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(54) **A roller shutter**

(57) The invention relates to a roller shutter (1), in particular for covering window and/or doors openings, comprising side guides (31), in which a shutter (4) is slidably disposed, said shutter (4) comprising a number of elongated, profiled laths (41) connected together by means of elastic, elongated couplers (42), wherein laths (41) are provided at their elongated edges with cylindrical, elongated recesses (412) with mouths (413), the width (S) of which is smaller than diameter (D) of the recesses (412), and said elongated couplers (42) comprise cylindrical, elongated parts (422), disposed in cylindrical recesses (412) of the laths (41) they connect, and elongated connecting parts (421) the width (s) of which is smaller than diameter (d) of the cylindrical part (422) and smaller than the width (S) of the mouth (413). In order to improve functional properties and durability of the roller shutter, cylindrical parts (422) of the couplers (42) are made of material having the Shore hardness exceeding by at least 50° ShA the Shore hardness of said connecting parts (421) of the couplers (42), and said couplers (42) are formed in a coextrusion process.

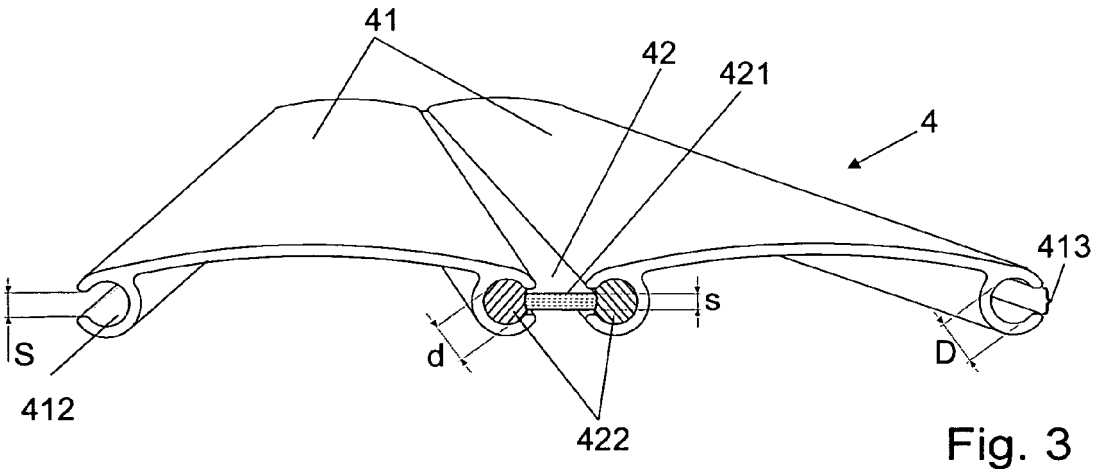


Fig. 3

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## Description

### Technical Field

**[0001]** The present invention relates to a roller shutter, in particular for covering window and/or doors openings, comprising side guides, in which a shutter comprising a number of elongated, profiled laths is slidably disposed.

### Background of the Invention

**[0002]** Various roller shutters are known from the state of art that comprise rigid, profiled laths hinged together along their longitudinal edges directly (an appropriate projection at the first longitudinal edge of the profile of the lath cooperates with an appropriate recess at the second longitudinal edge of the profile of the neighbouring lath) or by means of elastic, elongated couplers made of a homogenous, usually elastomeric material and disposed in elongated, usually of the same shape, recesses at the edges of the laths. While the shutter is rolled in and out it is usually subjected to tensile forces acting perpendicularly to the longitudinal axes of the laths.

**[0003]** Rollers having shutters with laths connected with each other directly are prone to wear due to friction between cooperating laths during rolling a shutter in and out. Furthermore, an action of these friction forces requires a higher force in order to roll a shutter in or out. Rollers of this kind are also noisier in operation.

**[0004]** On the other hand, rollers having shutters with laths connected with each other by elastic couplers are prone to fall apart since tensile forces acting on the couplers lead to their deformation, and in turn to slide the coupling parts thereof out of elongated recesses at the edges of laths. Furthermore, due to the friction between an elastomeric coupler and a rigid recess of a lath, sliding such couplers inside the recesses may impede assembling the roller.

**[0005]** In order to solve the first of the aforementioned problems, UK patent specification GB 2 113 749 A filed January 7, 1982 discloses a roller shutter assembly comprising at least three elongated laths, hinged together along their longitudinal edges, and resilient loading means which urge the shutter towards an opening position, so that each hinge is subjected to a tensile load which tends to separate the two laths it hinges together.

