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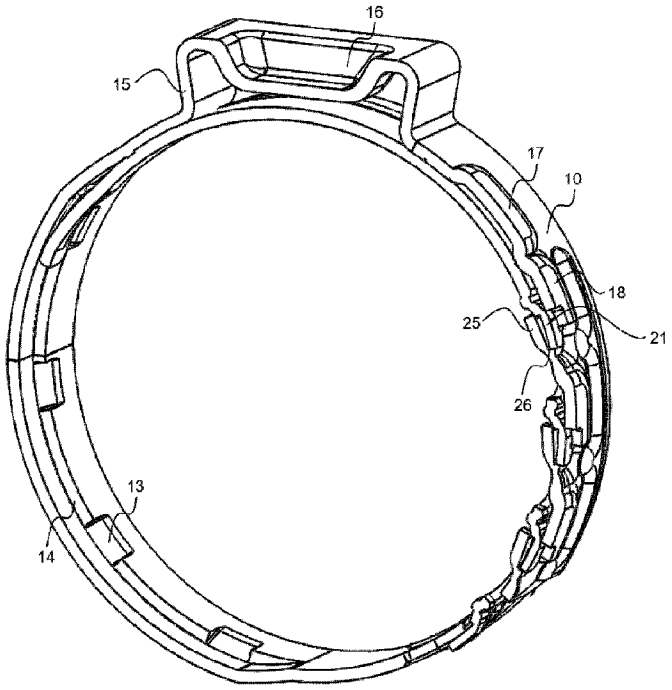
(54) Title: HOSE CLAMP

Fig. 4



(57) Abrégé/Abstract:
The invention relates to a hose clamp consisting of a clamping strip (10) having strip sections overlapping in the closed state of the hose clamp, on which hooks (12, 19) are arranged for closing the hose clamp, and having a tensioning device (15) arranged in the outer strip section for tensioning the hose clamp around an object to be clamped. The hooks (12, 19) are made to protrude from the clamping strip via strain hardening and have a respective lobe (21, 25). In the closed state of the hose clamp, the lobe (21) of a hook (12) arranged on the inner strip section and the lobe (25) of a hook (19) arranged on the outer strip section overlap one another, and the force transmission occurs via mutually touching transverse surfaces (27, 32) of the hooks (12, 19).

Abstract

The hose clamp described herein consists of a clamping band with overlapping band sections in the closed state of the hose clamp, on which hooks are arranged for closing the hose clamp, and with a tightening device arranged in the outer band section for tightening the hose clamp around an object to be clamped. The hooks are stamped out from the clamping band under cold working and each have a lug. In the closed state of the hose clamp, the lug of a hook arranged on the inner band section and the lug of a hook arranged on the outer band section engage over each other, and the force is transmitted via transverse surfaces of the hooks that are in contact with each other.

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HOSE CLAMP

State of the art

[0001] Hose clamps for connecting a hose to a pipe nipple, for example, are usually designed with a given nominal diameter in such a way that, when tightened, the inner surface of the clamping band is in contact with the hose over its entire circumference without any gaps and a continuous surface pressure is achieved between the hose and the pipe nipple.

[0002] A hose clamp is known from WO 2017/005283 A1, in which the outer end section of the clamping band has a plurality of openings and an ear-like tightening device for tightening the hose clamp around the material to be tied and the inner end section has hooks which can be hooked into the openings for closing the hose clamp. The outer end portion of the clamping band further has a band arch for receiving and guiding a tongue provided at the inner end of the clamping band.

Summary of the invention

[0003] The invention is based on the general object of at least partially eliminating disadvantages that occur in comparable hose clamps of the prior art. A more specific object of the invention can be seen in the provision of a hose clamp adjustable in diameter with high strength of the parts connecting the inner and outer band sections.

[0004] The solution to this problem is achieved with the hose clamp specified in claim 1. In this hose clamp, hooks for closing the hose clamp are arranged on the overlapping band sections, which hooks are stamped out of the clamping band, are strongly cold-formed when pressed to less than the thickness of the metal sheet and each have a lug, wherein, in the closed state of the hose clamp, the lug of at least one hook arranged on the inner band section and the lug of a hook arranged on the outer band section engage over one another and wherein the force transmission takes place, in the tightened state of the hose clamp, via transverse surfaces of the hooks which are in contact with one another.

[0005] The process of cold forming and thus hardening provides the hooks with a high degree of strength (in particular, local hardening portions can be formed which strengthen the hooks); their height may thus be low so that they protrude less far from the clamping band. This improves the line of force application between the hooks. The main amount of force transmission happens via the transverse surfaces of the hook located on the inner band section and the hook located on the outer band section. At the same time, the risk of injury from the hose clamp and damage to the hose clamp itself is reduced. An opening cap contributes to the hooks being formed compactly in height, as it provides the necessary space for the positioning hook to be hooked onto the pulling hook.

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[0006] Due to the interlocking design of the pulling hook and the opening cap, the pitch of the positioning hooks can be reduced, which allows the diameter to be changed in small steps.

[0007] The configuration of the hooks according to the invention further facilitates the hooking-in of the clamping band sections in the bent state of the hose clamp.

[0008] The areas of the clamping band at the pulling hooks and/or at the positioning hooks can be reinforced by means of lateral reinforcing embossments between the edges of the clamping band and the pulling or positioning hooks. These reinforcing embossments can be configured as beads projecting radially outwards from the clamping band and each extending over the entire extension of the pulling or positioning hooks or only a part thereof. Such reinforcement beads are particularly useful in the areas of the clamping band that end up in a position underneath the tightening device in the closed state of the hose clamp after locking the hose clamp. This applies in particular to the area of the positioning hooks and the adjacent area of the clamping band adjacent on the tongue side. An additional configuration of these reinforcement beads as corrugated beads results in a particular stabilisation of the clamping band against buckling in radial direction underneath the tightening device.

