

[54] **RELEASABLE BUCKLE**
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[52] U.S. Cl. **24/193**
[51] Int. Cl. **A44b 11/12**
[58] Field of Search..... **24/265 BC, 170, 191, 193**

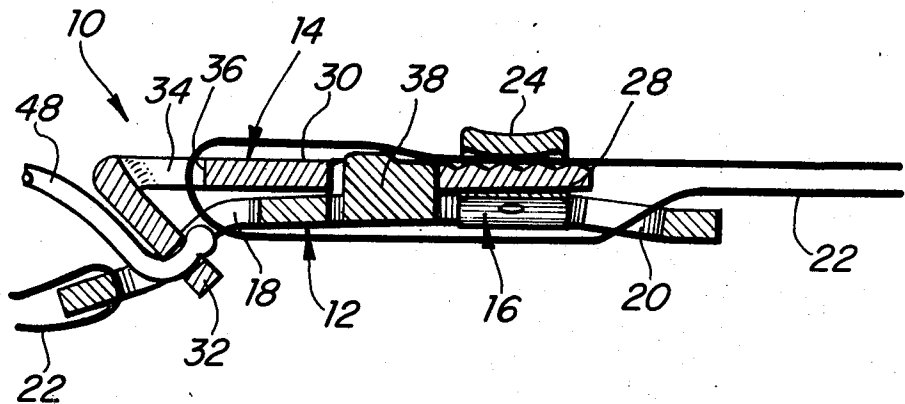
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[57] **ABSTRACT**
A buckle comprising a frame member formed with strap openings at its ends and a bridge intermediate its ends; and a clamping member pivotally mounted intermediate its ends to the frame member. The clamping member has a tongue at one end extending beneath the bridge for clamping a strap against the bridge and a strap slot near its other end bounded on one side by an edge overlying a strap opening in the frame. This slot edge is further from the pivot axis than the bridge so that a pivotal force applied to the clamping member at the edge by tension on the strap is multiplied to clamp the strap between the tongue and bridge. A spring is mounted on the frame for biasing the tongue toward the bridge and a lanyard is attached to the clamping member for pivoting it to release the strap.

15 Claims, 8 Drawing Figures



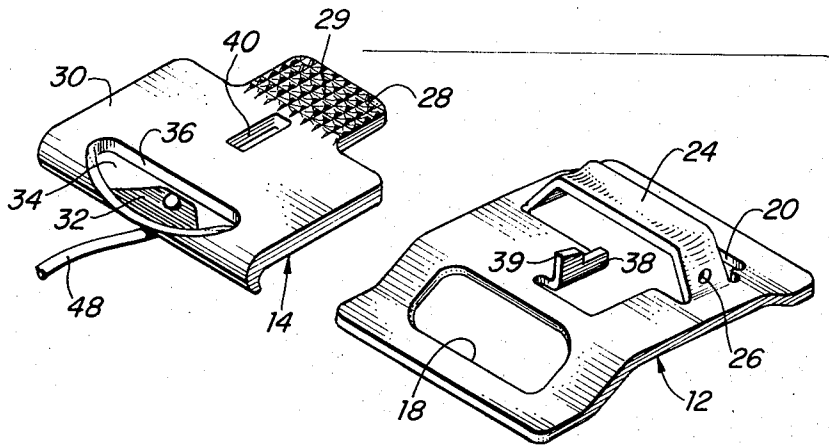


FIG. 1.

