Oct. 31, 1967 J. E. HATFIELD 3,349,449

SAFETY BELT BUCKLE AND WEBBING

Filed Dec. 21, 1964 2 Sheets-Sheet 1

Fig. 1

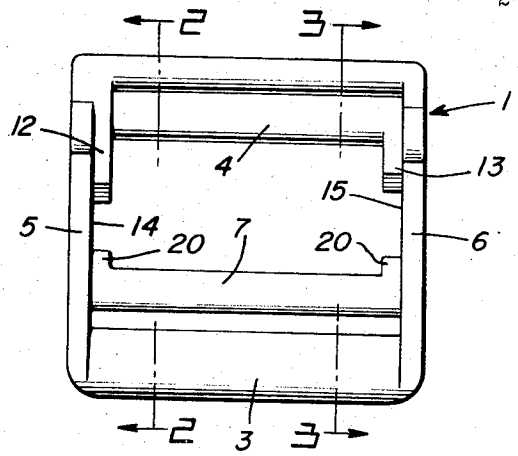


Fig. 2

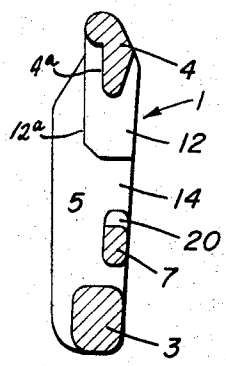


Fig. 3

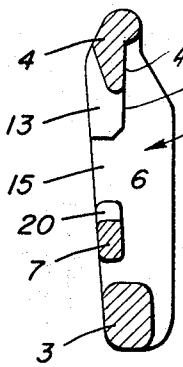


Fig. 5

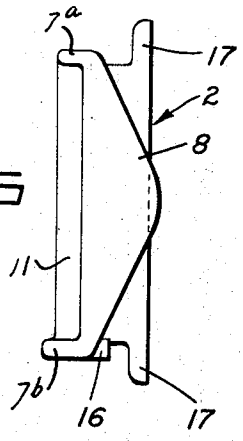
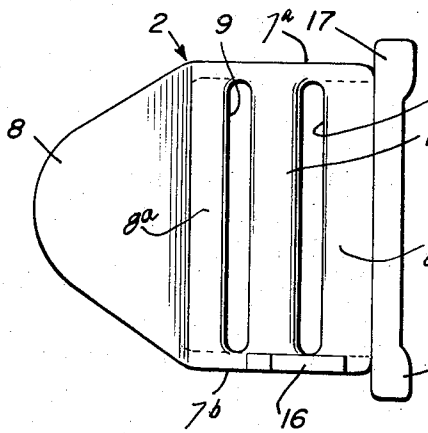


Fig. 4



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SAFETY BELT BUCKLE AND WEBBING

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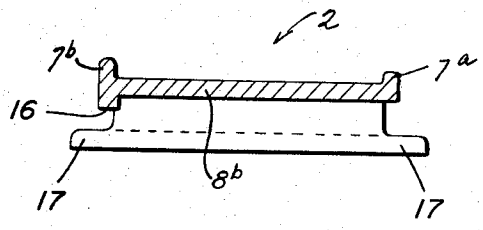
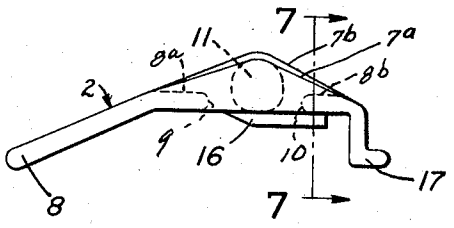


