June 14, 1966 J. R. HOLLINS 3,255,502

QUICK RELEASE BUCKLE

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Fig. 1.

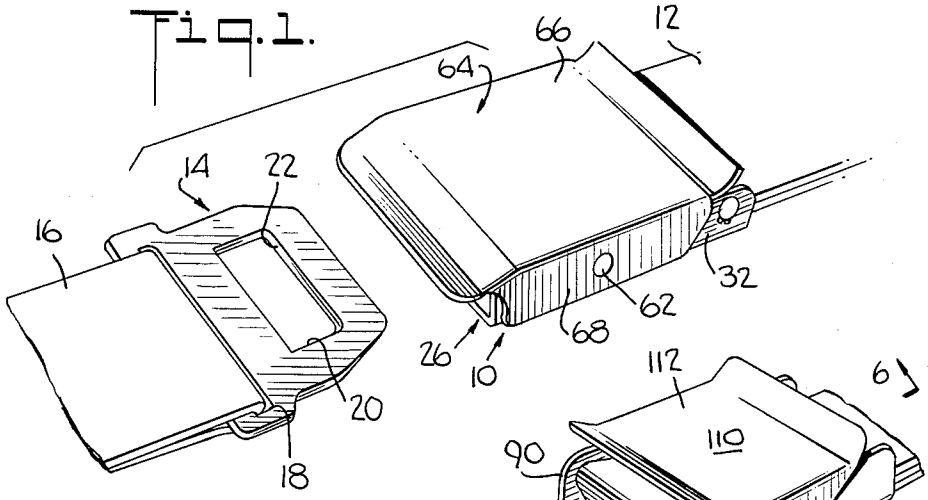


Fig. 5.

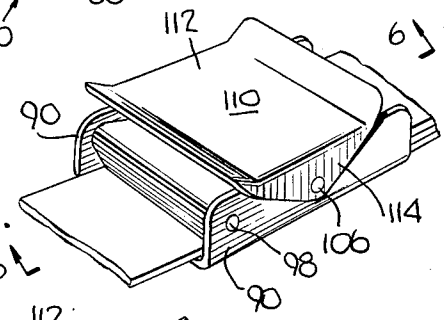


Fig. 6.

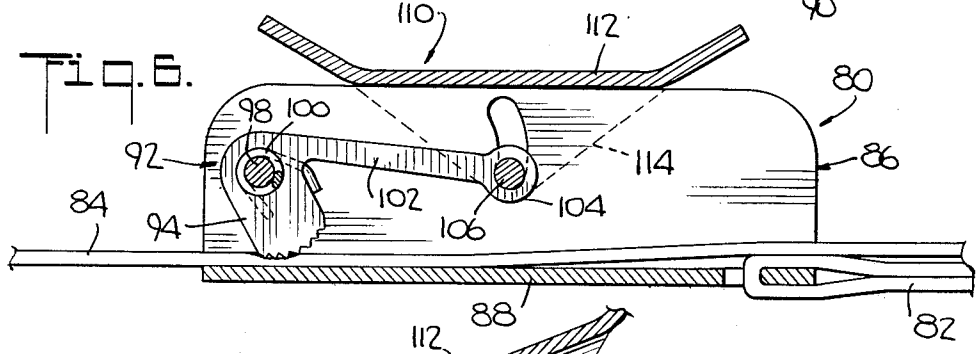
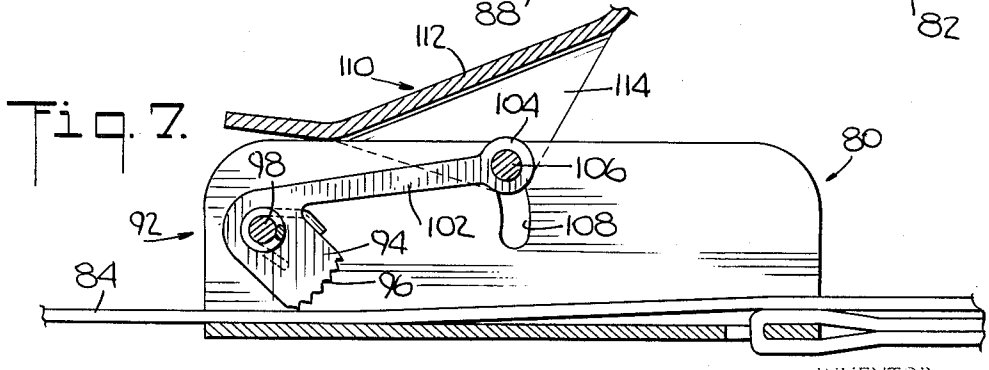


Fig. 7.



