

[54] **BUCKLE ASSEMBLY**

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[58] Field of Search 24/265 BC, 187, 189, 191, 24/192, 170, 193, 163, 178, 188

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[57] **ABSTRACT**

A buckle assembly for use with belts and straps having

a frame and a pivot pin formed of a suitable resilient material such as plastic. The frame has a pivotal cross-member and a support cross-member, while the pivot pin has a first end portion, a second end portion, and a main body portion connecting the two end portions. The pivotal cross-member has a cylindrical shaft portion extending between two parallel cylindrical support plates, and the first end portion of the pivot pin has a radial passage which tapers inwardly to a transverse central opening. The buckle assembly may be manually assembled by inserting the first end portion of the pivot pin between the support plates and forcing the shaft portion through the radial passage into resilient receipt in the central opening. In use, the hinge pin pivots about the pivotal cross-member but the tightness of the fit between the various surfaces of the pivot pin and the pivotal cross-member maintains the pivot pin in a plane perpendicular to a plane through the frame and substantially eliminates lateral movement or play of the pivot pin. This facilitates insertion of the pivotal pin through a hole in the belt or strap to which the frame is attached. In use, the tension of the belt pulls the second end portion of the hinge pin into bearing contact with the support cross-member. The second end portion may have outer and inner hook portions projecting downwardly therefrom to define a slot therebetween which snugly receives the support cross-member and provides the hinge pin with additional strength.

5 Claims, 6 Drawing Figures

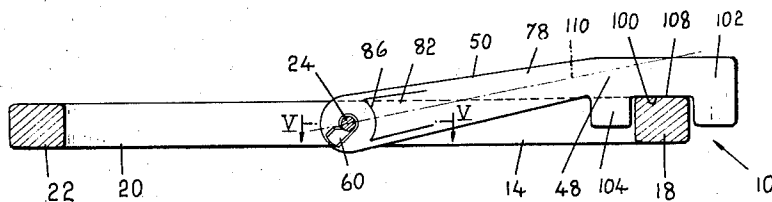


Fig. 1.

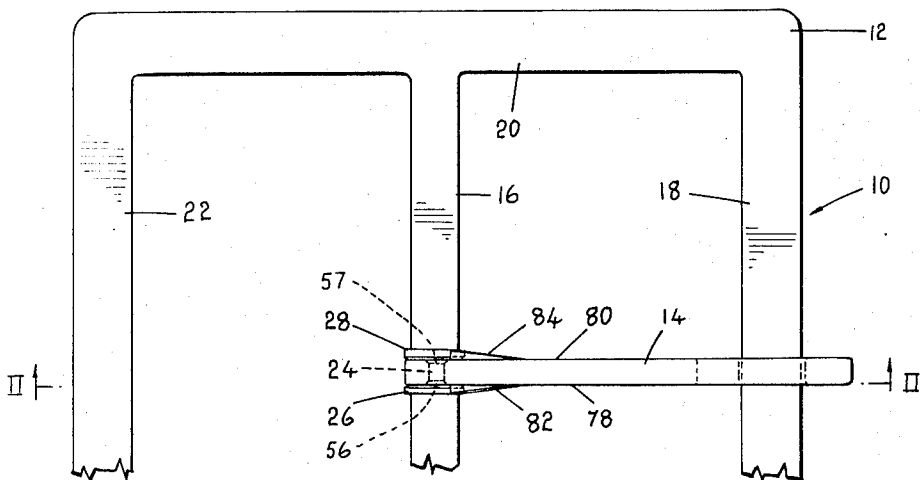


Fig. 2.

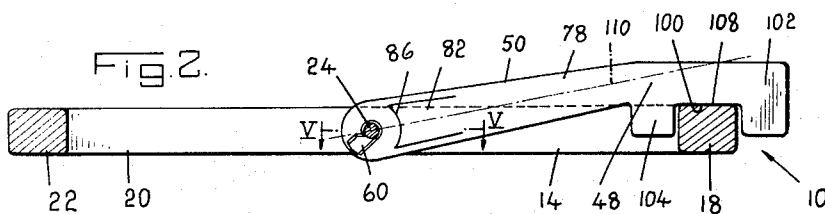


Fig. 3.

