

June 4, 1963

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3,091,830

BUCKLES

Filed Aug. 13, 1959

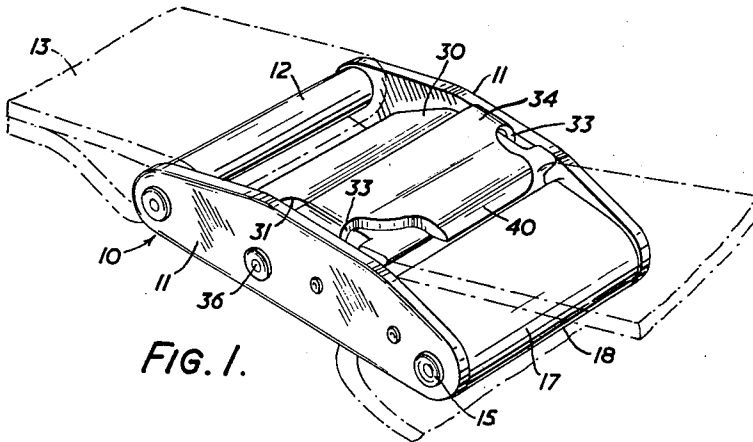


FIG. 1.

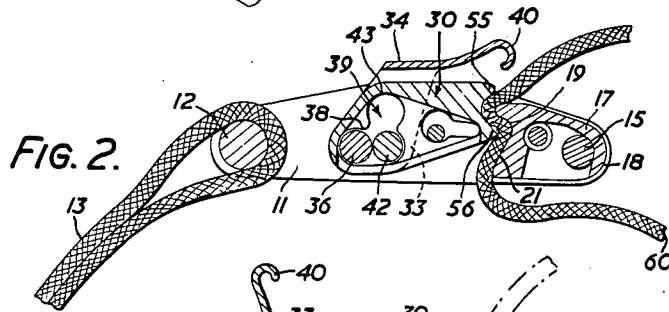


FIG. 2.

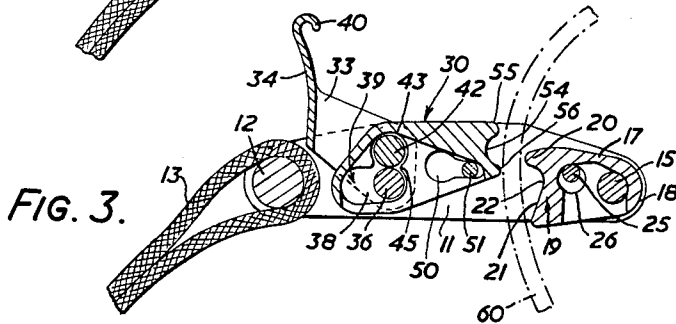


FIG. 3.

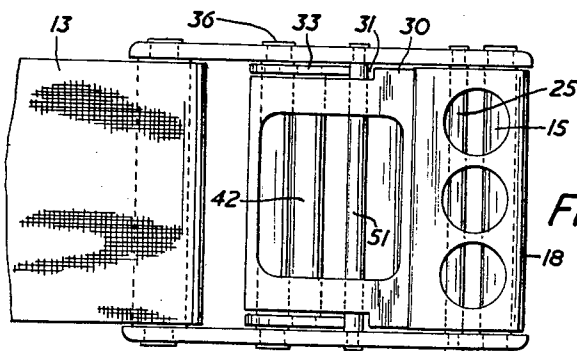


FIG. 4.

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Filed Aug. 13, 1959, Ser. No. 833,467

Claims priority, application Great Britain Aug. 19, 1958
8 Claims. (Cl. 24-170)

This invention relates to buckles of the type in which a strap passes between and is held by a pair of opposed abutment members which extend parallel to the width of the strap, the abutment members serving to retain the strap by friction.