**[0006]** Each hinge comprises an elongated strip of resilient material having enlarged formations along its longitudinal edges, the enlarged formations of each strip being received and retained within longitudinally extending recesses which are formed by respective longitudinal edges of the laths that are hinged together by that strip. Each recess has a longitudinally extending mouth through which the strip extends, the mouth being narrower than both the interior of the recess and the enlarged formation along the longitudinal edge of the strip that is located therein, and the mass of the resilient material of that formation and the configuration of that formation being such that it cannot be squeezed through the mouth during normal usage of the shutter. However, the roller shutter of such a construction blocks rotation of a lath with respect to the strip, which lead to the strip deformation while the shutter is rolled in or out.

**[0007]** Known improvement of this construction involves making the recesses in the laths of the shutter in a cylindrical shape. Such cylindrical recesses cooperating with cylindrical edge parts of elastic couplers provides an additional degree of freedom of a hinged connection between a lath and a coupler that may therefore, to a certain extent, rotate before undergoing deformation.

**[0008]** It has been an object of the present invention to provide a roller alleviating the aforementioned drawbacks, which would feature improved functional properties and durability and which would be easier to assembly.

### Summary of the Invention

**[0009]** The invention provides a roller shutter, in particular for covering window and/or doors openings, comprising side guides, in which a shutter is slidably disposed, said shutter comprising a number of elongated, profiled laths connected together by means of elastic, elongated couplers, wherein laths are provided at their elongated edges with cylindrical, elongated recesses with mouths, the width of which is smaller than diameter of the recesses, and said elongated couplers comprise cylindrical, elongated parts, disposed in cylindrical recesses of the laths they connect, and elongated connecting parts the width of which is smaller than the diameter of the cylindrical part and smaller than the width of the mouth. According to the invention said cylindrical parts of the couplers are made of material having the Shore hardness exceeding by at least 50° ShA the Shore hardness of said connecting parts of the couplers, and said couplers are formed in a coextrusion process.

**[0010]** Provision of a coextruded coupler in which cylindrical parts are harder than connecting parts limits deformation of the cylindrical parts in recesses of the laths while the shutter undergoes tensile forces. Therefore durability of the shutter is increased as compared to shutters known form the state of art made of only one type of elastic material.

**[0011]** Furthermore, harder cylindrical parts of the coupler are easier to slide inside and along the recesses of the laths. This sliding movement is also easier due to increased longitudinal stiffness of the coupler.

**[0012]** Furthermore, shapes of the cylindrical parts of the couplers reduce friction while the shutter is rolled over the rolling shaft.

**[0013]** Preferably said cylindrical parts of the couplers are formed from thermoplastic elastomer (TPE), preferably from thermoplastic polyamide elastomer (TPA), and more preferably from Tefabloc® elastomer, such as "Tefabloc® TO .. 138", and said connecting parts of the couplers are formed from thermoplastic elastomer (TPE),

preferably from TPV elastomer, and more preferably from Santoprene™ material, such as "Santoprene™ 111-45".

**[0014]** Preferably the ratio of the width of the mouth to the diameter of the cylindrical recesses is in the range of 0.3 to 0.7, while the ratio of the width of the elongated coupling part to the width of the mouth of the cylindrical recesses is in the range of 0.5 to 0.8.

**[0015]** Cylindrical parts of the elastic couplers may also be additionally reinforced with cores embodied in the material of the couplers during coextrusion of the couplers.

Brief Description of the Drawings

**[0016]** The invention is presented below in exemplary embodiment and in connection with the attached drawings on which:

Fig. 1 is a schematic perspective view of a roller shutter according to the present invention configured to serve as a roof roller shutter;
Fig. 2 is a cross-sectional view of the roller shutter along the line A-A of Fig. 1,
Fig. 3 is a cross-sectional, perspective view of the shutter shown in Fig. 1,
Fig. 4 illustrates the shutter of the roller shutter in three distinct axial positions between adjoining laths of the shutter, and
Fig. 5 shows another embodiment of a shutter of a roller shutter according to the invention.

**[0017]** A roller shutter 1 shown in Fig. 1 and Fig. 2 comprises a case 2 attached to two side guides 31 connected with a cross beam 32. A shutter 4 is slidably disposed in side guides 31 and may be rolled over a shaft 21 rotationally disposed inside the case 2 and driven by an electric drive system (not shown). Side guides 31 have elongated channels inside of which the edges of the shutter 4 slide while the roller is being rolled in or out. The shutter 4 comprises a number of profiled laths 41 connected together by means of elastic, elongated couplers 42 disposed in recesses of the laths 41.