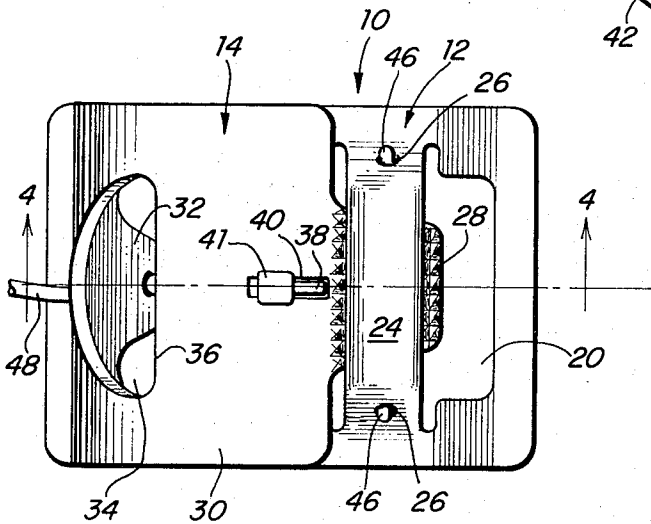


FIG. 2.

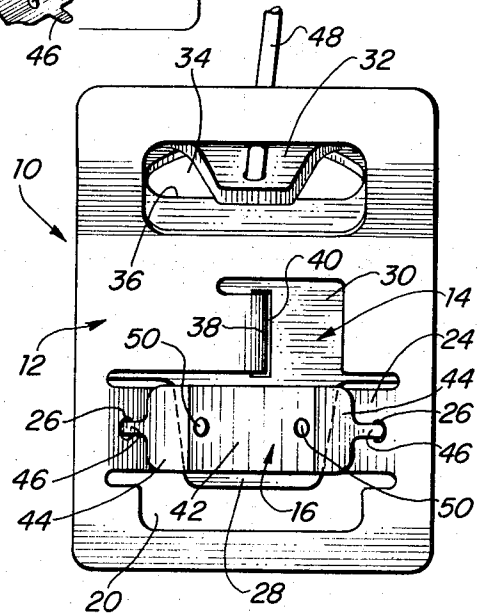


FIG. 3.

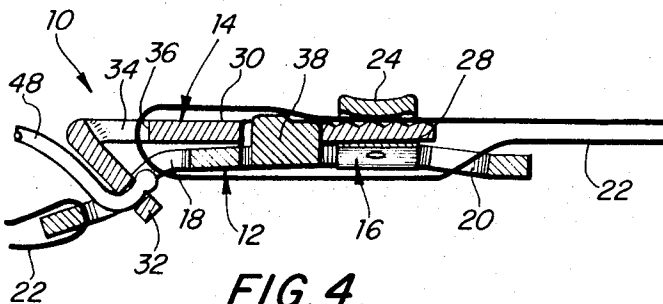


FIG. 4.

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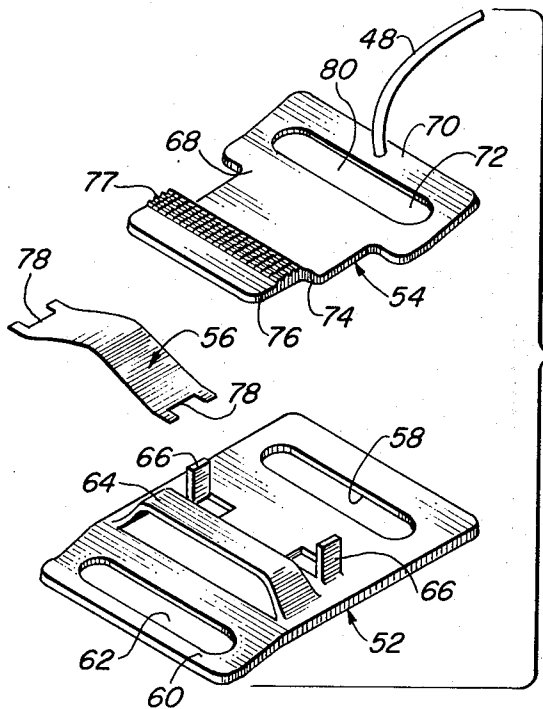


FIG. 5.