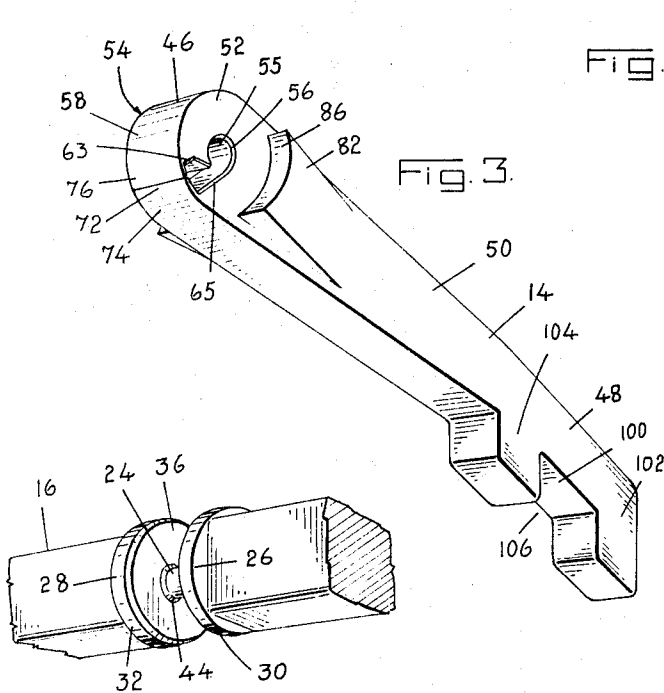


Fig. 4.

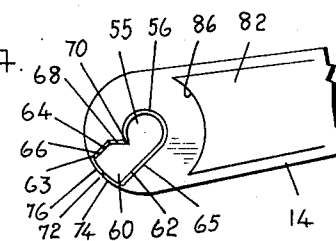


Fig. 5.

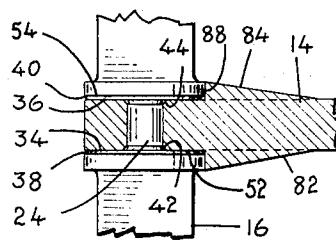
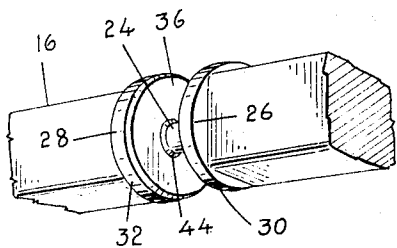


Fig. 6.



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BUCKLE ASSEMBLY

BACKGROUND OF THE INVENTION

The invention relates generally to buckle assemblies used with belts and straps and more particularly to a buckle assembly formed of a resilient material.

In the past, buckle assemblies having a metal pivot pin attached to a metal frame have been widely used. These buckle assemblies have had the disadvantages that the attachment of the hinge pin to the frame is relatively difficult, and the pivotal connection formed permits the extended end of the pivot pin to move laterally, thereby making it more difficult to insert the pivot pin through a hole in the belt. Other disadvantages of metal buckle assemblies are that they are relatively expensive to manufacture, subject to corrosion, difficult to form into desired shapes, difficult to colour, cold to the touch, relatively heavy, subject to metal detection and of some danger to the wearer as they have sharp corners which do not easily yield or fracture under compression.

More recently, attempts have been made to overcome some of these disadvantages by forming buckle assemblies of plastic. However, these previous plastic buckle assemblies have still had the disadvantages that they are difficult to assemble by attaching the hinge pin to the frame, and that the pivotal connection formed still permits lateral play of the extended end of the hinge pin which makes it more difficult to insert the hinge pin through a hole in the belt or strap to which it is attached than if the hinge pin merely pivoted in a single plane. This difficulty in assembling those buckle assemblies adds significantly to the cost of the buckle assemblies which are otherwise quite economical to manufacture.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to at least partially overcome these disadvantages by providing a buckle assembly which is relatively easy to manually assemble and which has a pivot pin formed of a suitable resilient material which pivots in a single plane with relatively little lateral movement from that plane.

To this end, in one of its aspects, the invention provides a buckle assembly comprising a frame and a hinge pin, the frame including a pivotal cross-member and a parallel support cross-member, the hinge pin having first and second end portions, the first end portion being adapted to be resiliently pivotally connected to the pivotal cross-member, the support cross-member of the frame being rigidly located relative to the pivotal cross-member and adapted to support the second end portion of the hinge pin when the first end portion is pivotally connected to the pivotal cross-member and the buckle assembly is in use.