**[0018]** Details of construction of the shutter 4 are shown in Fig. 3. Laths 41 have a form of substantially rectangular plates made of aluminium and bend archwise to the outside of the shutter. At the inside (or with reference to the drawing - at the bottom) side of the roller shutter, elongated edges of the laths 41 are provided with cylindrical elongated recesses 412 with elongated mouths 413.

**[0019]** Laths 41 are connected together by means of elongated couplers 42. Each coupler 42 is a uniform, coextruded element and comprises an elongated flat connecting part 421 joined with two elongated cylindrical parts 422.

**[0020]** As shown in Fig. 3, diameters (d) of the cylindrical parts 422 of the couplers 42 are close to diameters (D) of the cylindrical recesses 412 of the laths 41 which enables to slide the parts 422 inside the recesses 412 in order to connect adjoining laths 41. The width (S) of the mouth 413 of the recesses 412 is at the same time smaller than the diameter (D) of the cylindrical recesses 412, in order to improve durability of connection with elastic couplers 42 while the shutter 4 is subjected to tensile forces acting perpendicularly to the longitudinal axes of the laths 41. Width (s) of the connecting part 421 is at the same time slightly smaller than the width (S) of the mouth 413, so that cylindrical parts 422 of the couplers 42 may rotate (in a certain range) in recesses 412 of the laths 41 with no deformation of the connecting parts 421, as shown in Fig. 4a and Fig. 4b.

**[0021]** In order to further improve durability of connection of the shutter 4, the connecting parts 421 of the couplers 42 are formed from "Santoprene™ 111-45" elastomer, and cylindrical parts 422 of the couplers 42 are formed from thermoplastic elastomer "Tefabloc® TO .. 138". To manufacture couplers 42 in a coextrusion process, a single extrusion head has been used having a shape corresponding to the shape of the profile of the coupler, to which the materials have been delivered from three extruders, where external extruders delivered elastomer for cylindrical fragments 422, while internal extruder delivered elastomer for connecting part 421, leading to mixing these elastomers at the boundaries of their distributions.

**[0022]** Hardness of connecting parts 421 in a Shore scale amounts about 45° ShA (Shore Durometer Type A), while hardness of the cylindrical parts 422 of the couplers 42 amounts about 90° ShA (about 40° ShD for Shore durometer Type D).

**[0023]** Fig. 4 illustrates a cross-section of the shutter 4 for three axial positions between adjoining laths 41 and 41r, wherein local coordinate systems 51 and 52 have been assigned to elements that rotate during rolling the shutter 4 (laths 41 and cylindrical parts 422).

**[0024]** As shown in Fig. 4a, the shutter 4 is in an unrolled position, so that coordinate systems 51l, 52l, 52r and 51r are parallel to each other.

**[0025]** Fig. 4b illustrates a situation, in which the lath 41r has been rotated with respect to the lath 41l until the bottom surface of the connecting part 421 abutted on the bottom edges of the mouths 413 of the cylindrical recesses 412 of the laths 41l and 41r. In this position the connecting part 421 has not yet been deformed. As shown, each cylindrical part 4221 and 422r is rotated by some angle $\alpha$, wherein the angle of rotation of the lath 41r with respect to the lath 41l is obviously a sum of these rotations and amounts $2\alpha$ ($\alpha + \alpha$).

**[0026]** As illustrated in Fig 4c, further rotation of the lath 41r leads to an elastic deformation of the connecting part 421 that enables further rotation of the lath 41r by some angle $\beta$. Therefore, the total angle of rotation of the lath 41r amounts $2\alpha + \beta$.

**[0027]** Fig. 5 illustrates another embodiment of the roller shutter according to the present invention, where profiles of the laths 41 a are wider and cylindrical parts 422a of the couplers 42a are additionally reinforced with steel

cores 423 that have been embodied in the material (Tefabloc® TO 138) of the couplers 42a during coextrusion thereof.

**[0028]** The above embodiments of the present invention are merely exemplary. The figures are not necessarily to scale, and some features may be exaggerated or minimized. These and other factors however should not be considered as limiting the spirit of the invention, the intended scope of protection of which is indicated in appended claims.

