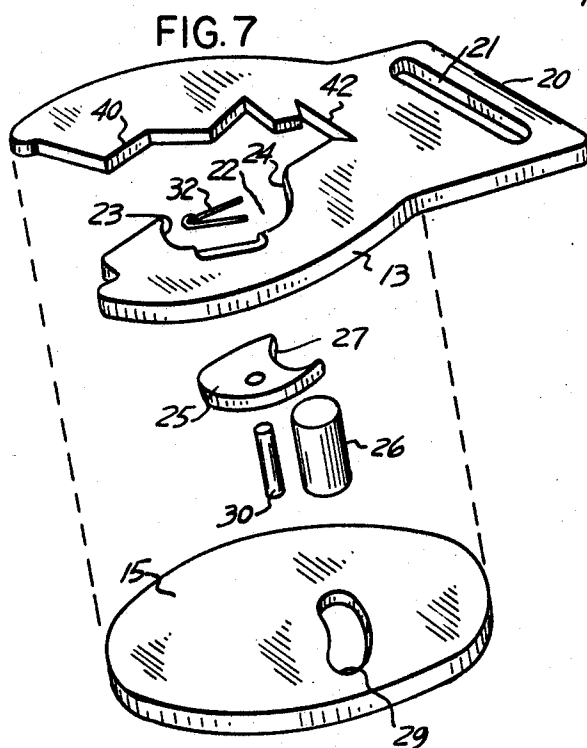
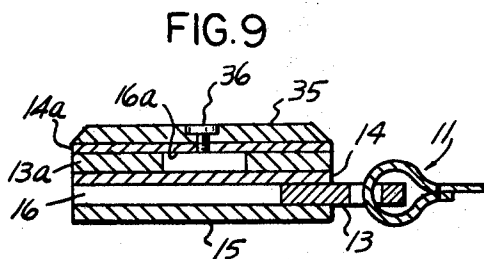
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SAFETY BELT BUCKLE

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SAFETY BELT BUCKLE

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11 Claims

ABSTRACT OF THE DISCLOSURE

A safety belt buckle having a pocket for slidably receiving a tongue having an anti-friction locking edge formed with an arcuate socket to receive a roller mounted upon a pivotable arm arranged within the buckle pocket for pivoting towards and away from the edge. The roller rolls into the socket for interlocking with the tongue and rolls out of the socket, upon manual movement of the arm, for disengaging the tongue. During interlock, the arm with the roller form a rigid strut to transmit forces between the tongue and the buckle, but may be rollingly released even when under load.

This application is a continuation-in-part of Ser. No. 699,463 filed Jan. 22, 1968, now abandoned.

BACKGROUND OF INVENTION

Seat belts or safety belts conventionally used in automotive vehicles, aircraft and the like, generally comprise a pair of belt halves, each having an end anchored to a firm support and an opposite end for interconnection by means of a releasable buckle. These buckles generally comprise a buckle portion containing a locking mechanism and an interengaging tongue portion.

In conventionally available buckles of this character, the locking mechanism is relatively large and cumbersome, thereby requiring relatively thick and large size buckles, particularly of a size to absorb the large loads which may be placed upon the belts. In addition, conventional seat belt buckles are usually opened or released by means of pressing a button or by lifting a cover plate, each of which mechanism is relatively easy to inadvertently release, but is difficult to deliberately release when the belt is under load.

Further, where both lap and shoulder straps are used, two conventional buckles are usually required.

SUMMARY OF INVENTION

Hence, it is an object of this invention to provide a relatively small size, thin, belt buckle, with a simple, inexpensive locking mechanism which is readily adaptable for release by means of a rotative movement, such as using a rotatable actuator cover, and which, by its internal configuration, is adapted to absorb considerably greater loads than conventional buckles, and is also relatively easy to deliberately release even when under load.

A further object of this invention is to form a releasable safety belt buckle out of simple, flat, stamped plates, with only a very few movable parts, adaptable for connection to either two or three belt ends.

Summarizing, the invention contemplates a buckle construction formed of a lamination of three metal plates, the central one being cut-out into a generally U-shape so as to form a tongue receiving pocket. The central plate is also notched to receive a pivoting arm which is loosely arranged to pivot into and out of the pocket and loosely carries and guides a simple cylindrically shaped roller which interengages with a socket formed on a tongue portion of the buckle. Since the arm moves in the plane of

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the central plate, its movement may be controlled by a pin extending outwardly through the upper plate and the pin may be moved by a circular movement, such as by a flat circularly turned control plate, although it is also possible to control the pin by means of a push button or slider if necessary or desired.