Drawings

[0009] Two embodiments of the invention are explained in more detail below with reference to the drawings. Herein:

Fig. 1 shows the hose clamp in the closed state according to an embodiment of the invention,

Fig. 2 and 3 show the hose clamp in the stretched initial state, seen from the outer and inner sides, respectively, in the closed state,

Fig. 4 shows the hose clamp of Fig. 1, cut along the center line of the clamping band,

Figs. 5 and 6 show enlarged illustrations of the hooks formed in the clamping band,

Fig. 7 and 8 show cross-sections through the outer and inner sections of the clamping band in the stretched state,

Fig. 9 shows the end of the outer clamping band section,

Fig. 10 shows a part of the inner clamping band section, seen from the inner side of the hose clamp in the closed state,

Fig. 11 and 12 show the hose clamp in the stretched initial state according to a further embodiment of the invention, seen from the outer and inner sides, respectively, in the closed state,

Fig. 13 shows an enlarged view of the tongue end of the clamping band according to the further embodiment and

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Fig. 14 shows an enlarged view of the band arch section of the clamping band according to the further embodiment.

Embodiment

[0010] The hose clamp shown in Figs. 1 to 3 consists of an open clamping band **10** which, starting from the inner band end shown in Fig. 2 at the top left (in Fig. 3 at the bottom right), has a tongue 11, a series of positioning hooks 12 (four in the example shown), a band arch **14** cut out of the clamping band **10** by two parallel longitudinal cuts and connected via flaps **13** to side parts of the clamping band **10**, a tightening device **15** in the form of a so-called "Oetiker" ear with a pair of outwardly cranked legs and a bar connecting them and reinforced by a bead **16,** a release hood **17** and, in the other outer band section, three pulling hooks **19** and opening caps **18**.

[0011] The hose clamp described herein is intended in particular for sealing and fastening bellows, for example for use in cardan shafts, made of thermoplastic materials or other materials of high Shore hardness that are hard to deform.

[0012] In use, the hose clamp which is supplied by the manufacturer in the closed state, is pulled axially onto the item to be tied, such as a pipe nipple and a hose surrounding it or, alternatively, opened for radial assembly and placed around the material to be tied, with the tongue **11** ending up positioned under the band arch **14.**

[0013] The three pulling hooks **19** in the outer belt section are then engaged with the positioning hooks **12** arranged in the inner band section, which correspond to the smallest possible diameter of the respective material to be tied.

[0014] In the example shown, there are three pulling hooks **19.** Depending on the force and strength requirements, two pulling hooks or a single pulling hook may be sufficient or more than three pulling hooks **19** may be required.

[0015] The number of positioning hooks **12** is greater than that of the pulling hooks **19** in order to allow for a corresponding range of variation in the clamp diameter. In the embodiment shown, only four positioning hooks **12** are assumed for the sake of simplicity. In Fig. 1 the hose clamp is closed at the largest diameter. For the smallest closed diameter, the positioning hook **12** closest to the inner end of the belt would in this case be underneath the release cap **17**, and the next three positioning hooks **12** would be in engagement with the three pulling hooks **19**.

[0016] As can be seen in particular from Figs. 2, 3, 6 and 8, each positioning hook **12** is arranged in a clearance window **20** cut out from the clamping band **10**. It comprises a lug **21** which is connected to the clamping band **10** at its edge facing away from the tightening device **15** and extends essentially parallel to the clamping band **10**. At the transition to the lug **21,** a step **22** is formed radially inwards and facing away from the tightening device **15.**

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[0017] As shown in particular in Figs. 1, 2, 5 and 7, each pulling hook **19** is curved dome-like radially inwards and has a lug **25** which engages over the lug **21** of the positioning hook **12**. The opening cap **18**, which is formed radially outwards on the opposite side of the pulling hook, provides the necessary space for the positioning hook **12**, so that the lug **25** of the pulling hook **19** can engage over the lug **21** of the positioning hook **12.** At the transition to the lug **25,** a step **26** is formed radially outwards and facing the tightening device **15.**

[0018] The lugs **21**, **25** of the positioning and pulling hooks **12**, **19** hold the outer and inner clamping band sections on top of each other, while the force is transmitted between transverse surfaces **27** of the pulling hooks **19**, which are transverse to the longitudinal direction of the clamping band **10,** and transverse surfaces **32** of the positioning hooks **12,** which are transverse to the longitudinal direction of the clamping band **10,** when the hose clamp is tightened.

[0019] Depending on the configuration length of the lugs **25** and **21,** the step **22** of the positioning hook **12** can abut with the free end of the lug **25** of the pulling hook **19** and the step **26** of the pulling hook **19** can abut with the free end of the lug **21** of the positioning hook **12** in the closed position of the hose clamp, which generates a secondary force transmission location and results in a mutual stabilisation of the hooks arranged on the inner and outer band sections.

[0020] As shown in Fig. 9, the pulling hooks **19** and opening caps **18** are surrounded by reinforcement beads **30** embossed in the clamping band **10**, which increase the bending stiffness for a given material thickness and allow the transmission of higher forces.

[0021] For the same reason, according to Fig. 10, the clearance windows **20** of the positioning hooks **12** are stiffened by embossments **31** between the windows **20** and the side edges of the clamping band **10.**

[0022] Figs. 11 to 14 show a further embodiment of the invention, in which a section of the clamping band **10** is formed with lateral reinforcement beads, partly in continuous groove shape **40** and as corrugated beads **41** in interrupted groove shape.