## Claims

1. A roller shutter (1), in particular for covering window and/or doors openings, comprising side guides (31), in which a shutter (4) is slidably disposed, said shutter (4) comprising a number of elongated, profiled laths (41) connected together by means of elastic, elongated couplers (42), wherein laths (41) are provided at their elongated edges with cylindrical, elongated recesses (412) with mouths (413), the width (S) of which is smaller than diameter (D) of the recesses (412), and said elongated couplers (42) comprise cylindrical, elongated parts (422), disposed in cylindrical recesses (412) of the laths (41) they connect, and elongated connecting parts (421) the width (s) of which is smaller than diameter (d) of the cylindrical part (422) and smaller than the width (S) of the mouth (413), **characterised in that** said cylindrical parts (422) of the couplers (42) are made of material having the Shore hardness exceeding by at least 50° ShA the Shore hardness of said connecting parts (421) of the couplers (42), and said couplers (42) are formed in a coextrusion process.

2. The roller shutter according to Claim 1, **characterised in that** said cylindrical parts (422) of the couplers (42) are formed from thermoplastic elastomer (TPE), preferably from thermoplastic polyamide elastomer (TPA), and more preferably from Tefabloc® elastomer, such as "Tefabloc® TO .. 138", and said connecting parts (421) of the couplers (42) are formed from thermoplastic elastomer (TPE), preferably from TPV elastomer, and more preferably from Santoprene™ material, such as "Santoprene™ 111-45".

3. The roller shutter according to Claim 1 or 2, **characterised in that** the ratio of the width (S) of the mouth (413) to the diameter (D) of the cylindrical recesses (412) is in the range of 0.3 to 0.7.

4. The roller shutter according to Claim 1 or 2 or 3, **characterised in that** the ratio of the width (s) of the elongated coupling part (421) to the width (S) of the mouth (413) of the cylindrical recesses (412) is in the range of 0.5 to 0.8.

5. The roller shutter according to Claim 1 or 2 or 3 or 4, **characterised in that** the cylindrical parts (422a) of the elastic couplers (42a) are additionally reinforced with cores (423) embodied in the material of the couplers (42a) during coextrusion of the couplers (42a).