In addition, by adding two more plates, one of which duplicates the above mentioned U-shaped plate, and arm and roller, a second tongue receiving pocket is provided so that a single buckle may be used for both lap and shoulder belts.

The roller, arm, notch and plate configuration, permits the structure to accommodate large loads, as well as eliminates binding so that the buckle may be easily released when under load.

These and other objects and advantages of this invention will become apparent upon reading the following description, of which the attached drawings become a part.

DESCRIPTION OF DRAWINGS

FIG. 1 is a plan view of the buckle and end portions of a belt secured thereto.

FIG. 2 is an enlarged plan view of the buckle with the upper plate removed, showing the interengagement between the releasable tongue and the locking mechanism.

FIG. 3 is a view similar to FIG. 2, but showing the tongue being removed.

FIG. 4 is a cross-sectional view taken in the direction of arrows 4—4 of FIG. 2, but showing the complete buckle including the upper plates.

FIG. 5 is a cross-sectional view taken in the direction of arrows 5—5 of FIG. 3.

FIG. 6 is a plan view, to the scale of FIG. 1, of the inner or bottom face of the upper plate, taken in the direction of arrows 6—6 of FIG. 5.

FIG. 7 is a perspective, exploded view of parts of the buckle.

FIG. 8 is a plan view, similar to FIG. 2, showing a modification adapted to receive two tongues.

FIG. 9 is a cross-sectional view, with tongues removed, of the buckle of FIG. 8, taken in the direction of arrows 9—9 of FIG. 8.

DETAILED DESCRIPTION

FIG. 1 illustrates a buckle 10 to which are connected the ends 11 and 12 of a safety or seat or lap belt of the type used in automotive vehicles or aircraft. The buckle functions to releasably interconnect the opposite ends of the belt, the belt being of a conventional web or similar construction.

The buckle comprises a roughly U-shaped, central plate 13 (see FIG. 2) and an upper cover plate 14 and lower cover plate 15 (see FIG. 4) secured to the central plate as by means of rivets, screws or welding (not shown), to thereby form a forwardly opening, flat pocket 16. A flat tongue plate 17 is arranged to removably fit within said pocket, with the tongue plate having an integral belt connecting tab portion 18 provided with a slot 19 through which the belt end 12 may be fastened in any conventional way. Likewise, a belt connecting tab 20 is formed on the central plate 13 and it too is provided with a slot 21 for receiving and connecting to the belt end 11.

An inwardly opening, forwardly and rearwardly extending notch 22 is formed on one leg of the U of plate 13 (see FIGS. 1, 2 and 7), with the forward end of the notch forming an arcuate or concavely curved seat 23, formed as a segment of the arc of a circle. The opposite or rear end of the notch is similarly formed as a circularly curved seat 24, but of larger size than the seat 23.

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Fitted within the notch is an arm plate 25 whose forward end is complementarily shaped to fit closely within the forward seat 23 for pivoting relative to the seat without positive connection to the plate.

The rear end of the arm plate engages a roller 26 in its roller receiving concave curved end 27. About one-half of the circumference of the roller fits within the curved end 27 and the roller, which is cylindrically shaped and axially perpendicular to the plane of the plates, closely fits within the rear seat 24 of the notch for rolling movement into the pocket and into a correspondingly circularly curved roller receiving socket 28 on the tongue 17.

Arcuate grooves 29 are formed in the upper and lower plates (see FIG. 6, for example) to receive the upper and lower end portions of the roller and to closely guide the roller. As can be seen, the roller is closely fitted, yet relatively loose as it is not pinned or permanently connected to its adjacent elements and this is also true of the arm.

A control pin 30 is connected to the arm 25 and extends upwardly through a curved pin slot 31 in the upper plate.

The arm 25 is normally biased inwardly (as in FIG. 2) by means of a suitable spring 32 fitted within a rabbeted edge 33 in the notch 22. It is contemplated that the same spring effect may be obtained by a suitable spring engaging the control pin 30, rather than the arm directly.

The upper plate 14 is covered with a circular actuator plate 35 fastened in place by a suitable pivoting type fastener 36. The upper end of the control pin 30 is loosely fitted into an oversized opening 37 formed in the bottom of the actuator plate so that rotation of the plate, after a small amount of play, moves the pin 30, which in turn moves the arm 25 and the roller 26 inwardly of the notch 22, to disengage from the socket 28 in the tongue 17.

