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(54) IMPROVEMENTS IN OR RELATING TO A BUCKLE FOR SAFETY BELT
 AND SIMILAR EQUIPMENT AND METHOD FOR ITS MANUFACTURE

(71) I, PATRICE MARIE BAYON, a French citizen, of Le Prieuré, Avrillé, Maine-et-Loire, France, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a buckle for safety-belt or similar equipment.

According to the invention, a buckle comprises a frame of substantially channel shape with a base and two sides extending over a portion of the length of the base. One end of the base being connected to a fixing means and the other end forming part of a passage for a keeper, said base having upright lugs for laterally guiding a swivelling safety-member hinged on a rod passed through oblong apertures in the sides of the frame and which are placed in such a way that said rod is simultaneously urged against the base of said frame and against an end of said upright lugs, a spring placed between said frame and said safety-member biasing the safety-member towards a position in which teeth of the safety-member are held in an aperture in the keeper when located in said passage.

The invention also relates to a manufacturing method of the main portion of the buckle, i.e. the frame. According to this second aspect of the invention, a metal plate is cut to form, in the same, convergent oblong apertures each intercepting an imaginary line corresponding to a fold line separating a plane base portion from a respective portion having to be bent to form one of the sides, guides are simultaneously stamped in the side portions, while also simultaneously apertures aligned with said stamped pieces and extending at least for a part along the imaginary lines are formed, and a folding step is then performed along said lines to turn-up the sides in a second operation.

Various other features of the invention are shown in the following detailed description.

Embodiments of the invention are shown

by way of non-restrictive examples in the accompanying drawings, wherein:—

Fig. 1 is an exploded perspective view showing the main components of a buckle according to the invention.

Fig. 2 is a partially exploded top plane view illustrating the arrangement of some of the elements of the buckle.

Fig. 3 is a developed plane view of the base of the buckle, showing preferred features of the invention.

Fig. 4 is a longitudinal cross-section of the buckle placed in its working position.

Fig. 5 is a partial cross-section substantially taken along line V—V in Fig. 4.

Fig. 6 is a cross-sectional view similar to Fig. 4 of a variant.

Fig. 7 is a cross-sectional view similar to Fig. 6 illustrating a characteristic position of the variant shown in Fig. 6.

The buckle illustrated in the drawings comprises a frame 1 shaped as a channel with a base 2 and sides 3, 4 extending along past the length of the base 2 and at right angles thereto. The frame 1 is designed to be connected to the body of a vehicle by fixing means which, in Fig. 1, are illustrated as a cable 5 provided at its free end with a projecting tip 6 to be fitted into an aperture 7 formed in the frame 1 at one end of the base 2. The fitting means can of course, be different and, for example, can be constituted by a fitting plate, a strip or other similar parts comprising means connectable to the body 1, and, for example, fitted into the aperture 7.

Lugs 8 and 9 extend from the base 1 between the sides 3, 4 in parallel with the same. An aperture 10 is made substantially at the median portion of the base 2 to form a catch 11 edged by two apertures 11a, 11b and to form opposite the catch 11 an axially extending recess 12.

Apertures 13, 14 are made in the sides 3, 4. As shown in Fig. 3, the apertures 13, 14 are of an oblong shape and extend obliquely, with their ends 13a and 14a respectively cutting fold lines 15, 16 between the sides 3, 4 and the base 2.

The obliqueness of the oblong apertures

13, 14 is exaggerated in the drawings to make better understood a feature of the invention which is hereinbelow described.

Since said oblong apertures cut the fold lines 15, 16, it is ensured that, after the folding of the sides 3, 4, from the base as will be described later the oblong apertures extend to the geometrical plane defined by the top of the base 2. The oblong apertures 13, 14 are designed to house a rod 17 whose length is selected, as shown in Fig. 2, so that the rod does not protrude substantially beyond the sides 3, 4 when said rod is positioned.

Due to the obliqueness of the oblong apertures 13, 14 and the fact that the apertures 13, 14 extend to the base 2, the rod 17 is able to bear against said base 2. The position of the oblong apertures 13, 14 is, further, selected so that the rod 17 can bear against the lugs 8, 9 when it rests on the bottom 2.