Fig. 7

Fig. 6



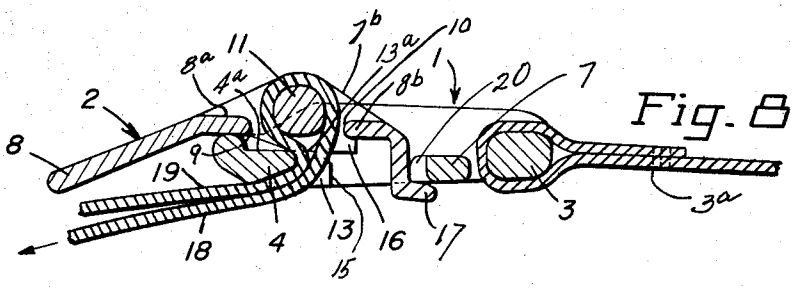


Fig. 8

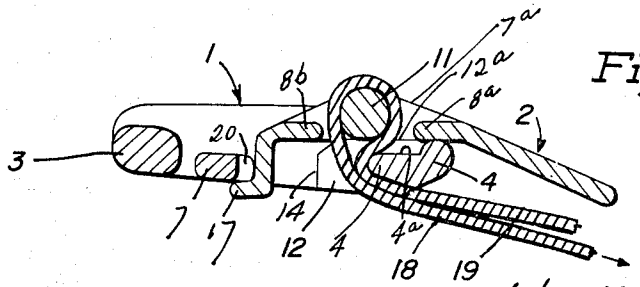


Fig. 9

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United States Patent Office 3,349,449 Patented Oct. 31, 1967

3,349,449

SAFETY BELT BUCKLE AND WEBBING

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Filed Dec. 21, 1964, Ser. No. 420,060
3 Claims. (Cl. 24—197)

This invention relates to improvements in safety belts and an improved buckle.

Buckles of this sort utilize two separable buckle parts. One of them constitutes a main body member of loop-shaped formation and the other an insertable or slide member complementary to the loop. They have connected therewith strap ends of a safety belt. Generally, the buckle is of the type set forth in U.S. Patent 3,060,537. In buckles of this type, the strap passing around the slide or inserting member is trapped between a bar of the slide member and an abutment on the loop member. The disadvantage of this is that for a given load, the applied force necessary to release the buckle by opening the inserting member is variable, sometimes being much higher than normal. This is the result of the relative position of the slide or inserting member and the main body or loop member varying in the locked position of the buckle under load. In this type of buckle it is generally necessary to fulcrum the slide on the loop for moving it to a release position. Therefore, the strap is trapped slightly further forward from the fulcrum of the slide member on the loop and the force necessary to release the buckle is substantially increased and may be greater than is desirable to freely and quickly open the buckle.

It is therefore an object of the present invention to provide a buckle in which the above mentioned disadvantage of variable release force is substantially reduced.

It has been found that this object can be achieved by not trapping the strap passing around the rigid cross bar of the slide or insertable member in engagement between said bar and the rigid abutment or cross bar on the main loop member, but rather relying on the strap trapping its returned portion frictionally between itself and the cross bar or abutment of the loop. In this way, as the cross bar of the slide member does not have to be movable to trap the strap against the cross bar or abutment of the loop member, with the consequent danger that it may trap the strap in one or a range of relative positions, its movement can be limited by a stop on the loop member so that it always settles in one position, or alternatively the bar can settle to an equilibrium position relative to the loop member when the trap is tensioned under the influence of the forces acting thereon in the two lengths of the loop of the strap passing around the bar. The slide member will in practice be slid along the loop members under the influence of the tension in the strap until said slide member comes into contact with a stop on said loop member or, if no stop is provided, until the inner length of the loop of strap around said bar, i.e., the length passing between the cross bar of the slide member and the abutment of the main buckle loop, is deflected inwardly by the abutment or cross bar of the loop towards the other outer length of the strap, sufficiently to balance the pull exerted on the bar by the said outer length of the strap loop. In this way the slide member assumes a constant position relative to the loop member and substantial variations in the release force are avoided.