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QUICK RELEASE BUCKLE

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Fig. 2.

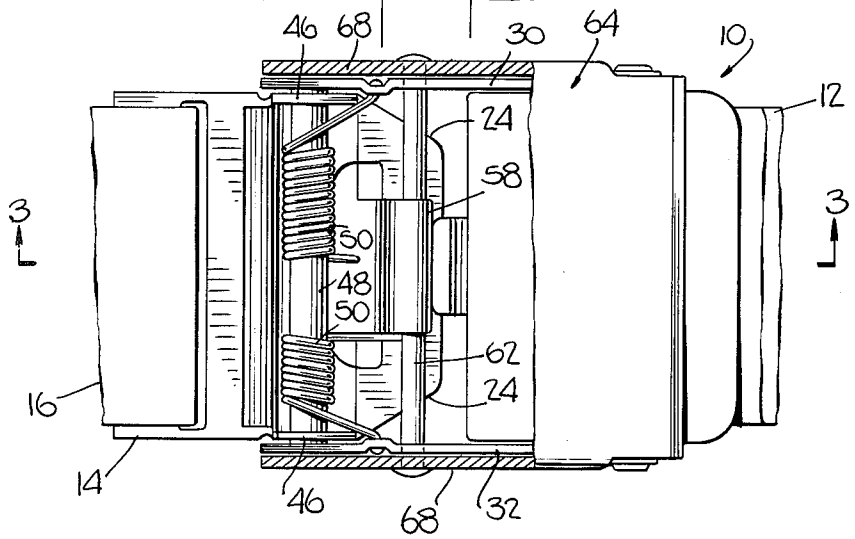
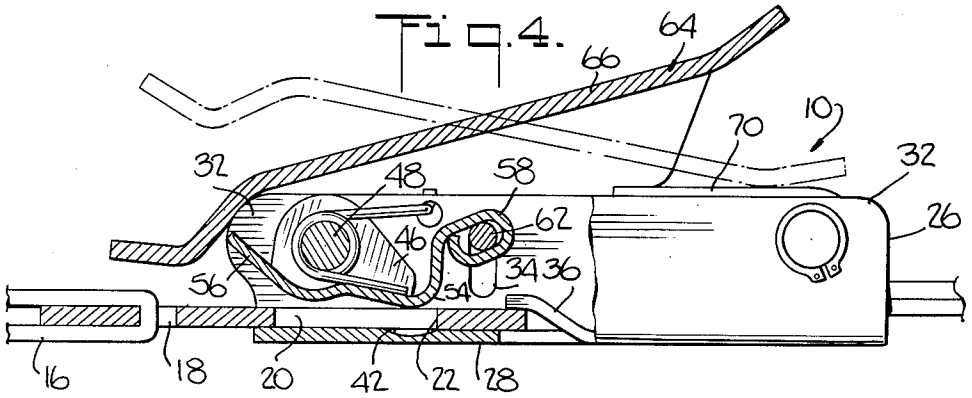


Fig. 4.



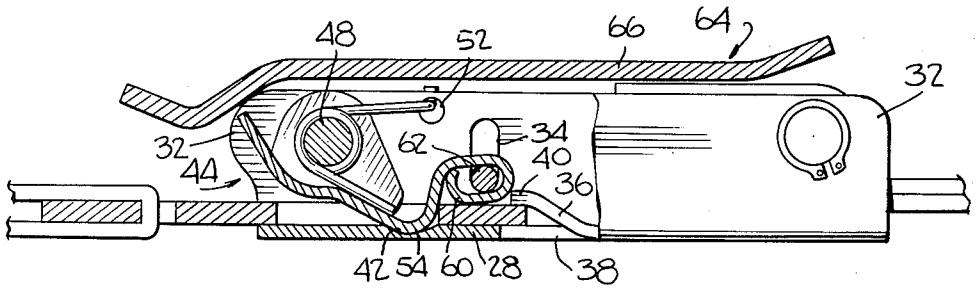


Fig. 3.