The opposite edge of the tongue 17 is formed in a sawtooth edge configuration 39 with a complementary sawtooth edge 40 formed on the opposite internal edge of the plate 13, and suitably inclined complementary leading edges 41 are formed on the tongue and U-shaped plate. Thus, as illustrated in FIG. 3, releasing the tongue from the pocket requires some slight movement of the tongue towards the notched edge of the plate 13. During interengagement of the two parts, as shown in FIG. 2, the sawtoothed edges cooperate to absorb and handle considerable loads.

The sawtooth edges may be omitted and instead the two opposite edges of the tongue may be each formed with sockets 28, so that the tongue may be inserted into the pocket reversibly.

A rear end groove 42 is formed in the plate 13 to carry a leaf type, or other suitable type, of spring 43 which normally exerts a pressure upon the adjacent end of the tongue 17 tending to push the tongue backwards out of the pocket, and placing the roller and arm in compression.

OPERATION

In operation, the belt ends 11 and 12 are secured to the buckle plate 13 and tongue plate 17 respectively. For interengaging and connecting the two belt ends, the tongue 17 is slid into the pocket 16 until its leading end engages the spring 43 and its socket 28 receives the roller 26. The socketed edge of the tongue acts as an anti-friction surface upon which the roller rolls just before and until rolling into the socket. The roller is now gripped between the opposing edges of the socket and curved end 27 of the arm plate 25.

At this point, any lateral loads placed upon the belt, including heavy loads due to an accident, are transmitted through the roller 26, the arm 25 and into the seat 23 and then the plate 13. Thus, the roller and arm together act as a strut arranged at an acute angle to the edge of the tongue for carrying load and for preventing release

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of the tongue until the arm is moved away from the tongue. In addition, a portion of the load is carried by the sawtooth configuration and by the upper and lower plates. Thus, despite the small size and relative thinness of the plates, unusually high loads can be carried by this construction.

To release the tongue, the control pin 30 is moved by simply rotating the actuator plate 35 a small amount, thereby moving the arm 25 and guiding the roller, which rolls as it moves out of the socket and into its seat 24. At the same time, the tongue is moved slightly to disengage the sawtooth configuration and then it is pulled out of the pocket.

A simple latch construction or a push-type button or lever construction may be utilized to actuate the control pin 30, if desired, but to reduce the possibility of inadvertent release the rotative type of actuator is preferable.

As can be seen, the buckle comprises four simple stamped plates which may have the grooves and openings, etc., formed therein through a stamping operation. The arm being loose relative to the plates, as is the roller, it is easily assembled and is inexpensive in construction.

MODIFICATION

FIGS. 8 and 9 illustrate a modification for releasably fastening two belt ends to a third belt end. For example, it may be used for fastening a shoulder strap or belt and lap belt of an automotive type safety harness.

The construction is identical to that described above except for the addition of a second U-shaped plate 13a, a second top plate 14a, with a second roller 26a, arm 25a, pin 30a, etc. The additional belt end 12a, such as a shoulder strap, is provided with a tongue 17a, having a tab 18a with fastening slot 19a, the tongue being otherwise identical to the first tongue 17.

With this construction, both tongues 17 and 17a may be fastened into their respective pockets 16 and 16a, and simultaneously released by rotating the actuator plate 35.

This invention may be further developed within the scope of the following claims. Accordingly, it is desired that the foregoing description be read as being merely illustrative of an operative embodiment of this invention, and not in a strictly limited sense.

Having fully described an operative embodiment of this invention, I now claim:

1. A safety belt buckle comprising an approximately U-shaped, flat, central plate, covered by an upper and a lower plate, with the U opening in a forward direction for thereby forming a flat, tongue receiving pocket;

an internal notch formed on one side of the U and opening inwardly thereof, the notch being elongated and having its forward and rear ends each shaped as a concave segment of a circular arc to form a forward and a rear seat;

a flat arm plate, arranged in the notch and the plane of the central plate, and having a forward end shaped complementary to and fitted within said forward seat for pivoting in its own plane;

a cylindrically shaped roller arranged perpendicular to the plates and fitted within the rear seat of the notch, with the rear end of the arm plate formed with a curved socket to closely receive approximately one-half of the roller circumference and to hold the roller against said rear seat, the roller being free of positive securement to said plates for free rotation about its own axis;

said upper and lower plates each having an arcuately shaped guide groove aligned with and closely receiving the opposite end portions of the roller, wherein the arm plate may pivot relative to the forward seat, outwardly of the notch towards the center of the U, and the roller correspondingly may roll about its axis and move generally inwardly of the U;

a pin connected to the arm plate and extending inwardly through an elongated slot in the upper plate,

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so that movement of the pin, in a plane parallel to the plates, correspondingly moves the arm plate and roller;

a flat tongue shaped to closely fit within said pocket and having a concavely curved socket formed along an edge thereof in alignment with the rear seat of the notch to closely receive the roller, wherein inward movement of the roller into the socket locks the tongue against withdrawal and positions the arm in a rearwardly-inwardly sloping position relative to the central axis of the tongue and the central plate for transmitting loads through the roller, the arm and into the forward seat;

and means for fastening the ends of belts to the tongue and to the central plate for thereby releasably interconnecting said belt ends.

