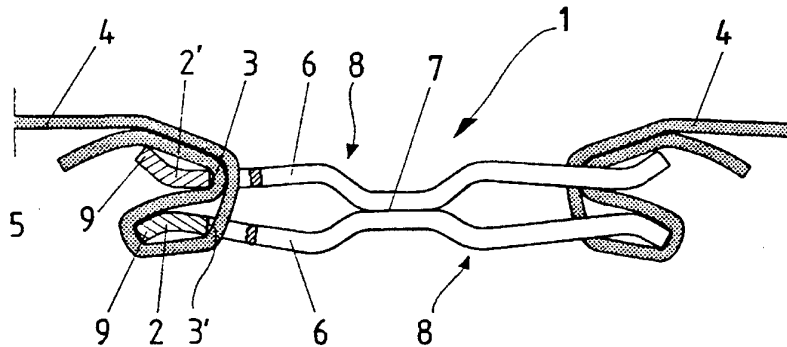




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/FI94/00065</p> <p>(22) International Filing Date: 16 February 1994 (16.02.94)</p> <p>(30) Priority Data: 930688 17 February 1993 (17.02.93) FI</p> <p>(71)(72) Applicant and Inventor: VAARA, Erkki [FI/FI]; Likolammentie 6, FIN-41160 Tikkakoski (FI).</p> <p>(74) Agent: HELKE, Kimmo; Kespat Oy, P.O. Box 601, FIN-40101 Jyväskylä (FI).</p>	<p>(81) Designated States: US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i> <i>In English translation (filed in Finnish).</i></p>	

(54) Title: FASTENING DEVICE



(57) Abstract

The object of the invention is a load belt clasp (1) for locking the two ends of a load belt (4) to one another, which includes on both sides a loop bar (2) and, in the centre of the direction of pull of this or in the region of it, a bending edge (3) of a counter bar (2'). The load belt clasp (1) consists essentially of two sheet metal components (6) attached to one another, both of which have an opening in the centre and at least one of which forms loop bars (2) that border the opening and at least one of which forms counter bars (2') with bending edges (3) that border the opening.

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FASTENING DEVICE.

The object of the invention is a load belt clasp for locking the two ends of a load belt to one another, which includes a loop bar on both sides and in the centre of the direction of pull of this or in the region of it a bending edge of a counter bar, in which case the end of the load belt can be brought over the bending edge from the opposite side of the loop bar and further threaded round the loop bar and finally round the bending edge back to the direction of pull, when part of the load belt remains between the incoming load belt and the bending edge, thus creating a friction lock of the tensioned load belt.

A load belt clasp of the type referred to in the introduction is presented in Swedish patent publication number 450621. A self-locking load belt clasp is generally created by arranging a suitable loop bar through an opening formed in the clasp in such a way that a loop of the load belt turned round the loop bar must make a sharp bend, when a friction-locked joint is automatically formed.

The tensile strength of one typical load belt is 1800 kiloponds, but the improved model from the holder of the above patent withstands only 1300 kiloponds. The problem is mainly shearing in the belt, which is in part influenced by deformation under tension due to the construction of the load belt clasp, which in turn create an uneven loading in the cross-section of the belt.

Load belt clasps consisting of two separate plates are presented in patent publications US 3,121,270 and DE-B-1557 535. The straight sheet metal components bend under heavy loads nor is the tensile strength of the load belt properly exploited.

The intention of this invention is to create a new kind of load belt clasp, by means of which the tensile strength of the load belt can be exploited more fully. The characteristic features of a load belt clasp in accordance with the invention are presented in the accompanying Patent Claims. When the load belt clasp is

formed of two sheet metal components, a greater degree of freedom is brought to the construction, which makes possible optimum dimensioning. The load belt clasp is advantageously formed of two similar essentially rectangular sheet metal pieces, both ends of which can act as either a loop bar or counter bar, depending on the direction of the threading of the load belt.

Other advantages and forms of application of the invention appear later.

In what follows the invention is illustrated with reference to the accompanying Figures, which show one load belt clasp in accordance with the invention.

Figure 1 shows the load belt clasp in partial cross-section and the threading of the load belt through it.
Figure 2 shows the load belt clasp in an axonometric view.
Figure 3 shows the construction of the load belt clasp in detail as a partial enlargement.