According to the present invention there is provided a buckle of the kind referred to in which the rigid loop and slide members are so constructed that, when said members are engaged, the cross bar on the slide member and the cross bar or abutment on the loop member are spaced apart sufficiently in use of the buckle, to avoid the strap passing around the cross bar and back on itself being trapped between said loop cross bar and the abutment or cross bar of the slide member, locking of the strap being achieved by the strap itself trapping the returned portion thereof against said abutment.

In a buckle according to the present invention, the locking of the strap is effected by friction between the two superposed portions of the strap which bear against each other where the strap is returned on itself after passing round the bar. If there were about to be any slipping under the load the two portions of strap would move in opposite directions, and since when the strap is under tension the outermost of the overlapping portions, being the one taking the load, presses the other returned portion of the strap to the underside of the abutment on the loop member, the friction between the two layers of the strap is sufficient to lock the strap.

Another disadvantage of known buckles of the kind referred to which lock the strap passing around the bar of the slide member by trapping it between the rigid bar and the rigid abutment or cross bar on the loop member, is that in order to release them, the bar and abutment have to be separated by rocking the slide member into the release position. To do this the existing load on the strap has to be overcome, i.e., the belt incorporating the buckle has to be tightened slightly more in order to be released. This can be demonstrated by holding the straps connected by such a known buckle in fixed jaws so as to prevent tightening, whereupon it is found that the buckle cannot be released, assuming all available stretch in the material of the straps has been taken up by the loading thereon. This is a practical limit to the magnitude of the mechanical advantage obtainable by use of the rockable slide member in overcoming the load to release the buckle. This limit is determined by considerations such as the need for the buckle to be reliably self-locking under load, and for the length of the slide member to be acceptable to the user. In consequence, with known buckles there is, for a given load, a lower practical limit to the force required to release the buckle.

The reason for this limitation of known buckles is that the fulcrum on the loop member about which the slide member is rocked has to be disposed to the side of the outer length of the loop of the strap about the bar thereof remote from said abutment in order that the buckle shall be self-locking. In a buckle according to the present invention, however, both lengths of the loop of strap around the bar of the slide member exert a pull on the bar and in consequence the fulcrum about which the slide member is initially rocked can be moved closer to the bar to a position substantially on the line of the outer leg, as seen in side view, while still obtaining a self-locking action. Also, it is found that the force necessary to draw the inner length of the loop between the outer strap length and the abutment is considerably less than the load on the buckle so that if, according to the position of the fulcrum, an extension of the loop around the bar of the slide member is necessary in rocking the slide member to the release position, this extension is obtained by the inner length slipping and not by drawing the outer length, i.e., by slightly tightening the belt.

For the above reasons, it is found that the release force for a given load can be made substantially smaller than with the aforementioned known buckles of this general type.

It is to be understood that the fulcrum about which the slide member is rocked for release is not necessarily a point on each side of the loop member but may be a rounded surface or surfaces on which the slide member performs a combination of sliding and pivoting and rolling, this movement herein referred to as "rocking."

Yet another disadvantage of known buckles is that if the strap is continually alternately tensioned and released

the strap will tend to creep round the bar very slightly so that the safety belt becomes slacker than intended. This is thought to be caused by friction on the strap between the bar and the abutment as the strap is continually trapped and released. This disadvantage is very considerably reduced in buckles according to the present invention.

In order that the invention may be well understood a preferred embodiment will now be described by way of example only with reference to the accompanying drawings, in which:

FIG. 1 shows a plan view of the main body or loop member of a buckle according to the invention.

FIG. 2 is a cross section on the line 2—2 of FIG. 1.

FIG. 3 is a cross section on the line 3—3 of FIG. 1.

FIG. 4 is a plan view of the slide or insertable member of the buckle.

FIG. 5 is an end view of the slide shown in FIG. 4 as seen from the left.

FIG. 6 is a side view of the insertable buckle portion of FIG. 4.

FIG. 7 is a section on the line 7—7 of FIG. 6.

FIG. 8 is a longitudinal cross section of an assembled buckle.

FIG. 9 is a longitudinal cross section of an assembled buckle looked at in the opposite direction from FIG. 8.