According to the present invention a buckle for connecting a strap to another part includes a body affording a pair of opposed abutment members which extend parallel to the width of the strap and between which the strap is to be gripped, each abutment member having a gripping surface of concave section extending transverse to the length of the strap, the edge of the concave surface of one abutment member extending towards or into the concavity of the other to kink the strap and secure it. Preferably the abutment members are capable of rocking about pivotal axes, at least a part of the gripping surfaces lying above a plane through the pivotal axes so that when a strap is gripped therebetween and a tension applied to its lower end the gripping surfaces are drawn towards one another to grip the strap more firmly. Thus an initial tension may be maintained in a strap by a grip between the lower edge of one abutment and the concavity of the second abutment member whilst an increased tension causes the abutment members to rock so that the strap is also gripped by the upper edge of the second abutment member against the concavity of the first.

Means are preferably provided to limit the rocking movement of the gripping surfaces towards one another.

Conveniently one abutment is secured relative to the body to prevent longitudinal movement towards the other abutment member and the second abutment member is retractable away from the first abutment member to permit insertion and withdrawal of the strap. In this case means are preferably provided to prevent rocking of the retractable abutment member when in a retracted position. The retractable abutment member may comprise a block movably mounted on the body, co-operating pin and slot means being provided between the block and the body to permit the rocking movement in a gripping position but not in a retracted position, and the retractable abutment member may be connected to the body of the buckle through a pivoted operating member. In this case the retractable abutment member has in it an L-shaped cam slot which receives a pair of parallel bars which are secured to the operating member and one of which serves as the pivot for the operating member.

The invention may be carried into practice in a number of ways but one specific embodiment will now be described by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a perspective view from above and one side of a buckle according to the present invention;

FIGURE 2 is a sectional side elevation of the buckle with a strap gripped between its abutments;

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FIGURE 3 is a view, similar to FIGURE 2, with the strap released; and

FIGURE 4 is an under plan view.

The embodiment to be described comprises a buckle suitable for a safety belt in aircraft or motor vehicles. The buckle serves to connect two strap ends and comprises a body 10 having a pair of side rails 11 interconnected at one end, referred to as its forward end (on the left in the drawings), by a bar 12 of circular cross-section to which one strap end 13 is secured by a sewn loop. At its other, rearward, end the body has a further bar 15 interconnecting its side rails and affording a pivot for a rocking abutment 17. This takes the form of a flat bar of generally rectangular cross-section but having a smoothly curved end face 18 at the outer end of the buckle and at its other end a recessed concave gripping surface 19, as shown in FIGURES 2 and 3. This concave surface has two distinct sections; an upper radiused section or projection 20 which merges into a straight lower section 21, with the effect that the recess is of somewhat inverted L-section with the angle 22 of the L smoothly curved.

Slightly inwards of and above the bar 15 about which the rocking abutment 17 pivots is a pin 25 extending through a hole 26 in the abutment which is of cross-section considerably larger than the pin itself so that the abutment can rock up and down to a limited extent of approximately 10°. It is shown at its lower limit in FIGURE 3 and in an intermediate position in FIGURE 2.

Mounted between the rocking abutment 17 and the circular bar 12 at the other end of the body is a retractable abutment. This comprises a block which lies between the side rails 11 of the body but, as shown at 31 in FIGURES 1 and 4, over the majority of its length is slightly spaced therefrom to permit the arms 33 of an inverted generally U-shaped operating member 34 to pass down between the rails 11 and the abutment block 30 where they are pivoted to a fixed transverse bar 36 extending between the rails 11 and through the longitudinal or horizontal limb 38 of an L-shaped cam slot 39 in the block. The base of the U-shaped operating member 34 has a finger piece 40 extending rearwards from it by which it can be rotated.

A second movable bar 42, extends between the arms 33 of the operating member, parallel to the fixed bar 36, and works in the transverse or vertical limb 43 of the L-shaped slot 39.