[0023] In the closed state of the hose clamp, one or more of the positioning hooks **12** are in engagement with the corresponding number of tension pulling **19**, depending on the hose diameter. On the tongue side thereof, a part of the inner end of the band reaches the position underneath the tightening device **15.** The lateral corrugation beads **41** provided in the appropriate part of the clamping band **10** stabilise the clamping band **10** against buckling in the radial direction underneath the tightening device **15**. The corrugation beads **41** can be configured in the form of interrupted grooves or as a series of individual beads. On both sides of the clamping band **10,** they merge into continuous groove-shaped reinforcement beads **40.**

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[0024] Lateral reinforcement beads **42** are provided in the area of the band arch **14** forming a tongue channel for the tongue **11** and accommodating it in the closed state. Since breakage occurs frequently in the area of the band arch **14**, the additional reinforcement beads **42** effectively contribute to a stabilisation of the band arch area.

[0025] In the present embodiment, the reinforcement beads **40**, **41**, **42** are provided both in the area of the positioning hooks **12** and in the area of the pulling hooks **19** in order to jointly contribute to the overall stability of the hose clamp. However, it is also conceivable to provide only the reinforcement or corrugation beads **40**, **41** or only the reinforcement beads **42.**

Reference signs

10	clamping band
11	tongue
12	positioning hook
13	flaps
14	band arch
15	tightening device
16	bead
17	release cap
18	opening hood
19	pulling hook
20	clearance window
21	lug
22	step
25	lug
26	step
27	transverse surface
30	reinforcement beads
31	embossment
32	transverse surface
40	reinforcement bead
41	corrugated bead
42	reinforcement bead

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Claims

1. A hose clamp made of a clamping band (**10**) comprising band sections which overlap one another in the closed state of the hose clamp and on which hooks (**12**, **19**) are arranged for closing the hose clamp, and a tightening device (**15**) arranged in the outer band section for tightening the hose clamp around an object to be clamped,

characterised in that the hooks (**12**, **19**) are stamped out from the clamping band and each have a lug (**21**, **25**) and a transverse surface (**27**, **32**) facing transversely to the direction of the clamping band (**10**), wherein, in the closed state of the hose clamp, the lug (**21**) of at least one hook (**12**) arranged on the inner band section and the lug (**25**) of a hook (**19**) arranged on the outer band section engage over one another and the force transmission in the tightened state of the hose clamp occurs via the mutually contacting transverse surfaces (**27**, **32**) of the hooks (**12**, **19**).

2. The hose clamp according to claim 1, wherein, in the closed state of the hose clamp, a step (**22**) of a hook (**12**) arranged on the inner band section abuts with the end face of the lug (**25**) of a hook (**19**) arranged on the outer band section and a step (**26**) of a hook (**19**) arranged on the outer band section abuts with the end face of the lug (**21**) of a hook (**12**) arranged on the inner band section.

3. The hose clamp according to one of the preceding claims, wherein at least one hook configured as a pulling hook (**19**) is arranged on the outer band section and one or more hooks designed as positioning hooks (**12**) are arranged on the inner band section.

4. The hose clamp according to claim 3, wherein three pulling hooks (**19**) and at least three, preferably more than three, positioning hooks (**12**) are provided.

5. The hose clamp according to claim 3 or 4, wherein the pulling hooks (**19**) and/or the positioning hooks (12) are each surrounded by reinforcement beads (**30**) stamped out from the clamping band (**10**).

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6. The hose clamp according to any one of claims 3 to 5, wherein the clamping band (**10**) has reinforcing embossments (**31**, **40**, **41**, **42**) arranged between the tightening hooks (**19**) and the clamping band edges and/or between the positioning hooks (**12)** and the clamping band edges.

7. The hose clamp according to claim 6, wherein reinforcement beads (**40**, **41)** arranged between the positioning hooks (**12)** and the clamping band edges are continued towards the end of the inner band section.

8. The hose clamp according to claim 6 or 7, wherein the reinforcement beads arranged between the positioning hooks (**12**) and the clamping band edges are formed as corrugated beads (**41**) over their entire length or over a part of their length.

9. The hose clamp according to claim 8, wherein the reinforcement beads arranged between the positioning hooks (**12**) and the clamping band edges are formed as corrugated beads (**41)** over a part of the inner band section which is positioned underneath the tensioning device (**15**) in the closed state of the hose clamp.

10. The hose clamp according to any one of the preceding claims, wherein the positioning hooks (**12**) and pulling hooks (**19)** are reinforced by local hardening portions occurring due to the manufacturing process.