The load belt clasp 1 is constructed of two pieces 6 of sheet metal, in both of which there is an opening in the centre and which are attached to one another by means of attachment 7, which is advantageously spot welding. When the load belt 4 is secured symmetrically to the load belt clasp 1, no great stresses are created in attachment 7. Even if the attachment fails, the load belts are not able to free themselves. The sheet metal components 6 include loop bar 2 and counter bar 2' as operational parts, the edge of which towards the centre forms bending edge 3. On account of their symmetrical construction these components can change places, if the threading of the load belt takes place from the other side.

The sheet metal components 6 include a flexible bend 8 near to the attachment point and stiffening bend 9 in the loop bar 2 and the counter bar 2', Figures 1 and 2. The stiffening bends 9, which in accordance with the Figures are directed outwards, also

assist in the threading of the load belt. Alternatively the sheet metal pieces can part in a V-shape, i.e. the profile of the piece would be X-shaped. The stiffening bend 9 is practically essential, because in order to create a spring-effect the thickness of the sheet cannot be increased, but additional stiffness is required in the ends.

Figure 3 shows a partial enlargement of the load belt, in which the depression in the one sheet metal component 6 left by the spot welding used as an attachment 7 is drawn. The Figure also clearly shows how the loop bar 2 and the counter bar 2' leave a gap between them, which closes due to tension thus squeezing the load belt into place. This flexing of the loop and counter bars 2 and 2' can be controlled by shaping the spring bend 8.

A 98 g weight load belt clasp in accordance with the Figure, equipped with a 50 mm maximum belt width, in which 2,5 mm St52 tempered steel was used, achieved a breaking strain of 2600 kg, whereas the previously known 93 g weight load belt clasp did not achieved a breaking strain of 200 kg. The loading values can be improved by using boric steel. By means of a load belt clasp in accordance with the invention the tensile strength of the load belt itself can be more fully exploited.

The flexing properties of a load belt clasp manufactured from steel sheet can be illustrated by the following equation:

$$20 \frac{1}{\text{mm}} < \frac{l^3}{Ds^3} < 80 \frac{1}{\text{mm}}$$

in which l is the length of the spring-like arm, d is its width, and s is the thickness of the sheet metal. The most advantageous expression has the value 50 l/mm. Here the spring-like arm is formed of the part at the side of the opening, which extends from the attachment point to the bar.

Naturally, the inventive concept can be applied to a one-sided attachment too for securing a single load belt end, even though applications of this type are not known at present. In order to round the corners the pressed sheet metal components are ground

before attachment. In addition, load belt clasps include painting or plastic coating, which rounds the corners.

Patent Claims

1. A load belt clasp (1) for locking the two ends of a load belt (4) to one another, which includes two sheet metal components, in both of which there is an opening in the centre forming on both sides in one sheet metal component a loop bar (2) and in the centre of the direction of pull of this or in the region of it a bending edge (3) of a counter bar (2'), in which case the end (5) of the load belt (4) can be brought over the bending edge (3) from the opposite side of the loop bar and further threaded round the loop bar (2) and finally round the bending edge (3) back to the direction of pull, when part of the load belt remains between the incoming load belt (4) and the bending edge (3) thus creating a friction lock of the tensioned load belt (4), characterized in that the sheet metal components (6) are attached to one another thus setting at each end the loop bar (2) and the counter bar (2') near to one another at a small distance apart and that at least one sheet metal component is arranged to flex in such a way that under the influence of the load the loop bar (2) and the counter bar (2') press together squeezing the load belt (4) between them and increasing frictional force.

2. A load belt clasp (1) in accordance with Patent Claim 1, characterized in that in at least one sheet metal component there is a spring bend (8) near to the attachment (7) in such a way that beginning from the attachment (7) the spring metal components (6) at first move away from one another and then come close to one another.

3. A load belt clasp (1) in accordance with Patent Claim 1, characterized in that, seen from the side the sheet metal components form an essentially X-shaped piece.

4. A load belt clasp (1) in accordance with Patent Claims 1, 2, or 3, characterized in that the loop or counter bar (2, 2') of at least one sheet metal component includes a transverse stiffening bend (9).

5. A load belt clasp (1) in accordance with one of Patent Claims 1 - 4, characterized in that the attachment (7) between the sheet metal components (6) consists of spot welding.