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United States Patent Office 3,255,502 Patented June 14, 1966

3,255,502

QUICK RELEASE BUCKLE

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4 Claims. (Cl. 24—191)

This invention relates to a quick release buckle for a safety strap.

More particularly, my invention pertains to a buckle of the character described, which is adapted to be used in conjunction with a seat belt and a harness web. The buckle, which is carried by the free end of one strap, is characterized by its ability to quickly and easily form a readily releasable engagement with an opposed strap. An end of each strap is anchored to a frame of a moving conveyance, such as, for instance, an automobile, a boat or an airplane. Safety straps of the aforesaid character are well known, as are buckles for releasably interengaging them.

In general, such buckles may be subdivided into two categories differentiated by their retainer members, both of which buckles, as later will be seen, are benefited by the use of my invention.

One ofthese categories is designed to be used with a metal tongue plate at the tip of the opposed strap, and a buckle in this category is provided with a latch-type retainer member. The tongue plate is formed with an opening, and the latch is designed to be biased transversely into said opening so as to block retracting movement thereof after coupling of the plate and buckle, unless, of course, the latch is deliberately withdrawn from the opening by the actuation of a release member at such times as the buckle and plate are intended to be disengaged.

The other category of buckles is distinguished by direct engagement between a retainer member and any intermediate portion of the opposed strap. A buckle of this latter category employs a roughened eccentric retainer member which is designed to swing into pinching, i.e. wedging, engagement with any intermediate portion of the opposed strap, being biased into such engagement and being shifted away from the strap upon uncoupling manipulation of the release member.

Customarily, in both categories of buckles and straps, the retainer member, whether it be the latch or the eccentric, is pivoted to a support frame adjacent one of its ends and is spring-loaded to a position in which it is coupled with the opposed strap either intermediate the ends of the opposed strap or with a tongue plate at the tip of the opposed strap.

One of the primary purposes of a safety strap or harness is to prevent a person from hurtling forward when a conveyance is abruptly stopped, for example in an accident. However, events do not progress in a determinable fashion at these times. Due to unforeseen circumstances it is not possible to predict the prevailing factors under which someone will desire to actuate the release member after an accident in order to free the person restrained by the buckle and strap. In a standard buckle of either category, the release member is actuated by pulling the free end thereof remote from the pivoted end. As noted heretofore, this action lifts the retainer member away from the tongue plate or opposed strap. Such free end of the release member might be at either the right or left side of the buckle and under ordinary circumstances is extremely simple to actuate. However, after an accident the person held by the strap or the rescuer who arrives upon the scene may find that the free end of the release member is inaccessible or blocked, or that the only access to the free end is by a hand improperly placed to lift that end. In such event, the person restrained by the strap will be held captive unless the strap is cut or other emergency measures can be taken. This can be dangeraus and trying to the trapped person, and might be fatal, as for example if the conveyance is about to burst into flames. The person might be in a physical condition sufficiently good to escape from the conveyance, but be held back by his inability to actuate the release member, for instance if a structural element presses the free end of the release member against his body.

It is an object of my invention to provide an improved quick release buckle for a safety strap which avoids the foregoing drawback.

It is another object of my invention to provide a buckle of the character described which can be manipulated by raising either end of the release member and thereby will avoid the possibility of accidentally trapping a person through constraint of the manipulating end of the release member.

It is another object of my invention to provide a buckle of the character described wherein the improved attributes of the buckle are secured through small physical changes in the mechanical components thereof so that although a considerable additional safety factor is provided the cost of manufacturing and maintaining the buckle and the structural complexity of the buckle are only slightly increased.

It is another object of my invention to provide a buckle of the character described which constitutes relatively few and simple parts, is easy to manufacture and can be operated without any previous instructions by persons having little mechanical skill.

Other objects of my invention in part will be obvious, and in part will be pointed out hereinafter.

My invention, accordingly, consists in the features of construction, combinations of elements and arrangements of parts which will be exemplified in the buckles hereinafter described and of which the scope of application will be indicated in appended drawings.