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Fig. 1

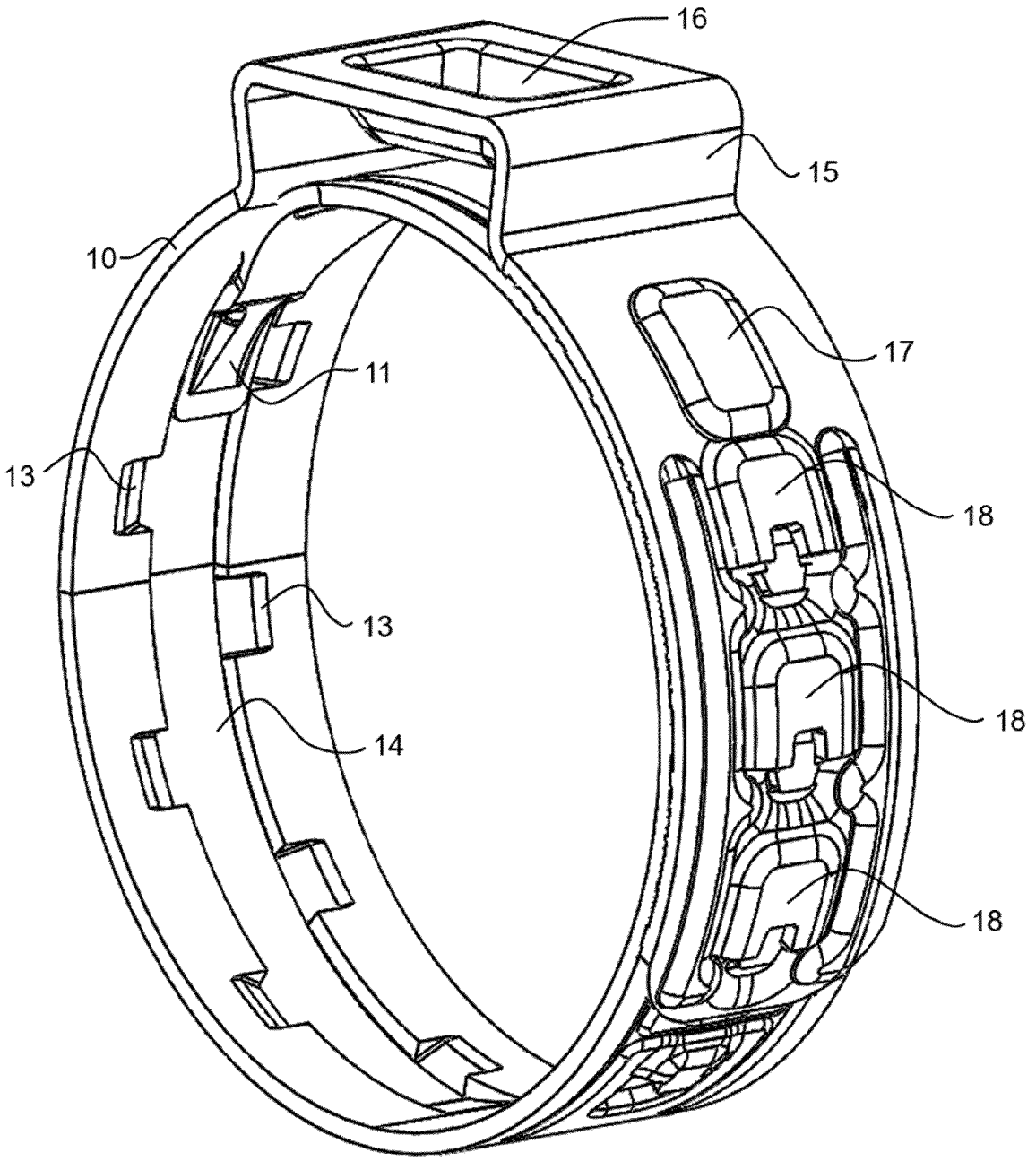

Fig. 2

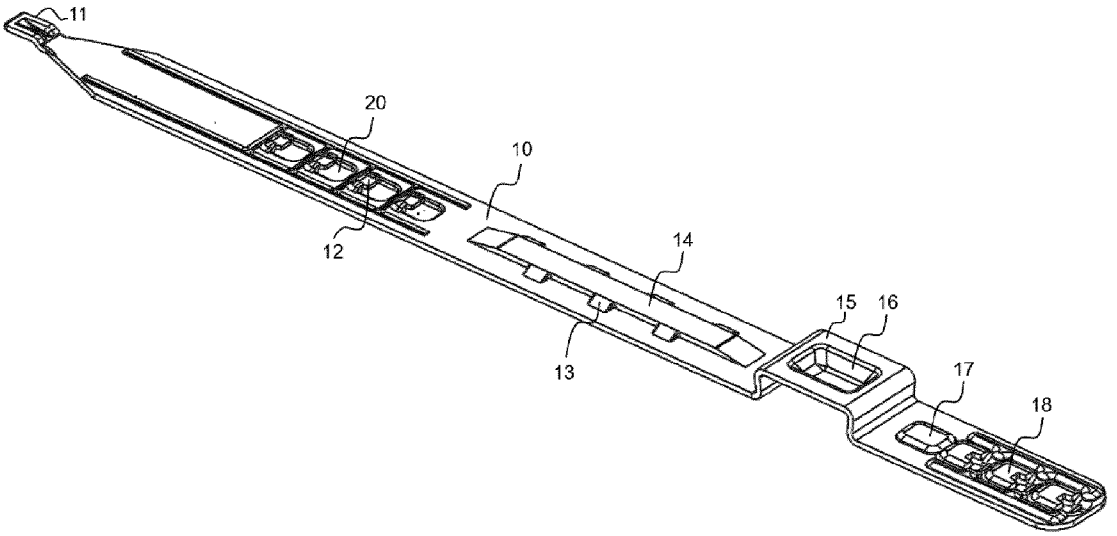

Fig. 3