In another of its aspects, the invention provides a buckle assembly comprising a frame and a hinge pin, the frame including a pivotal cross-member and a parallel support cross-member, the pivotal cross-member having a cylindrical shaft portion, the hinge pin being elongated and having a first end portion, a main body portion and a second end portion, the first end portion having an outer surface, a central cylindrical transverse opening adapted to pivotally receive the shaft portion, and a passage with at least one tapered side extending

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from the outer surface to the central opening, the passage adapted to permit resilient insertion of the shaft portion of the pivotal cross-member through the passage into retained pivotal receipt in the central opening, the support cross-member of the frame being rigidly located relative to the pivotal cross-member and adapted to support the second end portion of the hinge pin when the shaft is in pivotal receipt in the central opening and the buckle assembly is in use.

Further objects and advantages of the invention will appear from the following description taken together with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a portion of a buckle assembly according to a preferred embodiment of the invention;

FIG. 2 is a sectional view along line II—II in FIG. 1;

FIG. 3 is a perspective view of a hinge pin according to the embodiment of the invention seen in FIG. 1;

FIG. 4 is a front elevation view of a portion of the hinge pin shown in FIG. 3;

FIG. 5 is a sectional view taken along line V—V in FIG. 2; and

FIG. 6 is a perspective view of a portion of the pivotal cross-member of the frame of a buckle assembly according to the embodiment of the invention seen in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference is first made to FIG. 1 which shows a buckle assembly 10 having a frame 12 and a hinge pin 14. The frame 12 has a pivotal cross-member 16 and a support cross-member 18 rigidly located parallel to each other by side members 20. The frame shown also has an additional cross-member 22 although this is not necessarily the case. All of the members of the frame 12 of the buckle assembly shown are generally rectangular in cross-section, although this similarly is not necessarily so. The frame 12 and the hinge pin 14 are preferably formed of suitably resilient plastic by a conventional method such as injection molding. However, the frame 12 could be formed of a suitable non-resilient material.

As best seen in FIG. 6, the pivotal cross-member 16 has a cylindrical shaft portion 24, extending between first and second support plates 26, 28. These support plates 26, 28 have cylindrical outer surfaces 30, 32 and opposing parallel flat faces 34, 36. The outer edge 38, 40 of each support plate, formed where the outer surfaces joins the flat face, is preferably bevelled to facilitate insertion of the hinge pin between the support plates. Similarly, the inner corners 42, 44, formed where the flat faces 34, 36 join the cylindrical shaft portion 24, are preferably chamfered to provide the shaft portion with additional strength.

As best seen in FIG. 3, the hinge pin 14 is elongated and generally rectangular in cross-section and has a first end portion 46, a second end portion 48 and a main body portion 50 connecting the first and second end portions. The first end portion 46 has first and second parallel flat side surfaces 52, 54 and a central cylindrical transverse opening 55 extending therebetween. The opposite rims 56, 57 of the central opening 55 formed where the opening 55 meets the side surfaces

52, 54 are bevelled to correspond to chamfered inner corners 42, 44. The first end portion 46 also has a cylindrical outer surface 58 and a passage 60 extending between the cylindrical outer surface 58 and the central opening 55. The passage 60 has first and second sides 62, 64 which form outer bevelled corners 63, 65 with the side surfaces 52, 54 to match chamfered inner corners 42, 44 to facilitate assembly. The passage 60 is narrower adjacent the central opening 55 than adjacent the outer surface 58. This may be provided by having one or both of these sides 62, 64 converge towards the other as they extend inwardly towards the central opening 55. Alternatively, as clearly seen in FIG. 4, the first side 62 may be straight and flat, with the second side 64 having a first flat portion 66 extending from the outer surface 58 parallel to the first side 64 and a second flat portion 68 extending from the first flat portion 66 to the central opening 55. As shown, this second flat portion 68 converges towards the first side 62 to form a retaining ridge 70 adjacent the central opening 55. The passage 60 is rectangular in cross-section and defines a rectangular opening 72 in the cylindrical outer surface 58 of the first end portion 46. As seen in FIG. 4, this opening 72 is covered by two flexible concealing lips 74, 76 which extend respectively from the first and second sides 62, 64 of the passage 60 adjacent the outer surface 58. The lips 74, 76 have the form of the cylindrical outer surface 58, but are sufficiently flexible to permit insertion of the shaft portion 24 of the pivotal cross-member 16 into the passage 60, and sufficiently resilient to resume their original position concealing opening 72 following insertion of the shaft. In the preferred embodiment shown, the two concealing lips 74, 76 are of equal size and extend to contact each other in the middle of opening 72, but it is apparent that one of the lips could be larger than the other or even that there could be only one concealing lip extending from one side of the passage 60 to contact the opposite side.