5 6. A load belt clasp (1) in accordance with one of Patent Claims 1 - 5, characterized in that the initial blanks of the sheet metal components are essentially rectangular, as are their openings.

10 7. A load belt clasp (1) in accordance with one of Patent Claims 1 - 6, characterized in that the aforesaid two sheet metal components (6) are similar and that they are attached to one another on both sides of the opening in the centre in relation to the direction of pull.

15 8. A load belt clasp (1) in accordance with one of Patent Claims 1 - 7, characterized in that the aforesaid two sheet metal components are of heat-treated steel.

20 9. A load belt clasp (1) in accordance with one of Patent Claims 1 - 8, characterized in that the spring properties of the steel load belt clasp are expressed in accordance with the conditions of the following equation:

$$20 \frac{1}{\text{mm}} < \frac{l^3}{Ds^3} < 80 \frac{1}{\text{mm}}$$

25 in which l is the length of the spring-like arm, d is its width, and s is the thickness of the sheet metal.

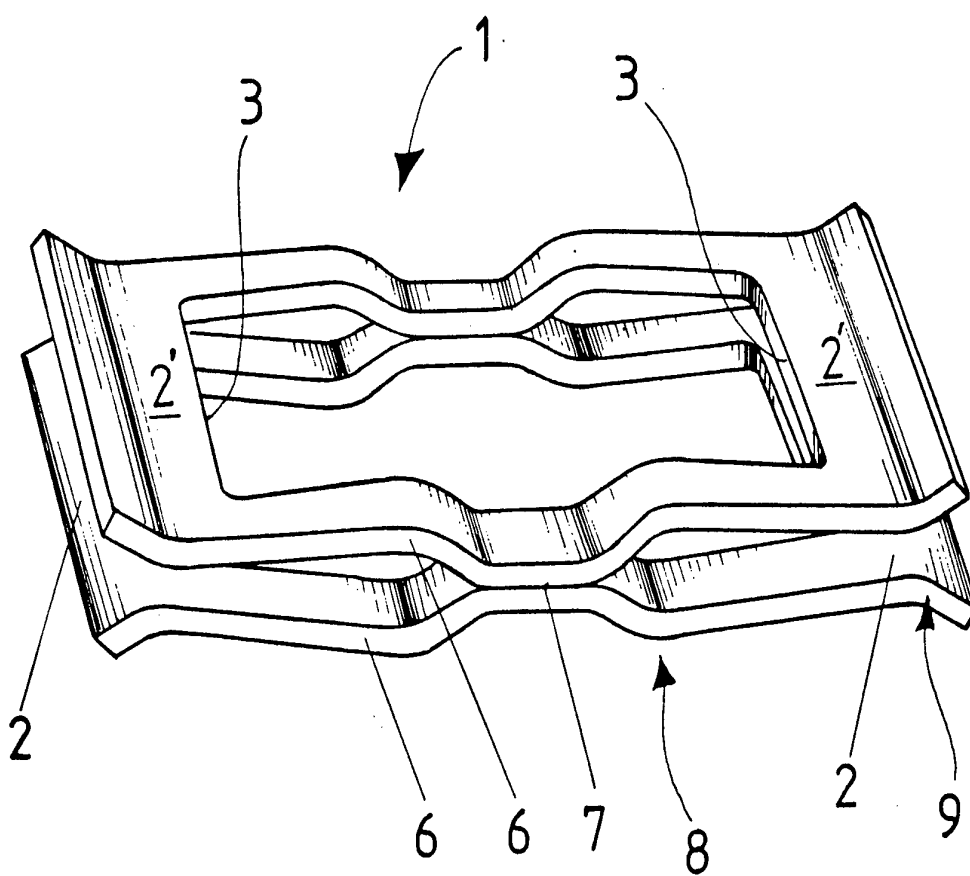


FIG. 2

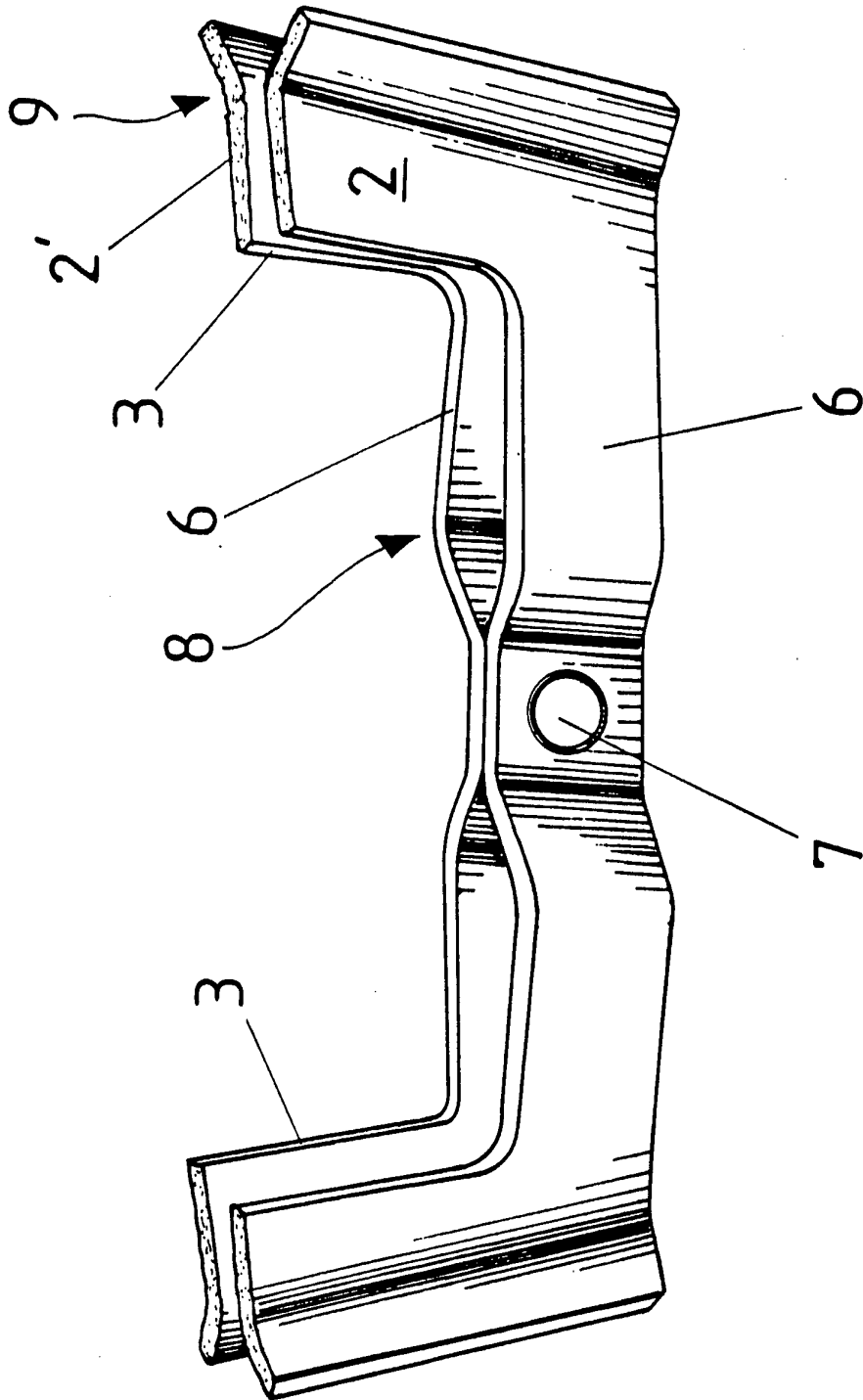


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 94/00065

A. CLASSIFICATION OF SUBJECT MATTER

IPC 5: B65D 63/14, A44B 11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5: B65D, A44B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	SE, B, 450621 (LINVENT AB), 13 July 1987 (13.07.87)	1
A	--	2-9
X	AU, B, 68041/81 (GERRARD STRAPPING SYSTEMS PROPRIETARY LIMITED), 26 January 1984 (26.01.84)	1
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 Further documents are listed in the continuation of Box C.
 See patent family annex.

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INTERNATIONAL SEARCH REPORT
 Information on patent family members

07/05/94

International application No.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE-B- 450621	13/07/87	AU-A- 6722287 EP-A,B- 0290435	01/07/87 17/11/88
AU-B- 68041/81	26/01/84	NONE	
CH-A- 475138	29/08/69	BE-A- 705068 FR-A- 1602642 NL-A- 6713962	15/02/68 04/01/71 16/04/68