In the accompanying drawings in which are shown various possible embodiments of my invention,

FIG. 1 is a perspective view of a quick release buckle and of an associated tongue plate, both the buckle and tongue plate being shown at the free ends of a pair of opposed straps designed to be interengageably coupled;

FIG. 2 is a top plan partly broken-away view of the coupled buckle and tongue plate;

FIG. 3 is a side view of a coupled buckle and tongue plate, the same being shown partially in section taken along the line 3—3 indicated in FIG. 2;

FIG. 4 is a view similar to FIG. 3, but in full lines illustrating the position of the release member when lifted at one end so as to shift the retainer member to its open state, and in broken lines illustrating the position of the release member when lifted at its other end so as to likewise shift the retainer member to its open state;

FIG. 5 is a perspective view of a coupled strap and buckle of another type which incorporates a modified form of my invention;

FIG. 6 is a sectional view taken substantially along the line 6—6 of FIG. 5 and illustrating the buckle in its closed state; and

FIG. 7 is a view similar to FIG. 6, but showing the buckle with one end of its release member lifted so as to shift the retainer to its open state.

In general, I accomplish the several objects of my invention by providing a buckle which includes a supporting frame of channel shape. The frame has a base, to wit, the base of the channel. Mounted on the frame is a retainer member which in one type of buckle is a latch and in the other a roughened eccentric. The mounting of the retainer member is such that said retainer member can be moved toward and away from the base.

When the retainer member is a latch the mounting usually is so arranged that the latch moves in a direction generally perpendicular to the base so that it can move with ease into or out of an opening in a tongue plate. When the retainer member is a roughened eccentric, the mounting usually consists of a pivot or the like near the eccentric so that the high part of the eccentric can swing into pinching engagement with an intermediate part of the opposed strap, or swing out of such engagement when the opposed strap is to be released.

Customarily, this buckle also includes a release member which heretofore has been pivoted at one end only and, therefore, has had only one free end that could be manipulated to release the buckle from a strap or tonque plate. Where the retainer member was an eccentric, the release member ordinarily was integral therewith. Where the retainer member was a latch, the release member either was integral with the latch or was a separate element which was pivoted to the frame and which mechanically interengaged the retainer member in a fashion such that when the free end of the release member was lifted, the retainer member was disengaged from the tongue plate.

In a conventional buckle and in the buckle of my invention, a spring is included to bias the retainer member to its closed or locked position, and such biasing spring likewise urges the release member to a position corresponding to the locked state of the buckle.

Pursuant to my invention the release member is pivotally connected to the retainer member at a region intermediate the ends of the release member, and, moreover, the release member is disposed to overlie the supporting frame with its ends in proximity to the frame. As a result, the release member is doubly fulcrumed with respect to the frame, that is to say, is provided with two alternately selectively effective fulcrums, one or the other of which will be rendered operable depending upon the mode of manipulation of the release member. Mor particularly, when one end (and this may be either end) of the release member is moved away from the frame, the other end of the release member will, if it is already not in engagement with the frame, be brought to bear against the frame and the area of bearing engagement serves as a fulcrum for the release member. It thus will be appreciated that insofar as the connection between the release member and the retainer member is concerned, the release member is mounted as a first class lever with the fulcrum intermediate its ends; but insofar as the relationship of the release member with the frame is concerned, the release member is mounted as a second class lever with the effort being applied at the end (either end) being moved away from the frame, with the fulcrum being located at the zone of bearing engagement between the other end of the release member and the frame, and with the load constituting the pivotal connection to the retainer member which connection is located between the ends of the release member.

As indicated previously, due to the described construction, either end of the release member is arranged to selectively engage the frame and such zone of engagement will constitute the fulcrum, so that the release member is able to act as a second class lever in two modes, one being when one end thereof is lifted and the other end acts as a fulcrum, and the other being when the other end is lifted and the one end acts as a fulcrum. Regardless which mode of operation is performed, the connection between the release member and the retainer member is identically effected to lift the retainer member and thereby release the opposed strap or the tongue plate.

Referring now in detail to the drawings, and more particularly to FIGS. 1 through 4, the reference numeral **10** denotes a buckle embodying my invention and attached to the free end of a safety strap **12**. Said buckle is designed to be coupled with a metal tongue plate **14** secured to the free end of the opposed safety strap **16**. The

other ends of the straps **12**, **16** are anchored to stationary parts of a conveyance in any conventional manner. Suitable adjustment means (not shown in detail) may be provided to vary the effective length between the anchored ends of the straps **12**, **16** when coupled. Such adjustment means may be included only in conjunction with the buckle, a typical such means being illustrated by way of example in U.S.L.P. No. 2,972,173 granted on February 21, 1961.