The generally rectangular main body portion 50 of the hinge pin 14 also has first and second parallel flat side surfaces 78, 80 from which first and second wing portions 82, 84 slope outwardly towards the first end portion 46. The wing portions 82, 84 are rectangular in cross-section and each terminate in a concave cylindrical end surface 86, 88 adjacent the first end portion 46.

The second end portion 48 of the hinge pin 14 has a lower surface 100 from which outer and inner hook portions 102, 104 project downwardly to form a slot 106 therebetween. The slot 106 is rectangular in cross-section and shaped to snugly receive the rectangular shaped support cross-member 18 with the lower surface 100 in bearing contact with the support cross-member when the buckle assembly is in use. As best seen in FIG. 2, the hinge pin 14 bends where the main body portion 50 meets the second end portion 48 so that the lower surface 100 of the second end portion 48 is flush with the upper surface 108 of the support cross-member 18 in this position. This may also be provided by having the main body portion 50 curved along its length.

The hinge pin 14 may be easily attached to the pivotal cross-member 16 to assemble the buckle assembly 10. The frame 12 is positioned on a flat support surface with either side facing upwardly, and the hinge pin 14 is grasped with the passage 60 in the first end portion

46 opening vertically downward. The first end portion 46 of the hinge pin 14 is located between the first and second support plates 26, 28 of the pivotal cross-member 16, and forced downwardly so that the shaft portion 24 of the pivotal cross-member 16 deflects the concealing lips 74, 76 passes through passage 60 resiliently forcing the first and second sides 62, 64 apart, and is resiliently received in central opening 56. As may be seen, the passage 60 is preferably inclined downwardly and forwardly at an angle of approximately 45° from the longitudinal axis 110 of the main body portion 50, as it has been found that this permits the hinge pin 14 to be held at a convenient angle during assembly. In the assembled position, the cylindrical shaft portion 24 of the pivotal cross-member 16 is pivotally received in the transverse opening 55 in the first end portion 46 of the hinge pin 14, and securely retained there by retaining ridge 70. The amount of force necessary to remove the shaft portion 24 from the central opening 55 is predetermined by the size of the shaft portion 24, the size of the retaining ridge 70 and the resiliency of the material forming the first end portion 46. In fact, in the preferred embodiment of the invention, the shaft portion 24 cannot normally be manually removed from the opening 55 without damaging the buckle assembly. The resiliency of the first end portion 46 not only permits easy assembly of the buckle assembly while providing that the fit of the shaft portion 24 in the central opening 55 is sufficiently tight, but also permits pivotal movement of the hinge pin 14 with respect to the frame 12. In the assembled position, the first and second flat side surfaces 52, 54 of the first end portion 46 frictionally engage the opposing parallel flat faces 34, 36 of the first and second support plates 26, 28. Similarly, as the hinge pin 14 is pivoted, the cylindrical end surfaces 86, 88 of the first and second wing portions 82, 84 of the main body portion 50 slidably engage a portion of the cylindrical outer surfaces 30, 32 of the first and second support plates. The close fit of these three different sets of surfaces in the assembled position eliminates or substantially reduces the lateral movement or "play" of the hinge pin, while at the same time permits it to pivot with respect to the frame in a single plane which is perpendicular to a plane through the frame. The size of the parts forming the various surfaces and therefore the tightness of the fit between the pivot pin and the frame are somewhat dependent upon the use to which it is intended to put the assembled buckle assembly. However, in the preferred embodiment shown, the cylindrical shaft portion 24 and the central transverse opening 55 are formed size to size; the width of the first end portion 46 of the hinge pin 14 and the distance between the first and second support plates 26, 28 are formed size to size; and the cylindrical end surfaces 86, 88 of the first and second wing portions 82, 84 are formed to have a diameter of curvature size to size with the diameter of the first and second support plates 26, 28.