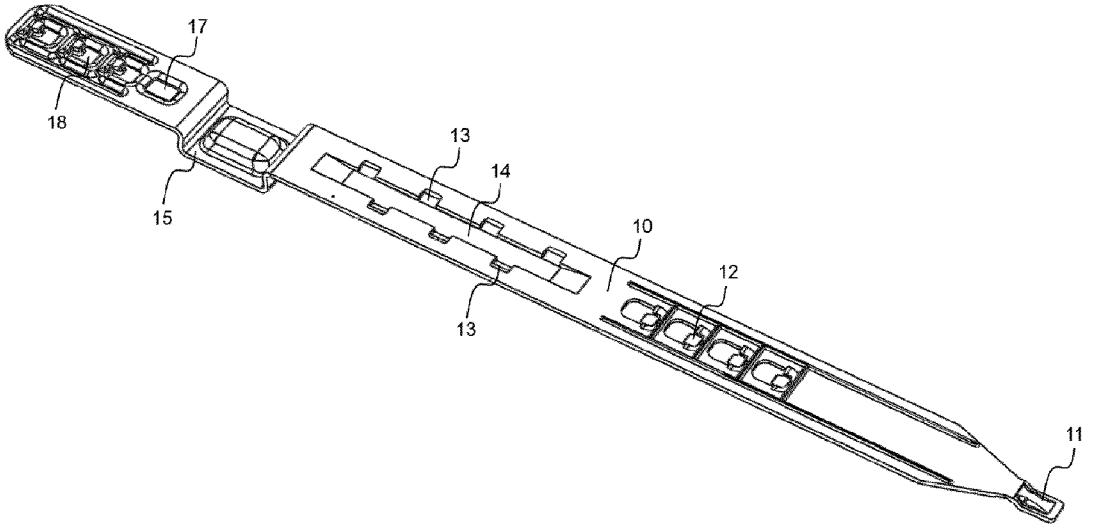

Fig. 4

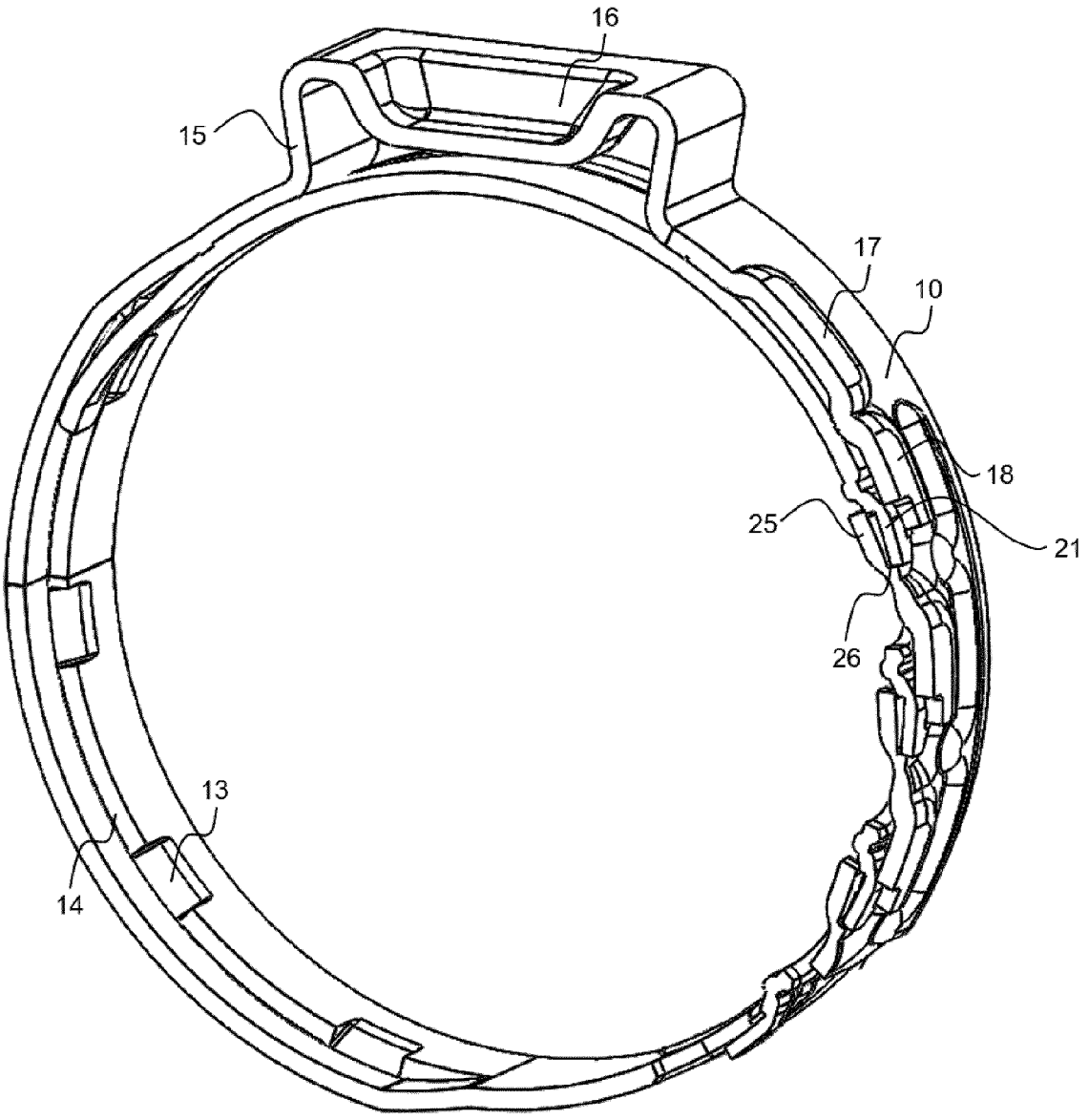

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Fig. 5

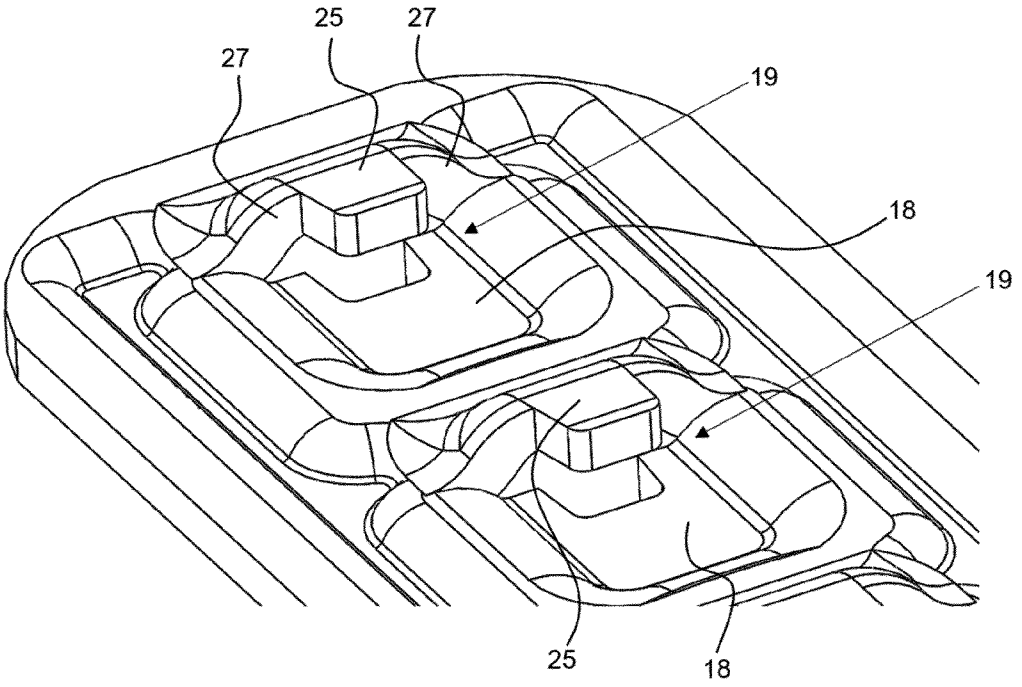