The rod 17 is used as a hinge for a safety-member 18 which, in the considered example, has the shape of an inverted channel having a top 19 and two sides 20, 21. Teeth 22 and lugs 23 are respectively formed in the sides 20, 21, and the lugs each have a hole 23a for the passage of the rod 17. A ramp 24 is formed in front of each of the teeth 22.

The width of the safety-member 18 is selected so that the sides 20, 21 thereof are laterally guided by the opposite faces of the lugs 8, 9. Openings 25 are formed in the base 2 of the frame 1 to receive the teeth 22 as shown in Fig. 4. The sides 20, 21 of the safety-member 18 are intersected by a pin 26 at their ends above the ramps 24.

The safety-member 18 can, possibly, be reinforced by the addition of small plates 27 (Fig. 1) having a shape corresponding to one of the sides 20 or 21, said small plates being placed either outside the sides 20, or inside the sides 20 and, consequently, being held in place, on one hand by the rod 17 and, on the other hand, by the pin 26. The drawing shows that the small plates 27 have teeth 22 similar to those in the sides 20, 21 of the safety-member.

A spring 28 is placed between the base 2 of the frame 1 and the rear portion of the safety-member 18 as shown in the various figures of the drawings. This spring is under compression and tends always to hold the teeth 22 of the safety-member in the openings 25 of the frame with the ramps 24 extending above the base 2.

The spring 28 tending to lift the safety-member 18, also tends to lift the rod 17 which bears against the upper portion of the oblong apertures 13, 14 while being slightly spaced from the lugs 8, 9. The safety-member and the rod are so prevented from oscillating and the vibrating inside the buckle.

The sides 3 and 4 have opposed guides 29, 30 which extend above the base 2 at a distance therefrom corresponding substantially to the thickness of the anterior portion of a keeper 31 having a catch aperture 32 and an aperture 33 for fixing the safety-belt shown at 34 thereto.

As shown particularly in Fig. 2, when the keeper 31 is positioned, its lower portion is placed beneath the guides 29, 30 and held against the base 2 of the frame 1 by the safety-member 18 urged by the spring 28, the teeth 22 of the safety-member being held in the aperture 32 of the keeper.

The lateral sides of the keeper are placed against the sides 3, 4 and, consequently, the keeper cannot swivel in any direction since it is located between the base 2, the sides 3, 4 and the guides 29, 30. It results therefrom that the only stresses which can be transmitted by the keeper to the teeth 22 of the safety-member 18 are axial tensile stresses directed along the arrow f_1 , which causes the teeth 22 always to work in the best conditions.

It is important to select the radius of the rod 17 in such a way that the geometrical axis 17a of the pin (Fig. 4) be placed in a plane parallel with the plane of the base 2 and extends at least at the level of the plane formed by the top 31a of the keeper 31. Thus, any pulling stress exerted in direction of the arrow f_1 on the teeth 22 can tend only to bring the safety-member into a position wherein it is strictly aligned with the keeper 31, and said keeper cannot be lifted above the base 2 because of the guides 29, 30. There thus exists no risk of involuntarily detaching the safety-member from the keeper whatever be the stress applied by the keeper even if, by any accidental cause, the spring 28 got broken.

It should be noted that a pull exerted by the keeper along the arrow f_1 presses the rod 17 against the base 2 of the frame and simultaneously presses said rod against the rear walls, of the lugs 8, 9 which are adjacent the lateral sides of the safety-member 18. Consequently, the pin 17 is not submitted to any bending stress and is subjected only to shearing stress and is held in various points.

For an easy and economical construction of the frame 1, Fig. 3 shows an initial cutting-out of the various openings, apertures and oblong apertures hereinbefore described in a blank sheet and the cutting-out of the openings 35, 36 transversely aligned with the area where must be formed the guides 29, 30 in the sides 3, 4; the openings 35, 36 being partly formed on the fold lines 15, 16.

This cutting-out operation can, of course, be easily performed with a press in only one working step at the same time as a stamping operation forming the guides 29, 30.