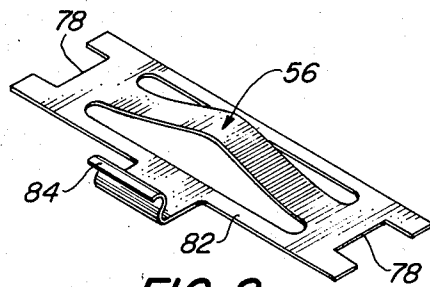


FIG. 8.

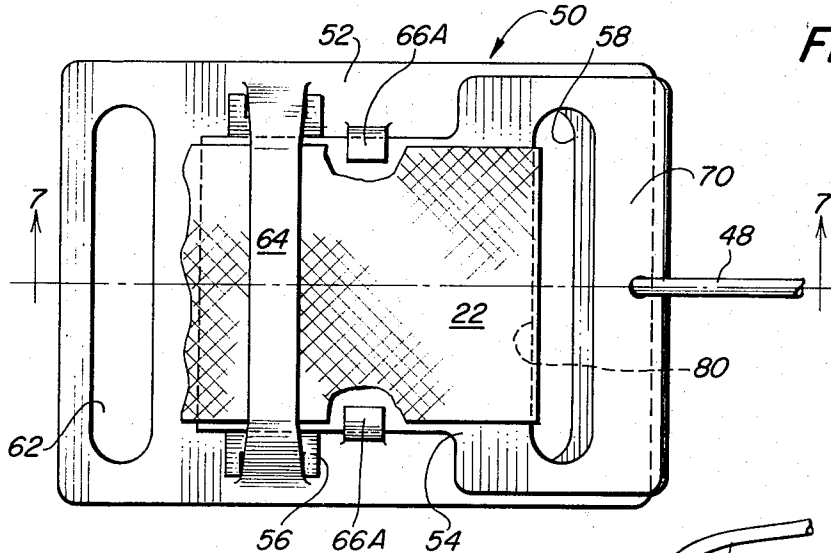


FIG. 6.

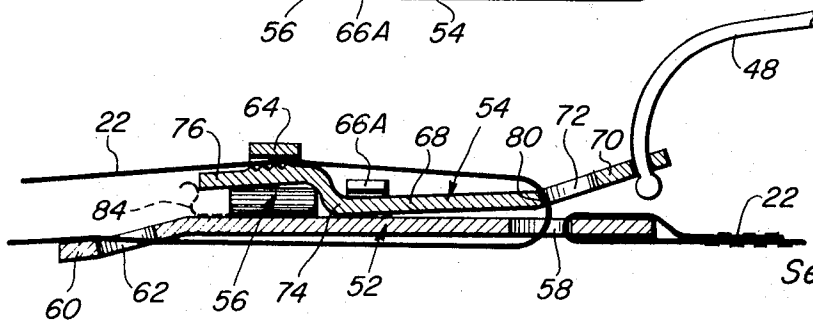


FIG. 7.

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RELEASABLE BUCKLE

This invention relates to buckles and particularly a quick-release buckle for clamping and tensioning straps or webs employed to secure cargoes or other objects in place.

Buckles of the type with which the present invention is concerned find a number of applications in which it is necessary to apply tension to a strap or web and secure the ends of the web under tension. These applications include, for example, holding objects together and/or in place as with cargoes during handling and shipment, and securing articles around or to the body of a man or other animal.

An object of the present invention is to provide a novel and improved buckle of the type described, that is: formed of inexpensive and easily fabricated and assembled components; has a low profile; is simple and easy to use; provides for tensioning of a strap or web; exhibits a positive and secure clamping action; and reduces wear on the straps.

Another advantageous feature of the buckle and object of the invention is the provision of a construction providing for quick and easy release in response to tension applied to a lanyard or thong attached to a component of the buckle, preferably in the direction of tension on the strap. This feature is particularly desirable in applications in which the buckle is a component of a harness employed to attach an article to a man's body because it facilitates both adjustment and quick release by the wearer due to the fact that both the tightening and releasing forces are applied in the same direction.