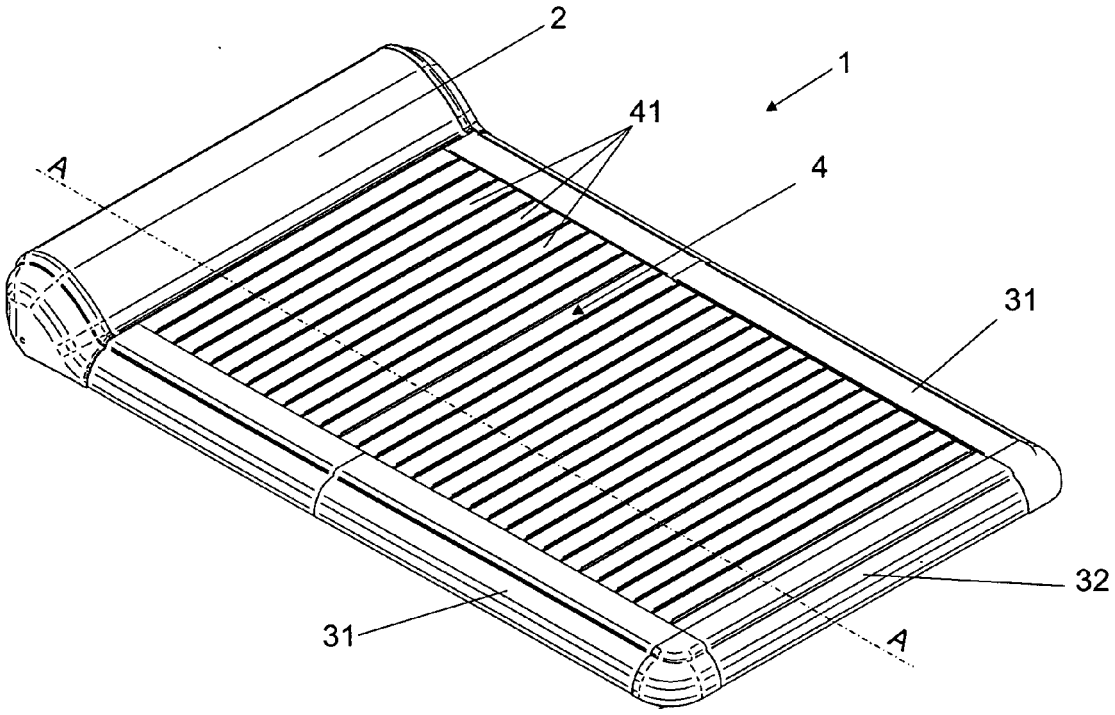


Fig. 1

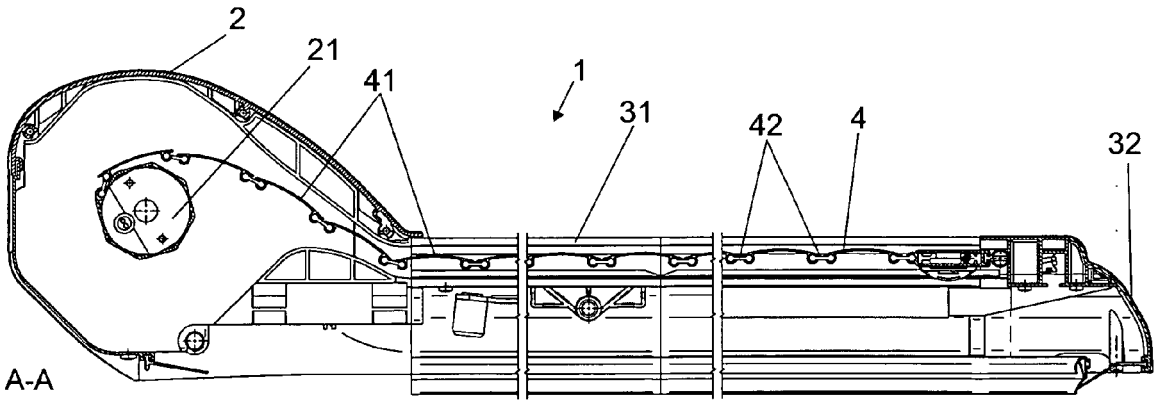


Fig. 2

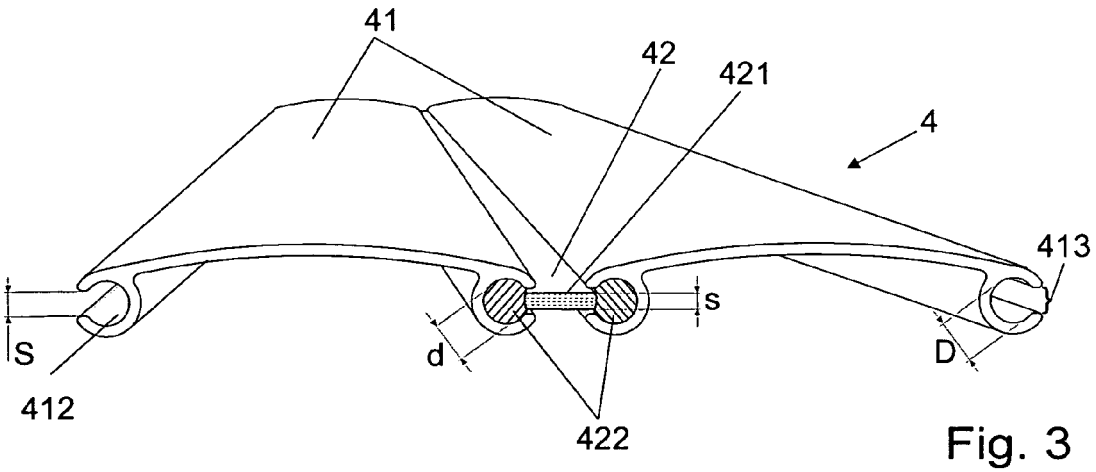


Fig. 3

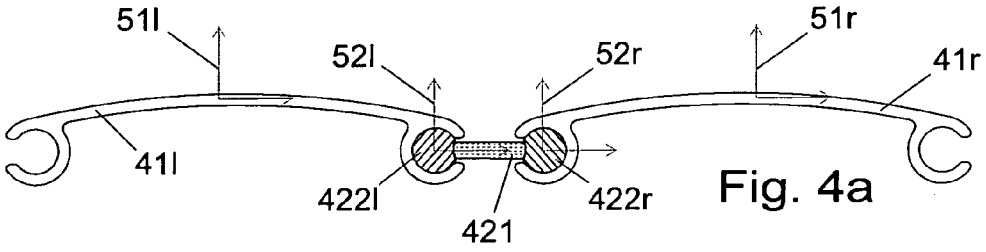


Fig. 4a

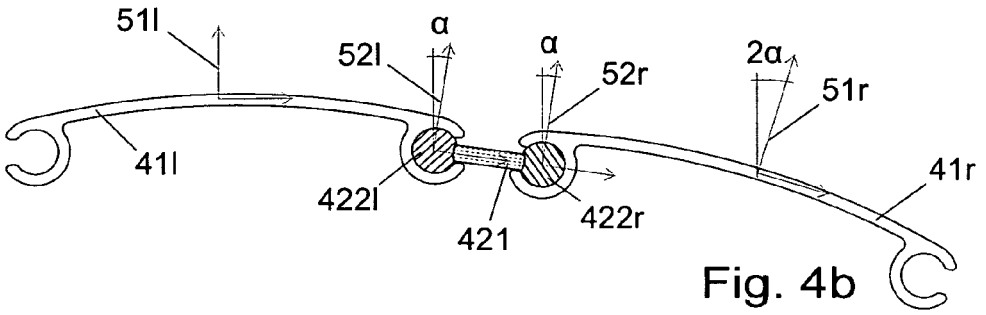


Fig. 4b

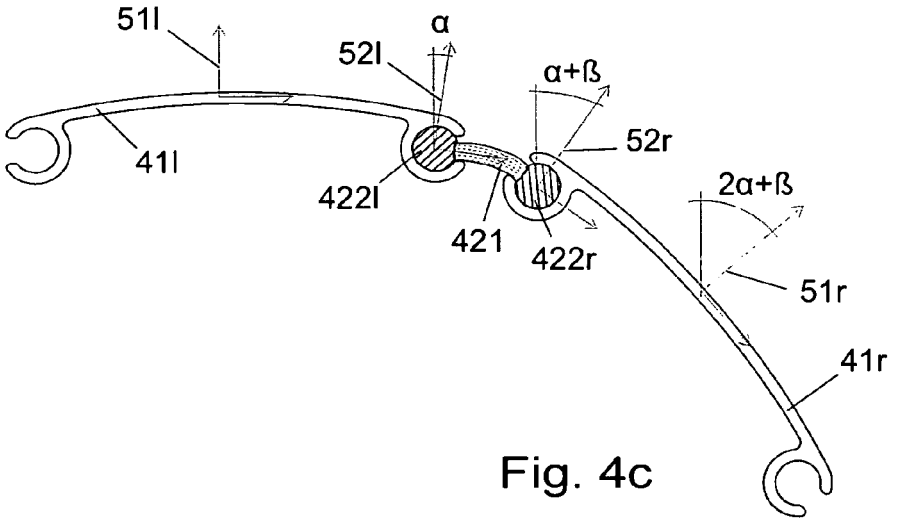


Fig. 4c

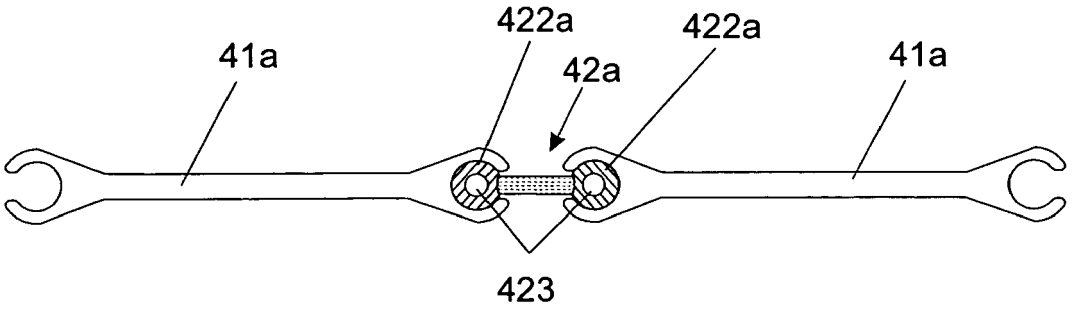


Fig. 5

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# EUROPEAN SEARCH REPORT

Application Number
EP 12 00 4286

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X<br><br><br>Y<br>A | DE 196 53 842 A1 (MIRANDA GIOVANNI [DE]; HANDKE JOERG [DE])<br>25 June 1998 (1998-06-25)<br>* claims 1-8; figure 3 *<br>----- | 1,2<br><br><br>3,4<br>5 | INV.<br>E06B9/15 |
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TECHNICAL FIELDS SEARCHED (IPC)

E06B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 23 October 2012 | Merz, Wolfgang |

CATEGORY OF CITED DOCUMENTS

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1

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23-10-2012

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## REFERENCES CITED IN THE DESCRIPTION

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