Fig. 6

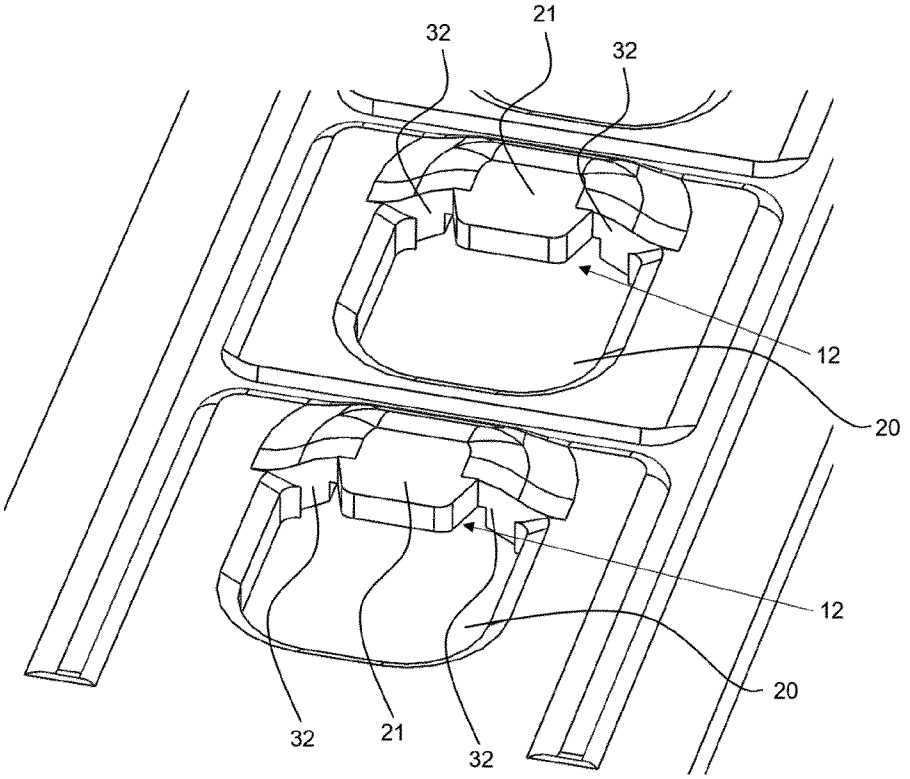

Fig. 7

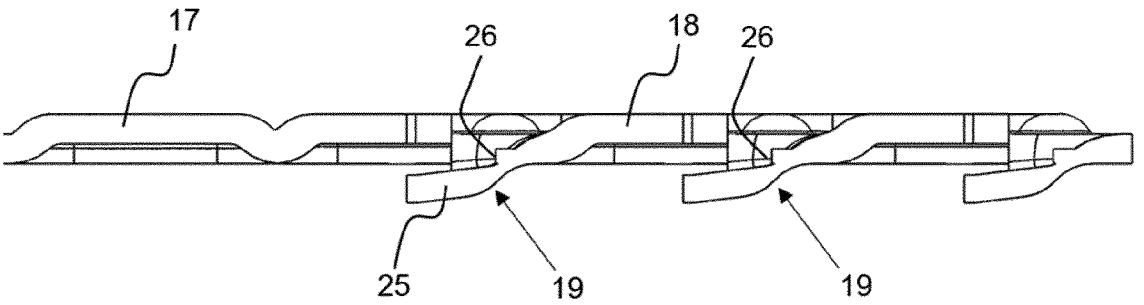

Fig. 8

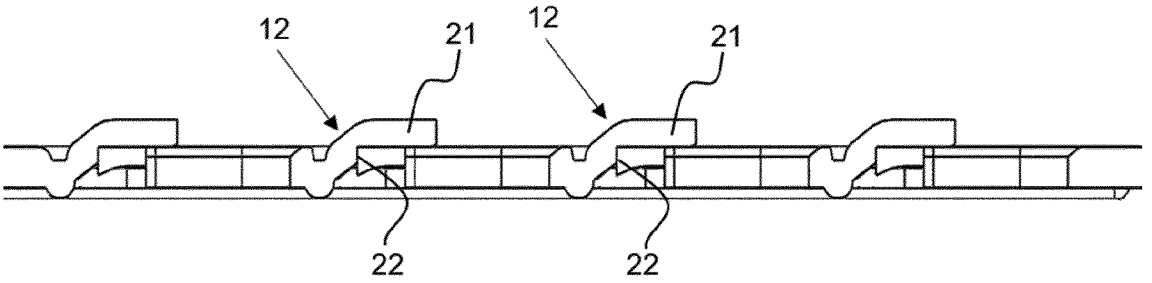