These and other objects are achieved in a buckle designed to have a low profile important in many applications to avoid snagging, catching, or causing injury to other objects. The clamping action of the buckle results from a lever action that is normal to the direction of tension on the belt or straps and, thus, avoiding the wear usually associated with buckle designs in which clamping results from a wedging or jamming action. The same lever action also facilitates release because it does not require movement of a buckle clamping member in engagement with the strap in a direction opposite to the direction of tension on the strap. Although release of the buckle is simplified, it requires relatively little force and does not damage the material of the belt or strap, the design of the buckle is such that it does not readily release as a result of impact, change in tension, or the like, which may be expected to occur in normal use and handling. The novel design of the buckle optionally includes a resilient detent for holding the buckle in an open or unclamped position to facilitate threading of a strap or belt through the buckle.

Other objects of the invention will, in part, be obvious and will, in part, appear hereinafter.

The invention accordingly comprises the apparatus possessing the construction, combination of elements and arrangement of parts which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIG. 1 is an exploded, perspective view of a buckle constituting a preferred embodiment of the invention;

FIG. 2 is a plan view of the buckle;

FIG. 3 is a bottom view of the buckle;

FIG. 4 is an elevational, sectional view, taken along the line 4—4 of FIG. 2, of the same buckle with a strap connected thereto;

FIG. 5 is an exploded perspective view of a buckle constituting another embodiment of the invention;

FIG. 6 is a plane view of the buckle of FIG. 5 and a portion of a strap;

FIG. 7 is an elevational, sectional view taken substantially along the line 7—7 of FIG. 6; and

FIG. 8 is a perspective view of a component of the buckle.

Reference is now made to FIGS. 1 through 4 of the drawings wherein there is shown a preferred form of buckle embodying the invention. The buckle, designated 10, has three components, namely, a frame member 12, a clamping member 14, and a spring 16. Each of these three components is designed to be formed simply and easily of sheet material, preferably metals because of their strength and rigidity, by conventional stamping and forming operations. The three components of the buckle are also designed to be assembled quickly and easily with a minimum of operations that could be performed automatically, to produce a buckle structure that is not only inexpensive, but is easy to use and reliable in its operation.

Frame member 12 is formed of a single, generally rectangular blank (preferably with rounded corners) of sheet material, preferably a metal such as steel. It includes a generally planar medial section and two end sections bent obliquely away from the medial section. The end sections of member 12 are formed with openings or slots 18 and 20 for passing a belt or strap shown at 22 in FIG. 4. The medial section of member 12 is formed with a raised, transverse bridge 24 having small openings 26 near opposite ends. The bridge 24 includes a long, straight section or span approximately equal in length to the width of the belt or strap and may have a curved cross section as shown in FIG. 4 to provide added rigidity and to facilitate threading the strap between the bridge and the clamping member as described below. Additionally, the inner surface of the bridge may be roughened or coined to provide additional friction when gripping a strap. The medial portion of the member 12 may also be formed with shallow longitudinal stiffening ribs.

The clamping member 14 is also formed of a single blank and includes an end tongue section 28, a medial section 30 and an end section 32 bend back upon itself at an acute angle. Tongue 28 and medial section 30 of member 14 are generally planar and an opening 34 (for passing a strap 22) is formed in end section 32 of member 14. Opening 34 is bounded on one side by a transverse edge 36 located at about the end of the planar medial section 30. If desired, medial section 30 may be formed with lengthwise ribs to provide a more rigid structure.

Member 14 is mounted on the medial section of member 12 for pivotal motion transverse to the direction of tension on strap 22. Mounting means are provided in the form of a flat-sided tab 38 formed up from the medial section of member 12 and projecting through a rectangular slot 40 in medial section 30 of member 14. Tab 38 is formed with a short extension 39 which is swaged or peened to form a head or enlargement 41 (as shown in FIGS. 2 and 4) that retains mem-

bers 12 and 14 together. Member 14 is mounted on member 12 so that its end tongue section 28 extends beneath bridge 24. The surface of tongue 28 facing the bridge is coined as shown at 29 to form tooth-like projections (which may be pyramidal or ratchet toothed) that serve to increase the gripping action on a strap and prevent slippage thereof between the bridge and tongue. It is to be noted that the side surfaces of tab 38 and the adjacent sides of slot 40 cooperate to prevent lateral and rotational movement of clamping member 14 relative to frame member 12. However, tab 38 extends vertically far enough so that the enlargement or head 41 will permit the clamping member 14 to pivot in a plane normal to the plane of frame member 12.