A two part buckle of the kind referred to for use with a safety belt or harness for a passenger in a motor car consists of a main body or loop member **1** and an insertable or slide member **2**.

The loop member **1**, which can be termed the first buckle portion, is rigid and of substantially rectangular form and comprises a cross bar **3** at its rear end around which the end 3^a of a belt or strap is passed and then secured back on itself by stitching. At the other end of the loop member **1** is a second cross bar **4** which serves as a strap abutment. Connecting the ends of said two cross bars are two side walls or cheeks **5** and **6**. A further transverse bar **7** may be provided close to the bar **3**.

The rigid slide member **2**, which can be termed the second buckle portion, is of generally rectangular shape, comprising a front cross bar 8^a having a tapered or sloping front handle portion **8**. It has side walls 7^a and 7^b connected to the ends of the cross bar 8^a. A second cross bar 8^b is provided at the opposite ends of side walls 7^a and 7^b and a cross bar **11** positioned in the opening between cross bars 8^a and 8^b defines parallel slots **9** and **10**. The ends of a safety belt are intended to be looped around bar **11** for belt adjustment purposes.

Extending inwardly from the side walls or cheeks **5** and **6** of the loop member **1** and adjacent to the cross bar **4** there are slide flanges **12** and **13**, slots or recesses **14** and **15** being defined between the ends of said flanges **12** and **13**, and projections **20** at each end of bar **7**, through which slots or recesses **14** and **15**, the slide or inserting member **2** can be inserted. The slot **15** on one side is longer than the slot **14** on the other side, and correspondingly the slide member **2** is higher at one side wall 7^b than the other side wall 7^a so the slide member **2** may only be inserted when the appropriate sides are properly presented to the slots **14** and **15** of the loop member **1**. This operation is set forth in U.S. Patent 3,060,537. The extra height on one side of the slide member **2** is produced by providing a land or extension **16** projecting from the underside of the slide member **2** along one side wall 7^b.

It will be noted from FIG. 9 that the flange **12** has a top slide surface 12^a which lies in a plane above the top slide surface 4^a of the bar **4** and the top edge 13^a of flange **13**. The flange **12** is thus raised at its top surface to a level above the top surface of the opposite flange **13** by the thickness of extension **16** at a location below bar **11**.

The ends of the flanges **12** and **13** on the loop member **1** which define the slots **14** and **15** serve as a fulcrum about which the slide member **2** is rocked to engage or disengage the two buckle members **1** and **2**.

In order to prevent the slide member **2** from being inserted into the loop member **1** with the rear end first, the end of the slide member **2** is provided with two projections **17** extending sideways beyond the width of the slide member **2**, which projections **17** lie close against the under surface of the loop member when the two members are correctly assembled as described in U.S. Patent 3,060,537. Thus, the slide member **2** may not be passed right through the loop member **1**, and also it cannot be inserted into the loop member **1**, rear end first.

The bar abutment **4** on the loop member is so positioned that when the two buckle members are assembled (see FIGS. 8 and 9) the bar **11** and abutment **4** are spaced apart the thickness of extension **16** (below bar **11**) in a direction perpendicular to the slideway of the buckle portion **1**. Hence a strap **18** which is less in thickness than this space, when looped around the bar **11** of the slide member and tensioned, is not trapped or clamped in direct engagement between the bar **11** and the bar **4**. The tension of the strap portion **18** presses the returned portion **19** of the belt strap against the end and underside of the abutment **4**, and the strap **18** is thereby locked on itself by friction. The slide member **2** is free to assume an equilibrium position on the loop member **1** under the influence of the pulls exerted thereon by the two lengths of the loop of strap passing therearound as herein before explained.