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Fig. 9

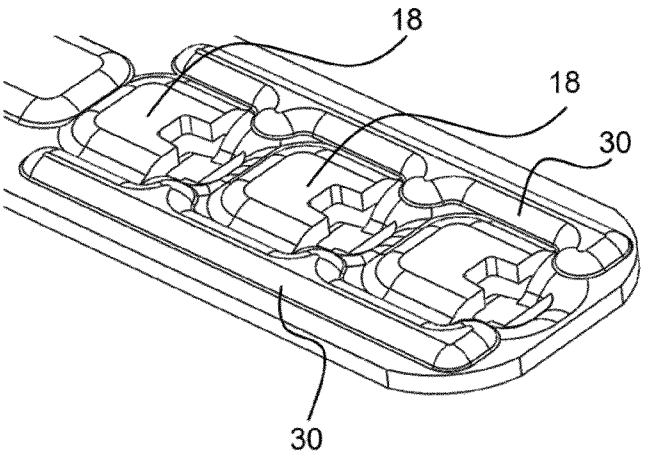


Fig. 10

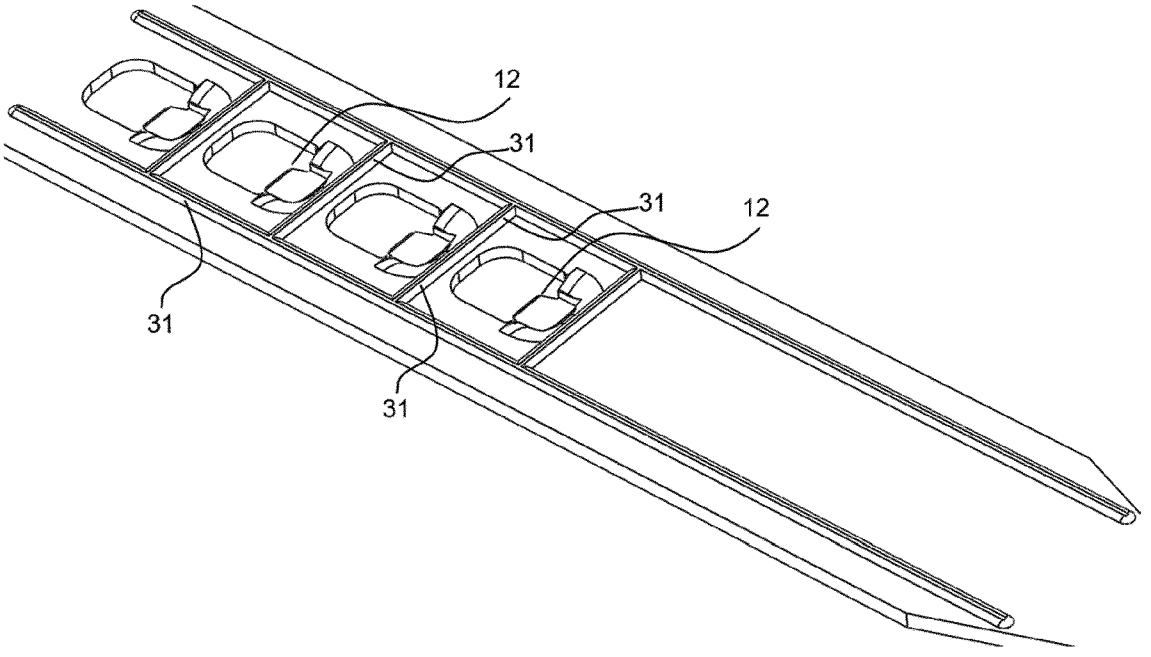
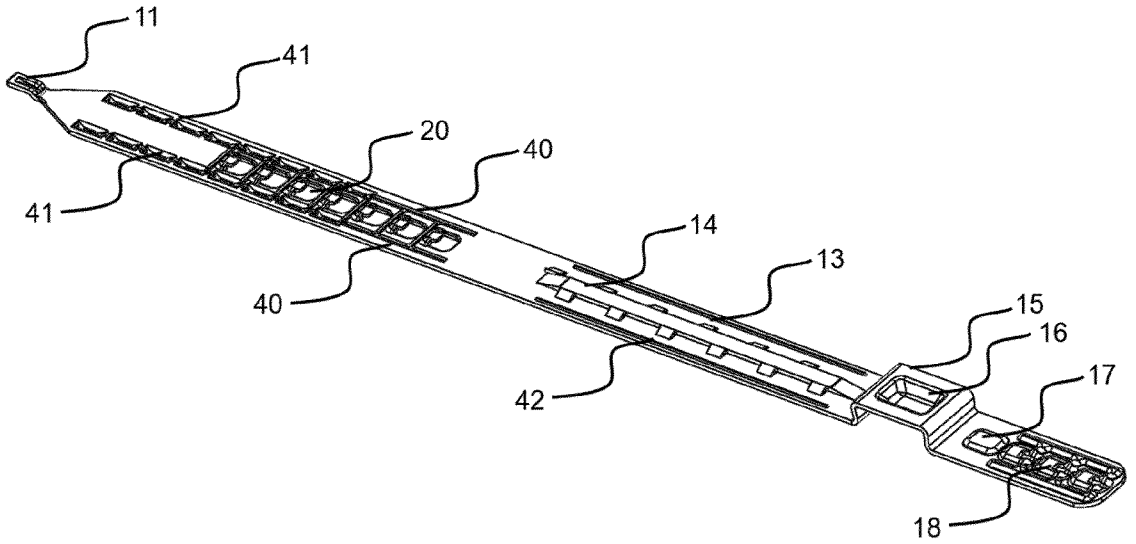