Resilient means in the form of a spring 16, also preferably formed of sheet metal, are provided for biasing clamping member 14 so as to urge its tongue 28 toward the bridge. In the form shown in FIG. 1, spring 16 includes an arcuate medial section 42 and upturned end sections 44 terminating in narrow projections 46 adapted to extend into the openings 26 for holding the spring in place. The medial section 42 of spring 16 may be formed with a pair of openings 50 near its end adapted to receive a tool for bending the spring to permit insertion of projections 46 into holes 26.

In use, one end of a strap or belt 22 is threaded through opening 18 and bent back and fastened to itself by conventional means such as stitching, riveting or the like. The other end of the strap is threaded through opening 20, extended behind the medial section of frame member 12, and then threaded in turn through openings 18 and 34 and between tongue 28 and bridge 24 where the strap is gripped. Clamping is achieved by action of spring 16 which urges clamping member 14 in a counterclockwise direction (as viewed in FIG. 4) on the pivot point resulting from its connection with tab 38, thus causing the strap 22 to be clamped between its tongue 28 and bridge 24. Tension applied to the strap results in a force applied by the belt to the edge 36 of opening 34 that serves to assist spring 16 in retaining the clamping member in clamping engagement with the strap. Preferably the distance between the aforesaid pivot point and edge 36 of opening 24 is substantially greater than the distance between the same pivot axis and the center of bridge 24 so that the clamping member functions as a lever to provide a mechanical advantage in translating the tension on the strap into a strong clamping force exerted on the strap at the bridge. The retaining action of the buckle is further enhanced by the bending of the strap sharply around edge 36 which frictionally engages the strap to prevent motion thereof. The construction is such that pivotal release motion does not require relative motion of the strap and edge 36, and by virtue of the lever action of member 14, requires relatively little force.

The buckle 10 is released by pivoting the clamping member in a clockwise direction (as achieved in FIG. 4) against the pivotal force exerted by spring 16 and by a strap under tension engaging the edge 36 of hole 34. Release is facilitated by the additional mechanical advantage realized due to the additional spacing between the pivot axis and the end section 32 of clamping member 14 which has a lanyard or thong 48 attached thereto for use in releasing the buckle. In this connection it is to be noted that end section 32 is bent such

that the application of tension on the lanyard in a direction parallel with the direction of tension on the strap and buckle will cause pivotal (release) motion of the clamping member 14. It is to be noted further that the strap and buckle are usually oriented with respect to the object about which the strap is buckled so that the required release motion is outward or away from the object, with the result that any impact or pressure on the clamping member applied inwardly toward the object will not tend to release the buckle, but instead will tend to tighten the grip on the strap.

The above-described embodiment offers a material advantage with respect to belt life and ease of buckle release over a jamming type buckle that requires moving a clamping member (which is jammed or pinched in its clamping position) along and in contact with the strap to effect release of the strap. This advantage is due at least in part to the fact that with this invention the clamping force is exerted normally to the direction of tension and motion of the strap.