The end portions of the flanges **12** and **13** which serve as a fulcrum are so positioned that the fulcrum about which the slide member initially rocks during release of the buckle is, as seen in a side view (see FIGS. 8 and 9), on or just outside the line followed by the outer length of the strap **18** looped around the bar **11** of the slide member when the strap is tensioned. This rounded shape of the bar **11** of the slide member **2** and the spacing of bar **11** from bar **4**, enable the buckle to be released under load without having to overcome the load by, in effect, slightly tightening the straps interconnected thereby as herein before described.

The natural resilience of the strap **18** is such that when the buckle is engaged and the strap **18** is not tensioned, the slide member **2** is urged backwards by the tendency of the loop of the strap around bar **11**, which is bent around the abutment **4** into a direction at right angles to the plane of the buckle, to straighten out so that the rear end of the slide member **2** rides over the projections **20** adjacent the further transverse bar **7** provided on the loop member **1**. This prevents the slide member from becoming accidentally disengaged.

Various changes in the size, shape and arrangement of parts may be made to the form of invention herein shown and described without departing from the spirit of the invention or scope of the claims.

I claim:

1. A quickly releasable buckle for the webbing of safety harnesses comprising a first rigid buckle portion having a webbing attaching cross bar, a pair of spaced parallel side bars rigidly connected at the ends of the webbing attaching cross bar in right angle relation therewith, and a second cross bar defining an abutment bar connected to those ends of the side bars remote from the webbing attaching cross bar, said cross bars and side bars defining an inserting opening, and a second buckle portion comprising a pair of relatively spaced parallel cross bars, a side bar secured at its ends to similar ends of one of the cross bars of the second buckle portion, a second side bar secured at its ends to the opposite ends of the cross bars of the second buckle portion, and a webbing attaching cross bar secured to the side bars of the second buckle portion between and in spaced relation with respect to the cross bars of the second buckle portion, the outer side surfaces of the side bars of the second buckle portion being spaced apart less than the width of the inserting opening of the first buckle portion, whereby the second buckle portion may extend into the inserting opening of the first buckle por-

tion, the side bars of the first buckle portion being provided with extensions projecting into and communicating with said inserting opening adjacent to the second of its cross bars, the upper surface of one of said inward extensions and the upper surface of the cross bar remote from the webbing attaching cross bar defining a slideway upon which one of the side bars of the second buckle portion moves, the other of said inward extensions being projected so that its top surface is above the plane of said slideway, the other side bar using said top surface as a slideway, each side bar of the first buckle portion having an inner side recess, said recesses facing each other and communicating with the inserting opening of said first buckle portion, said webbing attaching bar of the second buckle portion at its lower surface directly facing the first buckle portion and being spaced when the buckle portions are assembled a distance above the slideway at least equal to the thickness of webbing adapted to be attached to the second buckle portion.

2. A quickly releasable buckle and webbing for safety harnesses, said buckle having a structure as defined in claim 1 and said belt webbing including a webbing end fixedly secured to the end cross bar of the first buckle portion and having its opposite end extended through the inserting opening of the first buckle portion and adjustably looped around the webbing attaching bar of the second buckle portion, to provide a free webbing end engaging the adjacent cross bar of the buckle portion and a main webbing portion frictionally forcing said adjusting end of the webbing portion against the adjacent end cross bar of the first buckle portion so the strap is free of direct clamping between said webbing cross bar

of the second buckle portion and the adjacent cross bar of the first buckle portion.

3. A buckle construction, including a buckle as defined in claim 1 in which the extension on one side bar of the first buckle portion has its slideway surface projected in spaced relation above the slideway surface of said abutment bar of the second buckle portion when the buckle portions are assembled, and in which the extension of the other side bar of the first buckle portion has its upper slideway surface in the same plane as the slideway surface of the abutment bar of the second buckle portion, said side bar of the second buckle portion at the end of the webbing attaching cross bar of the second buckle portion above the shorter extension of the first buckle portion being provided with a downwardly extending slide footing adapted to slide upon the slideway of the abutment bar of the first buckle portion and the slideway of the extension which lies in the same plane as the slideway of said abutment bar.

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