A conventional metal tongue plate **14** has been illustrated by way of example. This tongue plate constitutes a flat rigid sheet metal body formed with a narrow transversely elongated opening **18** through which the strap **16** is threaded and with a latch opening **20** located near the tip of the plate **14**. The configuration of the latch opening is a matter of commercial design; however said opening must be sufficiently large to admit the latch-type retainer member hereinafter to be described and preferably has a leading edge **22** which is perpendicular to the length of the strap **16**. For ease of admission of the tongue plate **14** into the buckle **12** the side edges of said plate adjacent the tip thereof converge forwardly as indicated at **24** (see FIG. 2).

The buckle **10** includes a supporting frame **26** of rigid construction formed for example from heavy sheet metal. Said frame as illustrated is in the shape of a channel with a base **28** and upstanding side walls **30**, **32**. Conveniently the side walls are parallel and coextensive. For reasons which later will be apparent the side walls are provided with registered aligned vertically extending slots **34**, one such slot being located in each wall and the slots being disposed approximately at the middle of the end-to-end length of the buckle. Actually the slots are somewhat forward of the middle of the frame, being disposed at the middle of a release member which hereinafter will be described in detail.

The base of the frame is formed with a centrally located upwardly offset leg **36** which may be struck up from the base to leave an aperture **38**. The offset leg includes a tip **40** that is parallel to the base **28** and an intermediate sloping shank which extends from the base to the tip in a direction toward the mouth of the buckle, this being the end designed to admit the tongue plate. The distance from the under surface of the tip **40** to the upper surface of the base **28** is slightly in excess of the thickness of the tongue plate so that the tip of the tongue plate can be inserted under the tip of the leg **36**. The location of the offset leg is governed by the location the tongue plate is to occupy in fully coupled position when it is engaged by a latch-type retainer member soon to be described. At such time the tip of the tongue lies under the tip of the offset leg.

The upper surface of the base of the supporting frame is fashioned with a depression **42** which is located immediately in back of the leading edge **22** of the latch opening **20** when the tongue plate is in fully coupled position.

The retainer member for the buckle **10** now being described is of a latch type and specifically constitutes a latch **44** fabricated from a rigid material such as heavy sheet metal. At both side edges thereof the latch includes a pair of registered upstanding ears **46** that are perforated to rotatably pass the ends of a shaft **48** extending transversely across the frame near the mouth end of the buckle.

A pair of helical torsion springs **50** are wrapped about the shaft **48**. Each spring has one end anchored in an opening **52** in a side wall **30** or **32** of the supporting frame and the other end bearing against the top of the latch **44** on such side of the shaft **48** as to urge downwardly the end of the latch remote from the mouth of the buckle.

The latch is fashioned to include a latching corner **54** which is located immediately above the leading edge **22** of the latch opening in the tongue plate when the tongue plate is fully thrust into the buckle with its tip beneath

the tip **40** of the offset leg and with further insertion prevented by the angled orientation of the shank of said leg. In this position the latching corner **54** snaps in back of the leading edge of the latch opening as shown in FIG. 3 and prevents the latch opening from being accidentally withdrawn from the buckle. The springs **50** maintain the latching corner in such locked position. Attention is called to the fact that in the aforesaid locked position the latching corner drops below the plane of the tongue plate into the depression **42** thereby inhibiting forced disengagement of the tongue plate when the straps **12, 16** are heavily or suddenly stressed.

The latch further includes an upwardly sloped conventional deflecting surface **56** at the mouth of the buckle. This surface will cam the entering end of the tongue plate into its proper position under the latch and the shaft, toward the latching corner and beneath the tip **40** of the offset leg **36**.

The end of the latch **44** remote from the mouth of the buckle is provided with a finger **58** having a curled under end **60** designed to receive a transverse pin **62** the opposite ends of which are freely slidable in the guide slots **34**. Said ends of the transverse pin protrude beyond the guide slots for reasons that soon will be apparent. It will be quite obvious that if the transverse pin is lifted away from the base of the supporting frame the latching corner **54** will be raised out of the latching opening **20** and will permit the metal tongue plate to become disengaged from the buckle. Absent such movement of the transverse pin the tongue plate will remain coupled to the buckle.