Another embodiment of a buckle incorporating the invention is illustrated in FIGS. 5 through 7 of the drawings. This buckle, designated 50 in FIG. 6, includes a frame member 52, a clamping member 54 and a spring 56. Buckle 50 is similar, in many respects, to buckle 10, particularly in its essential components and principle of operation. Frame member 52 is formed of a single blank of sheet material and includes an end section formed with a slot 58 for a strap 22 extending through the slot and secured to itself. Member 52 is generally rectangular and planar except for an end section 60 bent slightly out of the plane of the remainder of member 50 and formed with an opening or slot 62 for passing strap 22. The planar section of member 52 may be formed with shallow stiffening ribs. The medial section of member 52 is formed with a transverse bridge 64 and two retaining tabs 66 between the bridge and slot 58. Although not shown, it is to be understood that bridge 64 may be arcuate in cross-section as in the embodiment of FIGS. 1-4 for strength and also to facilitate threading the belt. Tabs 66 are bent over to retain the clamping member 54 as shown at 66A in FIGS. 6 and 7 when the buckle is assembled.

Clamping member 54 includes a generally planar medial section 68 (which is engaged between retaining tabs 66), an end section 70 angled away from medial section 68 and formed with a slot 72, an offset section 74, and an end tongue section 76. A thong or lanyard 48 is attached to end section 70. Offset section 74 is bent sharply at almost a right angle away from medial section 68 to form a corner that by engagement with the medial portion of member 52 functions as a fulcrum about which clamping member 54 is pivoted with respect to member 52. The end tongue 76 of clamping member 54 is generally parallel with its medial section 68 and extend under bridge 64. The upper surface of end section 76 is coined to form teeth or serrations 77 to prevent slippage of a strap clamped between end section 76 and the bridge 64.

Spring 56 is bowed as shown and includes notches 78 at its ends to accommodate the ends of bridge 64 which retain the spring in place. The bowed center section of spring 56 engages the underside of the tongue section 76 of the clamping member 54 and biases it up against the bridge 64.

The operation of buckle 50 is essentially the same as that of buckle 10. A strap is threaded down through slot 62 under the frame member 52 and thence through slots 58 and 72, the latter having a transverse edge 80 overlying slot 58 and spaced from the junction of the clamping member's medial section 68 and offset section 74 (the pivot axis) a distance substantially greater than the distance between the same junction and bridge 64, thereby providing a mechanical advantage with respect to the pivoting force produced by the tension of strap 22 applied to the edge 80 of slot 72 as in the preferred embodiment. From slot 72, the strap is threaded between bridge 64 and tongue 76 which clamp the strap under the influence of spring 56 and the tension of the belt as applied to the clamping member at the edge 80 of slot 72.

Another embodiment of the spring for biasing the clamping member is illustrated in FIGS. 7 and 8. In this embodiment, the spring 56A is similar in construction and operation to spring 56 except that it includes a base section 82 formed with an upstanding, L-shaped resilient spring detent 84 designed to engage and releasably retain the end tongue section 76 of clamping member 54 in its depressed or release position. Thus, when member 54 is pivoted in a counterclockwise direction (as seen in FIG. 7) by pulling on lanyard 48, the end edge of tongue section 76 will engage detent 84 which will yield to snap over the end edge and thereby hold the tongue section in release position. The clamping member is released from detent 84 by pivoting it clockwise relative to frame member 52.

The embodiment of FIGS. 5-8 has substantially all of the advantages of the preferred embodiment except that the latter is less costly to make and may be released by pulling the lanyard either in the direction of belt tension or at an angle to the direction of tension. In the embodiment of FIGS. 5-8, release is effected by pulling the lanyard outwardly away from the frame member. In both embodiments, clamping is accomplished by lever action. When load is applied to the buckle, tension is transmitted through the strap which is pulled against the edges 36 and 80 of the slots 34 and 72. The effect of this applied tension and the interaction of the strap with slot 34 or 72 is to apply a force largely perpendicular to the plane of the clamping member at the edge of such slot which is amplified by the lever ratio (preferably about 4:1) from such slot edge to the clamp surface (29 or 77), resulting in a clamping force substantially greater than the tension in the strap between the slot and the point of clamping. Under no-load conditions, the spring pressure is the sole source of clamping force. The invention also offers the advantage that a relatively strong spring may be used to assure adequate clamping force (e.g., 144 to 192 ounces) under no-load conditions while at the same time keeping the force required to be exerted by the user to release the buckle under load conditions within reasonable limits, e.g., 24 to 32 ounces. This is possible because of the mechanical advantage afforded by the lever ratio (preferably about 6:1) from the thong attachment point to the point of clamping. This lever ratio may be increased by increasing the distance between the pivot point and the point of thong attachment relative to the distance between the pivot point and the clamping point. It is to be noted also that