Fig. 11


11
41
20
40
41
14
40
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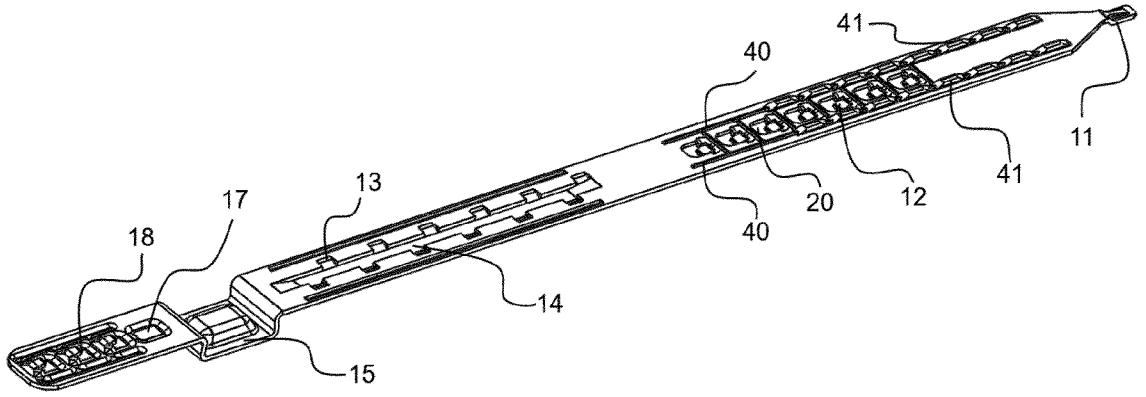
15
16
17
42
18

Fig. 12


41
40
11
41
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14
15

Fig. 13

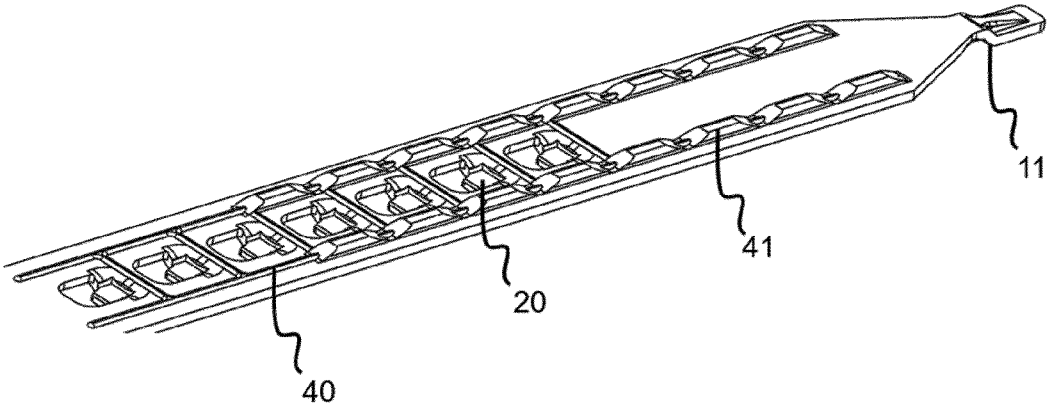

Fig. 14

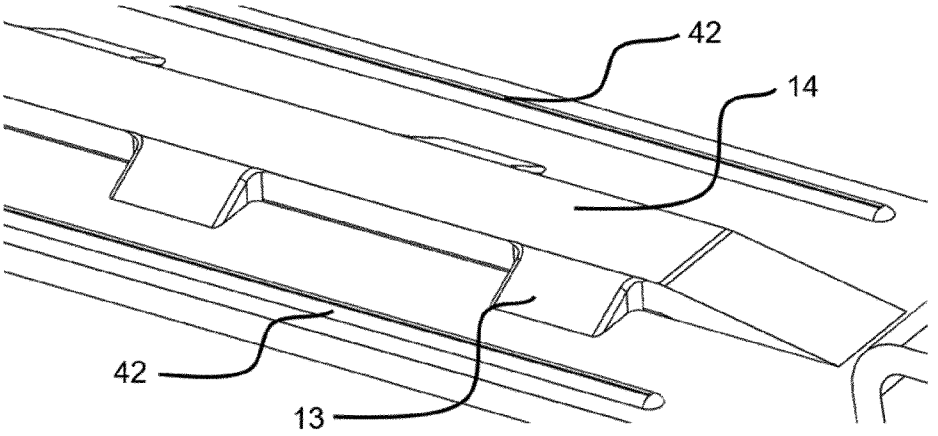

Fig. 4