The buckle also includes a release member **64**, the mounting and arrangement of which is the principal subject of this invention. Said release member is conveniently in the shape of an inverted channel and is made of rigid construction being fabricated for example from heavy sheet metal by a forming operation to include a top wall **66** and dependent side walls **68**. The release member overlies the supporting frame and is of approximately the same length. The side walls of the release member overlie the outer surfaces of the side walls **30, 32** of the supporting frame. The end of the top wall **66** adjacent the mouth of the buckle is upwardly inclined and protrudes beyond the side walls **68** and beyond the underlying portion of the suporting frame so that it may readily be grasped by the fingers of a user whereby the release member may be easily manipulated by placing the tips of a person's fingers beneath this end of the top wall and lifting the same. The other end of the top wall **66** likewise may extend beyond the side walls **68** and be upwardly inclined so as to have its under surface accessible for engagement by the tips of a user's fingers.

The side walls **68** are pierced in registry to rotatably receive the ends of the transverse pin **62** which are captively held thereto as by heading.

It will be observed (see FIG. 3) that the top wall of the release member in idle position overlies and is in proximity to the supporting frame **26**, being specifically disposed in proximity to the upper edges of the side walls **30, 32** of said frame adjacent the opposite ends of the buckle and, in particular, on opposite sides of the transverse pin **62**.

It is believed that the operation of the buckle is obvious from the preceding general and detailed descriptions of my invention; nevertheless, for the sake of completeness, such operation is set forth below.

To couple the tongue plate to the buckle, said plate simply is introduced into the mouth of the idle buckle. In such idle position, the top wall of the release member is approximately parallel to the base **28** and to the upper edges of the side walls **30, 32** of the supporting frame. Said top wall of the release member is close to the supporting frame over the lengths of said member and the frame. This idle position of the buckle is as illustrated in FIG. 3 except of course that the tongue plate at this time is not within the buckle. Likewise in such idle position the transverse pin is in its lowermost location and the latch is biased by the torsion springs **50** in a clockwise direction as shown in FIGS. 3 and 4 until the latching corner is close to or against the base of the supporting frame and is within the depression **42**. Movement of the latching member in such a closing direction is limited either by abutment of the latching corner against the base of the supporting frame or by abutment of the transverse pin against the bottoms of the slots **34**. As the tip of the tongue plate is pushed into the mouth of the buckle, the deflecting surface **56** prevents the plate from entering between the mouth end of the latch and the under surface of the top wall of the release member and directs the tongue plate under the shaft **48** and beneath the latching corner.

The introduction of the tongue plate swings the latch **44** upwardly about the shaft **48** against the action of the springs **50** sufficiently to allow the tongue to pass beneath the latching corner and enter into the space between the tip **40** of the offset leg and base **28** whereupon further insertion of the tongue plate is prevented. At or shortly before the time that the tongue plate reaches its maximum depth of insertion into the buckle, the latching corner **54** will clear the leading edge **22** of the latch opening and drop into the latch opening. The latching corner will fall beneath the level of the tongue plate due to the provision of the depression **42** and thereby prevents the tongue plate from slipping out when the straps are heavily stressed. At this time the parts are in the coupled position shown in FIG. 3 and the tongue plate can only be withdrawn by first actuating the release member.

It will be observed that the release member is pivotally connected to the end of the latch (retainer member) remote from the mouth of the buckle and at a zone between the ends of the release member.

In order to uncouple the buckle from the tongue plate either end of the release member, and specifically an end of the top wall **66** thereof, is lifted. Initially, if the top wall is not in contact with the supporting frame the end of the release member opposite from the end which is lifted will swing about the pin **62** down into engagement with the supporting frame. Further lifting movement will fulcrum the release member about the end thereof which is in engagement with the supporting frame and cause the center of the release member to swing upwardly about such fulcrum. This swinging action lifts the transverse pin **62** and correspondingly lifts the latch **44** so as to raise the latching corner **54** clear of the latch opening **20** so that the tongue plate can be withdrawn from the buckle.

The lifted position of the release member where the right hand end (as viewed in the various figures) is raised is shown in full lines in FIG. 4. The fulcrum interengagement between the release member and the supporting frame is at the left hand side where the pivotal engagement between said release member and supporting frame is clearly shown. In dot-and-dash lines on the same FIG. 4 I have shown the action which takes place when the left hand end of the release member is lifted. At this time the right hand end of the release member bears against the supporting frame or a member operatively integral therewith, in this instance a plate **70** that forms part of the adjustable connection between the strap **12** and the buckle **10**, so that such point of interengagement provides a fulcrum for the release member. Thereby this action of lifting the left hand end of the release member again raises the transverse pin **62** and causes the latching corner to clear the tongue plate.