A next working operation consists in folding over the lugs 8, 9 and the sides 3, 4. This second operation can also be easily performed in only one step by means of simple bending tools comprising a hollow punch at right angles with the openings 35, 36 and the base of the oblong apertures 13, 14. In fact, since the openings 35, 36 eliminate the metal near the stamped guides 29, 30 along the fold lines, there is no difficulty in bending the said sides 3, 4. Also the oblong apertures 13, 14 are not distorted upon the bending of the sides since they initially cut the fold lines 15, 16.

A catch 11 is used for holding and guiding the bent end 37a of a small pin 37 bearing against the underside of the base 2 as shown in Fig. 4, and on which is slipped a compression spring 38 whose ends bear, on one hand, against the end of the catch 11 and, on the other hand, on the bottom of the recess 12, as shown in Fig. 2. The spring 38 thus protrudes above the base 2 and is, consequently, compressed by the front end of the keeper 31 when the keeper is introduced into the body 1. When the spring 38 is compressed and the keeper fastened by the teeth 22, the spring 38 holds the keeper against the teeth 20 preventing any vibration of said keeper. On the other hand, when the safety-member 18 is released as hereinbelow described, the spring 38 releases and ejects the keeper 31.

To control the release of the safety-member 18 different means can be provided. In the embodiment of Figs. 4 and 5, a sliding control head 39 is provided with slides 40, 41 enveloping the top of the sides 3, 4 which thus form sliding and guiding surfaces for said sliding head 39. An aperture 42 is provided in each of the sides of the sliding head 39 and said aperture provides a ramp 43 against which bears each end of the pin 26 carried by the end of the safety-member 18, the spring 28 maintaining the sliding head in the position at which the pin 26 is at the lowest point of the ramps 43.

By moving the sliding head in the direction of the arrow f_2 , the ramp 43 lifts the pin 26 and, consequently, the safety-member 18 as well as the small plates 27 which are associated therewith. The teeth 22 are thus disengaged from the aperture 32 of the keeper which can be ejected by the spring 38.

It is advantageous, as illustrated in Fig. 4, that apertures 42 of the sliding head 39 have an upright vertical edge 44 aligned with the pin 36. Actually, in this manner, at the moment of engagement of the keeper 31, its end engages the ramps 24 of the safety-member which causes swivelling of this safety-member, the pin 26 then moving in the aperture 42 without causing any movement of the sliding-head 39.

The whole mechanism as above described is housed in an envelope constituted by two shells 45, 46 connected together by mutual engagement, glueing or by means of screws connecting the same to the body 1. The lateral sides of the envelope are touching the sides of the wings and of the sliding head 39, and thus the shells constituting the envelope, constitute end stop means both for the pin 17 and for the pin 26 which are not otherwise held. In the same way, it is the shell 45 which prevents any downwards movement of the spring 38 and of its guiding pin 37.

It is noted that by suitably adjusting the slope of the ramps 43 for the control of the pin 26, the stroke of the sliding head can be varied to a large extent, and consequently also the force to be exerted thereupon to ensure the lifting of the safety-member 18 when the keeper is released. On the other hand, only a low force is exerted to introduce the keeper because of the relative position of the pin 17 with respect to that of the keeper when guided on the top of the base 2. Actually, the keeper being guided according to a direction substantially aligned with the geometrical axis 17a, the arc of a circle in which swivels the safety-member extends on each side of an imaginary line passing through the axis 17a and extending parallel to the base 2, whereby the extent of distortion of the spring 28 is small.

To facilitate the engagement of the keeper, the shells 45, 46 form convergent guide walls 45a, 46a.

Figs. 6 and 7 show a variant embodiment of the control of the safety-member 18 according to which the pin 26 supports rocker arms 47 on each side of the safety-member; the rocker-arms 47 constitute cam levers bearing against the base 2 by cam surfaces 48, and against an abutment 39a of the sliding head 39 by rounded noses 49.

As shown in Fig. 6, when the sliding head 36 is pushed in the direction of the arrow f_2 , this causes the rocker-arm 47 to swivel and, consequently, to lift the safety-member 18 as shown in Fig. 7, so to disengage the teeth 22.

It is within the scope of the invention to directly connect the ends of the pin 26 to the lateral sides of the sliding head 36 and to swivel it on the base 2 or on the top of the sides 3, 4, which would have also for its effect to lift the safety-member 18 and release the keeper.