Hence in the released position shown in FIGURE 3 the fixed transverse bar 36 is in the angle of the L of the cam slot 39 and the movable bar 42 is above it at the further end of the transverse or vertical limb 43 of the L. As the operating member 34 is turned down to the position of FIGURE 2 it carries the abutment block 30 to the right towards the rocking abutment 17 in which position the movable bar 42 is in the angle of the L and the fixed bar 36 is in the opposite end of the horizontal or longitudinal limb 38 of the L. It will be appreciated that in this position the movable bar 42 reaches a dead centre position at which longitudinal pressure on the abutment 30 will have no tendency to turn the operating member 34 back to its released position. In order to ensure stability the L-shaped cam slot is provided with a slight rib 45 on the surface of its transverse limb 43 to provide a slight

recess or seat adjacent its angle in order to ensure a stable engaged position.

Near its rearward and the retractable abutment 30 is provided with a guide slot 50 for receiving a transverse pin 51 extending from side to side of the body to guide the abutment member 30 and limit its pivotal movement about the pivot of the operating member. The guide slot 50 is of generally key-hole section having a wide vertical portion at its forward or lefthand end and a narrower portion which substantially fits the pin adjacent its rearward end. Accordingly when the abutment member 30 is retracted to the released position of FIGURE 3 the narrow end of the key-hole slot 50 will be occupied by the pin 51 so that the abutment cannot rock up and down. On the other hand when the abutment member is advanced to engage the strap the abutment surface is permitted a certain limited degree of rocking movement up and down due to the fact that the pin 51 is in the larger portion of the key-hole slot 50.

The rear edge 54 of the retractable abutment is recessed to form a concave gripping surface of generally semi-circular cross-section merging at its upper and lower edges into smoothly curved ribs 55 and 56. The two abutments 17 and 30 are arranged so that the upper rib 20 of the rocking abutment 17 extends towards or into the concave gripping surface 54 of the retractable abutment 30 when they are in the gripping position of FIGURE 2 so that the retractable abutment 30 is in effect positioned slightly higher than the rocking abutment 17.

The disposition of the pivots 15 and 36 of the two abutments 17 and 30 and the pins 25 and 51 which limit their rocking movement is such that the opposed gripping surfaces are both above a plane containing the pivots 15 and 36. Therefore, referring to FIGURE 2, when the strap end 60 is gripped and a downward tension applied the tendency is for the gripping surfaces to be drawn closer together so that the grip is increased. It should be noted however that the disposition of the pins 25 and 51 ensures that at no time can the lower rib 56 of the retractable abutment touch the surface of the other abutment so that the strap cannot be cut by the abutments.

To secure a strap to the buckle the operating member 34 is raised from the position of FIGURE 2 to the position of FIGURE 3 to rotate the movable bar 42 and withdraw the retractable abutment 30 to the left to its retracted position. The strap end 60 can then be threaded up between the abutments and drawn up to the desired extent. The operating member is then moved to the locking position of FIGURE 2 to move the retractable abutment forward.

This causes the strap to be kinked between the gripping surfaces. Initially the strap is mainly gripped between the lower rib 56 of the retractable abutment and the straight section 21 of the gripping surface of the rocking abutment.

As a load is applied to the standing end 60 of the strap, however, it tends to draw the two abutments downwards, i.e. it rocks them downwards about their respective pivots. Such movement increases the grip already imposed by the lower rib 56 of the retractable abutment 30 and also draws the upper rib 55 tightly against the strap so that the grip on the strap is spread over almost the whole of the opposed abutment gripping surfaces.

Thus it will be appreciated that when a sudden shock load is applied the grip is gradually increased and this is found to permit a slight stretching of the strap to take place gradually and so reduce the danger of a very heavy load being applied instantaneously which might fracture the strap.

In this way, therefore, the buckle normally grips the strap to a relatively light extent but in the event of a sudden load being applied the grip is considerably increased. In the embodiment described which is suitable as a safety belt in an aircraft the load which the buckle takes initially is little more than that required to hold a person in a seat

under normal circumstances. On the other hand in an emergency the load which the buckle will withstand when the gripping surfaces are fully utilised is equivalent to an acceleration of approximately 9 g. At the same time to release the buckle a load of only 20 lbs. is required, with 300 lbs. on the strap.