It thus will be apparent that the lifting of either end of the release member will raise the retainer member to uncoupled position and free the tongue plate. Due to this arrangement if either end of the release member should be pinned against the buckle as the aftermath of an accident or if only one end of the release member should be accessible or in a position where it can only be

manipulated by one hand of the trapped person or of a person at the scene of the accident, the free or available end can be lifted to immediately release the safety strap.

In FIGS. 5 through 7 I have illustrated another embodiment of my invention in which the double alternately selectively effective fulcrum principle for the release member is applied to a buckle that utilizes an eccentric for wedging engagement with the opposed strap. In these figures the reference numeral **80** denotes a buckle embodying my invention which is attached to the free end of a strap **82** the other end of which is anchored. Said buckle is designed to cooperate with an opposed strap **84** intermediate the ends thereof, the remote end of said opposed strap likewise being anchored.

The buckle **80** is of the type including a wedging, i.e., pinching, retainer member. Said buckle includes a supporting frame **86** of rigid material made, for example, by die-casting or forging from metal so as to include a base **88** and side walls **90**.

Secured to the supporting frame is a retainer member **92** constituting a cam, i.e., an eccentric **94**, which is transversely ribbed as at **96**. The eccentric is rotatably mounted on a transverse shaft **98** the opposite ends of which are fast in side walls **90**. A torsion spring **100** has one end anchored to a side wall **90** and the other end arranged to bias the eccentric **94** in a clockwise direction as viewed in FIGS. 5–7. Thereby if an intermediate portion of the opposed strap is, as shown in FIG. 6, located between the eccentric and the base **88** the spring will force the eccentric into pinching, i.e., wedging, engagement with the intermediate portion of the strap so as to couple the strap to the buckle.

The retainer member **92** has an arm **102** in one piece with the eccentric **94** and extending within the supporting frame from the shaft **98** toward the middle of the frame where it terminates in a sleeve **104**. A transverse pin **106** extends rotatably through the sleeve **104** and the ends thereof project through opposed registered slots **108** in the side walls **90** of the supporting frame.

A release member **110** is provided which is quite similar to the release member **64** of the first described form of my invention. Said release member **110** conveniently is formed by bending operations from sheet metal and constitutes a top wall **112** and side walls **114**. The side walls are located on the outside of the side walls **90** of the supporting frame and are provided with apertures in which the tips of the transverse pin **106** are captively received. Thereby the release member is pivotally secured intermediate its ends to the retainer member **92**. The top wall of the release member overlies the frame and is in proximity thereto at both ends of the release member so that if either end of the release member is lifted the other end will engage the supporting frame and act as a fulcrum for pivotal interconnection between the release member and said frame. The ends of the top wall of the release member are upturned to facilitate placement of the tips of a user's fingers beneath them.

It will be apparent that the buckle **80** functions for releasing purposes in the same fashion as the buckle **10** in that lifting either end of the release member **110** will raise the arm **102** and thereby swing the eccentric **94** out of engagement with the opposed strap. When no manual pressure is applied to the release member the torsion spring **100** will bias the eccentric toward the base **88**.

It thus will be seen that I have provided devices which achieve the several objects of my invention and which are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein described or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A quick release buckle for a safety strap, said buckle comprising a supporting frame having a base, a retainer member, means pivotally mounting said retainer member on said frame for movement of a portion thereof toward and away from said base, means biasing said retainer member towards said base, a release member, and means pivotally connecting said release member to said retainer member, said release member having ends, said last named pivotal connecting means being located between said ends, said ends being located above and in proximity to said frame, both of said ends being movable toward and into contact with said frame and also away and out of contact with said frame, whereby when either end of the release member is moved away from said frame the other end will fulcrum on the frame and the intermediate portion of the release member will lift the retainer member away from the base.

2. A quick release buckle as set forth in claim **1** wherein the retainer member is an eccentric.

3. A quick release buckle as set forth in claim **1** wherein the retainer member is a latch.

4. A quick release buckle as set forth in claim **3** wherein the base has a depression in registry with the latch.

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