WHAT I CLAIM IS:—

1. A buckle for a safety-belt or similar equipment, comprising a substantially channel shaped frame with a base and two sides extending over a portion of the length of the base, one end of the base being connected to a fixing means and the other end forming

part of a passage for a keeper provided with at least one opening, said base further having upright lugs for laterally guiding a swivelling safety-member hinged on a rod passed through oblong apertures in the sides of the frame and which are placed in such a way that said rod is simultaneously urged against the base of said frame and against one end of said upright lugs, a spring being placed between said frame and said safety-member and biasing the safety-member towards a position in which teeth of the safety-member are held in an opening in the keeper when located in said passage.

2. A buckle according to claim 1, wherein said oblong apertures are formed slantwise in the sides of the frame, whereby a tensile force exerted by the keeper on the teeth of the safety-member presses the rod supporting said safety-member simultaneously against the base and against the lugs.

3. A buckle according to claim 1 or 2, wherein the passage for the keeper is defined by the base, the two sides and by stamped portions protruding from the sides.

4. A buckle according to claim 1, 2, or 3 wherein the radius of the rod on which is hinged the safety-member is selected so that its geometrical axis extends in a plane parallel to the base of the frame and at a distance from the base at least equal to the thickness of the keeper, whereby said geometrical axis is placed in a plane always passing at least at the level of the plane of the upper side of the keeper when the keeper is engaged in the passage.

5. A buckle according to any of claims 1—4, wherein the base of the frame forms a catch, said catch forming a bearing surface for a compression spring placed between the top of said catch and the bottom of the safety-member, said catch further forming a guide for a bent end of a small pin extending longitudinally beneath the frame and on which is slipped a compression spring extending axially to said frame and bearing against the front end of the keeper when said keeper is engaged in the passage, whereby said spring acts both to compensate for clearances between the keeper and the frame and as a component for ejecting the keeper upon release of the safety-member.

6. A buckle according to any of claims 1—5, wherein the safety-member includes, at the front portion thereof, ramps leading to the teeth, whereby said safety-member is lifted by the action of the keeper against said ramps upon introduction of said keeper into the passage.

7. A buckle according to claim 6, wherein the safety-member is provided, at its portion above the ramps and the teeth, with a transverse pin connected to a control head for causing the swivelling of the safety-member to release the keeper.

8. A buckle according to claim 7, wherein the transverse pin of the safety-member is passed through apertures of the control head, the bottoms, of said apertures forming inclined ramps causing lifting of said transverse pin and, consequently, of the safety-member when said head is slidably moved in a path parallel to the base of the frame.

9. A buckle according to claim 8, wherein the apertures in the head each have a vertical rear wall allowing clearance of the transverse pin upon lifting of the safety-member upon engagement of the keeper, whereby said head is not moved upon said engagement.

10. A buckle according to claim 7, wherein the safety-member is controlled by rocker-arms hinged on the transverse pin carried by said safety-member, said rocker-arms bearing, on the one hand, against the base of the frame and, on the other hand, against an abutment of the sliding control head.

11. A buckle according to claim 7, wherein an envelope surrounds the frame and partly surrounds the head, said envelope forming maintaining means for preventing the removal of the rod hinging the safety-member and of the transverse pin supported by said safety-member, said envelope also preventing the move of the small pin on which is slipped the compression spring for the ejection of the keeper.

12. A buckle according to claim 11, wherein the envelope surrounding the body has a mouth with convergent walls leading to the passage for the keeper.

13. A method of manufacturing the frame of the buckle according to any of claims 1—12, wherein a metal plate is cut to form therein convergent oblong apertures each intercepting an imaginary line corresponding to a fold line separating a plane base portion from a respective portion having to be bent to form one of the sides, guides are simultaneously stamped in the portions forming the sides, while also simultaneously forming apertures aligned with the stamped pieces and extending at least partly along the imaginary lines, and a folding step is then performed along said lines to turn-up the sides in a second working operation.

14. A buckle for a safety belt or similar equipment constructed and arranged substantially as hereinbefore described and shown in the accompanying drawings.

15. A method for the manufacture of the base of the buckle as claimed in Claim 14 substantially as hereinbefore described.

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