2. A buckle as defined in claim 1, and including spring means normally spring biasing the arm plate inwardly of the U.

3. A buckle as defined in claim 1 and including a circular actuator plate secured to and above the upper plate for rotation about its central axis;

said pin having its upper end engaged to the actuator plate and thereby being movable by rotation of the actuator plate for moving the arm plate and thereby moving the roller out of the tongue socket to release the tongue.

4. A buckle as defined in claim 1, and with the opposite edge of the tongue and the adjacent edge of the U being formed into a complementary, interfitted, sawtooth configuration;

said pocket being enough wider than the tongue so that the tongue may be moved towards said notch sufficiently for disengaging the sawteeth, when the roller is disengaged from the tongue socket for thereby permitting removal of the tongue from the pocket.

5. A buckle as defined in claim 4, and including a spring arranged in the rear end of the pocket for spring pressing against the adjacent end of the tongue and normally tending to push the tongue in a direction outwardly of said pocket, thereby placing the roller and arm under compression when the tongue is arranged in the pocket.

6. A construction as defined in claim 1, and including a second U-shaped plate, identical to the first, arranged upon the upper plate and opening at right angles to the first U-shaped plate and covered by a second upper plate to form a second tongue receiving pocket;

and a second roller and arm, identical to the first mentioned roller and arm, fitted in the second U-shaped plate to receive a second tongue identical to the first mentioned tongue;

and a second pin connected to the second arm and extending upwardly through a slot in the second upper plate, and means for simultaneously moving both pins to move both rollers for releasing both tongues.

7. A releasable locking mechanism, comprising: an element having an anti-friction edge to be locked, having a socket formed in said edge;

a locking arm having an end pivotally engaged with a support means and having a roller arranged upon its opposite end for rolling about an axis arranged parallel to the axis of pivoting;

said socket being curved into an arc complementary to said roller, and the roller being formed to roll into, fit within and releasably engage with the margin defining said socket;

guide means for guiding the movement of and holding said edge adjacent to the locking arm for rolling con-

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tact between the roller and edge and for rolling receipt of said roller into said socket;

means for pivotally biasing the arm towards said edge, and manually operable means for pivotally moving the arm away from said edge for rolling release of the roller from said socket;

said arm being positioned at an acute angle relative to said edge, during engagement of the roller within said socket for transmission of forces imposed upon said element laterally of said edge through the roller and arm to the pivotal engagement of the arm and then to the support means, for thereby locking said element to said support means.

8. A locking mechanism as defined in claim 7, and said arm having an arcuately curved portion against which the roller is abutted so that the roller during locking engagement with the socket, is gripped between said arm arcuately curved portion and the socket curved arc and the roller may roll therebetween for disengagement from the socket.

9. A locking mechanism as defined in claim 7, and including a belt portion end fastened to said element and a second belt portion end fastened to said support means for thereby releasably interlocking the two belt portion ends and holding them together under applied loads and for manually disengaging them when desired even under applied loads.

10. In a latching interlock for a vehicle restraint system, the combination comprising:

an element to be latched having an anti-friction surface with a socket formed therein;

a mating interlock surface having a roller formed thereon for rolling engagement with said anti-friction surface as said surfaces move in one direction relative to and adjacent to each other for interlocking engagement until the roller aligns with said socket, and means for rollingly moving the roller into said socket for interlocking the two surfaces;

with applied forces lateral of said surfaces and tending to relatively move the surfaces in an opposite direction for disengaging the two surfaces being transmitted from and to the surfaces through said roller; means for applying a force to one of said surfaces in a direction transverse to said applied lateral forces for rollingly disengaging the roller from said socket and thereby releasing the interlock between the surfaces.

11. A construction as defined in claim 10, and said mating interlock surface having an arcuately curved roller seat formed thereon against which said roller abuts, with the socket having a corresponding arcuately curved roller seat against which the roller abuts during engagement with said socket, for thereby forming rolling contacts with the roller during movement of the roller into and out of the socket.

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