In use, the hinge pin 14 pivots about the pivotal cross-member 16 in a single plane perpendicular to the frame 12, which facilitates insertion of the hinge pin 14 through a hole in the belt or strap to which the frame 12 is attached. When the hinge pin 14 has been inserted through a hole in the belt, the tension of the belt pivots the hinge pin 14 to a position in which the second end portion 48 of the hinge pin 14 is supported by the lower surface 100 being in bearing contact with the upper

surface 108 of the support cross-member 18. Pivot pins which are intended to be used for heavy duty uses or which are small in size may be provided with an outer hook portion 102, or with outer and inner hook portions 102, 104 to give them additional strength. If the pivot pin 14 has an outer hook portion 102, the tension of the belt deflects the main body portion 50 of the hinge pin 14 and thereby pulls the hook portion 102 against the support cross-member 18. If the pivot pin 14 has outer and inner hook portions 102, 104, as shown, with the cross-member 18 snugly received in the slot 106 defined therebetween, the deflection of the hinge pin is additionally resisted by a torsional force exerted by the cross-member 18 on the second end portion 48 of the hinge pin 14.

In addition, when the hinge pin is deflected by a load on the belt, a portion of the load is transmitted to the cross-member 16 through the end surfaces 86, 88 of the first and second wing portions 82, 84 abutting respectively on the outer surfaces 30, 32 of the first and second support plates 26, 28. This distribution of the load forces increases the load to which the buckle assembly may be subjected without failure, and is of particular importance in increasing the resistance of the buckle assembly to failure due to impact loading.

Although the disclosure describes and illustrates a preferred embodiment of the invention, it is to be understood that the invention is not restricted to that particular embodiment.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A buckle assembly comprising a frame and a hinge pin, the frame including a pivotal cross-member and a parallel support cross-member, the pivotal cross-member having a cylindrical shaft portion, the hinge pin being elongated and formed of a suitably resilient plastic and having a first end portion, a main body portion and a second end portion, the first end portion having an outer surface, a central cylindrical transverse opening adapted to pivotally receive the shaft portion, and a passage with first and second opposed sides extending from the outer surface to the central opening, the first side being flat, the second side having a first flat portion extending from the outer surface of the first end portion parallel to the first side, and a second flat portion converging towards the first side as it extends from the first flat portion to the central opening to form a retaining ridge adjacent the central opening, the passage adapted to permit resilient insertion of the shaft portion of the pivotal cross-member through the passage into retained pivotal receipt in the central opening, the support cross-member of the frame being rigidly located relative to the pivotal cross-member and adapted to support the second end portion of the hinge pin when the shaft is in pivotal receipt in the central opening and the buckle assembly is in use.

2. A buckle assembly as claimed in claim 1, wherein the passage defines a rectangular opening in the outer

surface of the first end portion, having a flexible concealing lip extending from at least one side of the passage adjacent the outer surface of the first end portion to at least partially cover the said opening.

3. A buckle assembly comprising a frame and a hinge pin, the frame including a pivotal cross-member and a parallel support cross-member, the pivotal cross-member having a cylindrical shaft portion, extending between first and second support plates with parallel opposed faces and cylindrical outer surfaces, the hinge pin being elongated and formed of a suitable resilient plastic and having a first end portion, a main body portion and a second end portion, the first end portion having an outer surface, a central cylindrical transverse opening adapted to pivotally receive the shaft portion, a passage with at least one tapered side extending from the outer surface to the central opening, the passage adapted to permit resilient insertion of the shaft portion of the pivotal cross-member through the passage into retained pivotal receipt in the central opening, and first and second parallel flat side surfaces adapted to frictionally engage the respective faces of the first and second support plates when the shaft is in pivotal receipt in the central opening, and the main body portion of the hinge pin being rectangular in cross-section with first and second side surfaces and having first and second wing portions sloping outward from the respective first and second side surfaces towards the first end portion, the first and second wing portions each terminating in a cylindrical end surface adjacent the first end portion, each cylindrical end surface being adapted to frictionally engage a portion of the cylindrical outer surface of the respective one of the first and second support plates when the shaft is in pivotal receipt in the central opening, the support cross-member of the frame being rigidly located relative to the pivotal cross-member and adapted to support the second end portion of the hinge pin when the shaft is in pivotal receipt in the central opening and the buckle assembly is in use.

4. A buckle assembly as claimed in claim 3, wherein the second end portion of the hinge pin has a lower surface with an inner and an outer hook portion extending downwardly therefrom to define a slot therebetween, the support member being snugly received in the slot with a portion of the lower surface being in bearing contact with the support cross-member when the buckle assembly is in use.

5. A buckle assembly as claimed in claim 3, wherein the support cross-member has a uniform rectangular cross-section and the second end portion of the hinge pin has a lower surface with an inner and an outer hook portion extending downwardly therefrom to define a slot therebetween, the slot being rectangular in cross-section to snugly receive the support cross-member with a portion of the lower surface in bearing contact with the support cross-member when the buckle assembly is in use.

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