What I claim as my invention and desire to secure by Letters Patent is:

1. Strap gripping means comprising a body provided with an opening for receiving a strap, a pair of parallel strap gripping abutments carried by said body on opposite sides of said opening, one of said abutments being mounted for translational movement between a gripping position toward and a release position away from the other, said abutments having complementary gripping surfaces contoured to interfit and kink said strap between them when said one abutment is brought into its gripping position, an operating and locking member pivotally mounted on said body to swing in a limited arc in a plane perpendicular to the principal plane of said body, means on said operating and locking member which operatively engages said one abutment to translate it between its release and gripping positions, and a projection fixed on said one abutment and located to be yieldingly urged by the resistance of said strap to compression between said gripping surfaces into a position in the path of travel of said abutment engaging means, in which position said projection resists swinging movement of said abutment engaging means past said projection and consequently resists movement of said operating and locking arm and resulting translation of said abutment between its gripping and release positions.

2. Strap gripping means as claimed in claim 1 in which both of said abutments are pivotally mounted on said body and at least part of each of said gripping surfaces lies above the plane of the pivotal axes of said abutments when said abutments are in gripping position so that when a strap is gripped between said surfaces and drawn toward the opposite side of said plane, said surfaces are drawn toward one another to grip the strap more firmly.

3. Strap gripping means as claimed in claim 1 in which said operating and locking member is pivotally mounted on a pin fixed to said body which projects through a slot in said one abutment, said slot serving to guide said one abutment during its translational movement.

4. A buckle as claimed in claim 2 in which said one abutment comprises a block movably mounted on the body, co-operating pin and slot means being provided between the block and the body to permit said one abutment to pivot in a gripping position but not in a retracted position.

5. A buckle as claimed in claim 2 in which the said one abutment has in it an L-shaped cam slot which receives a pair of parallel bars one of which is seated in said operating and locking arm and serves as said abutment engaging means, while the other bar is seated in said body and serves as the pivot about which said operating and locking member swings.

6. A buckle for connecting a strap to another part including a body comprising a pair of generally parallel spaced side rails interconnected by a transverse member at each end, a rocking abutment member extending between the rails adjacent one end, a stop to limit the extent of such rocking movement, a second abutment member between the other transverse member and the rocking abutment member, pivot means on said body slidably carrying the second abutment member for longitudinal movement relatively to the body between a gripping position near said first abutment member and a retracted position further away therefrom, the second abutment member having in it a slot of keyhole shape cooperating with a pin extending between the side rails to permit limited rocking movement of the abutment member about said pivot means in the gripping position but to prevent such rocking movement in the retracted position, each

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abutment member having a gripping surface of concave section extending transversely to the length of the side rails, the edge of the concave surface of one abutment member extending towards or into the concavity of the other abutment member in the gripping position to kink and secure a strap passed between them.

7. Strap gripping means comprising a body provided with an opening for receiving a strap, a pair of parallel strap gripping abutments carried by said body on opposite sides of said opening, one of said abutments being mounted for translational movement between a gripping position toward and a release position away from the other, said abutments having complementary gripping surfaces contoured to interfit and kink said strap between them when said one abutment is brought into its gripping position, and locking means for locking said one abutment in said gripping position, said locking means comprising an arm pivotally mounted on said body to swing in a limited arc in a plane transverse to the principal plane of said body between a locking position in which it prevents translational movement of said one abutment and a release position in which it does not, stop means carried by said arm approximately parallel to the principal plane of said body, and a rib on said one abutment projecting away

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from said gripping surfaces into the path of travel of said stop means as said arm is swung, the distance between the top of said rib and the gripping surface of said one abutment being so slightly less than that between the gripping surface of said other abutment and said stop means when said stop means is in contact with said rib that said stop means can pass over said rib into and out of locking position, when a strap is held between said gripping surfaces, only by compressing said strap.

8. Strap attaching means as claimed in claim 7 in which said arm is connected to translate said one abutment as it swings.

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