the actual tension in the strap is reduced in that portion extending between the clamping point and the engaged edge of the slot 34 or 72 by the friction (at that edge and at the edge of the offset slot 18 or 58 of the frame member) which reduces the total force loading seen by the lever system at the high force (i.e., clamping) end and also allows for a lighter overall design.

It is appreciated and to be understood that certain changes may be made in the above apparatus without departing from the scope of the invention herein involved. Thus the tabs 66A may be replaced by rivets for pivotably coupling together the clamping and frame members of the embodiment of FIGS. 5-8. Therefore, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A releasable buckle for clamping a strap comprising, in combination:

a frame member for attachment to one end of a strap, said frame member including end sections formed with openings through which a strap may pass and an intermediate section including a raised, transverse bridge;

a clamping member including first and second end sections and an intermediate section at which said clamping member is engaged with said intermediate section of said frame member for pivotal motion with respect thereto about an axis transverse to the direction of tension applied to a strap clamped by said buckle;

said first end section of said clamping member extending beneath said bridge for clamping a strap disposed between said first end section and said bridge;

said second section of said clamping member being formed with an opening for admitting a strap and bounded on the side closest said axis by a transverse edge overlying one of said openings in said frame member; and

resilient means for biasing said clamping member so as to urge said first end section toward said bridge and thereby provide clamping engagement with a strap extending therebetween.

2. A buckle as defined in claim 1 wherein the spacing between said transverse edge and said axis is greater than the spacing between said axis and said bridge.

3. A buckle as defined in claim 2 where the ratio between the aforesaid spacings is of the order of 4 to 1.

4. A buckle as defined in claim 1 wherein said frame member is formed of a single blank of sheet material and said bridge comprises a raised portion of said intermediate section of said frame member.

5. A buckle as defined in claim 4 wherein the said end sections of said frame member are bent away from said bridge to permit a strap to pass through said openings behind said frame member.

6. A buckle as defined in claim 1 wherein said intermediate section of said clamping member includes an opening and said intermediate section of said frame member includes an engagement section extending through the last-mentioned opening for pivotally coupling said members to one another.

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7. A buckle as defined in claim 6 wherein said clamping member is formed of a single blank of sheet material.

8. A buckle as defined in claim 7 wherein the surface of said first end section of said clamping member facing said bridge is formed with projections for engaging a strap.

9. A buckle as defined in claim 1 including means attached to said second end section of said clamping member for pivoting the latter about said axis to release a strap engaged between said bridge and said first end section of said clamping member.

10. A buckle as defined in claim 9 wherein the last-mentioned means comprise a lanyard.

11. A buckle as defined in claim 10 wherein said second end section of said clamping member is bent back upon itself to impart a pivotal motion to said clamping member in response to tension applied to said lanyard in the direction of tension on said strap.

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12. A buckle as defined in claim 1 wherein said resilient means comprise a spring mounted on said frame member and engaged with said first end section of said clamping member underlying said bridge.

13. A buckle as defined in claim 12 wherein said spring is formed of a single blank of resilient sheet material and is engaged with said bridge.

14. A buckle as defined in claim 13 wherein said resilient means includes a detent for engaging and releasably retaining said first end section in a release position spaced away from said bridge to facilitate threading of a strap therebetween.

15. A buckle as defined in claim 1 wherein said resilient means are formed of a single blank of resilient sheet material having a section providing a spring for biasing said first end section of said clamping member toward said bridge and another section constituting said detent.

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