

(19) **DANMARK**

(10) **DK/EP 3068314 T3**



(12)

Oversættelse af europæisk patentskrift

Patent- og
Varemærkestyrelsen

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- (51) Int.Cl.: **A 61 B 17/132 (2006.01)** **A 61 B 17/00 (2006.01)** **A 61 B 90/00 (2016.01)**
- (45) Oversættelsen bekendtgjort den: **2020-05-25**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2020-04-08**
- (86) Europæisk ansøgning nr.: **14721865.5**
- (86) Europæisk indleveringsdag: **2014-05-06**
- (87) Den europæiske ansøgnings publiceringsdag: **2016-09-21**
- (86) International ansøgning nr.: **EP2014059199**
- (87) Internationalt publikationsnr.: **WO2015070992**
- (30) Prioritet: **2013-11-15 DE 102013112597**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
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- (54) Benævnelse: **ÅREPRESSE**
- (56) Fremdragne publikationer:
WO-A2-2008/076820
DE-A1-102009 025 416
DE-U1-202013 100 312
US-A- 5 036 838
US-A1- 2005 131 322
US-A1- 2012 122 365
US-A1- 2012 310 273

Description

5 **[0001]** The invention relates to a venous tourniquet with a constricting strap, which is placeable around a body part, which strap is itself elastic in the circumferential direction or is provided with at least one elastic section and with one closure device, by means of which the constricting strap, when in its tensioned state around a body part, is lockable to form a tensioning loop.

10 **[0002]** A venous tourniquet of this type is described in US 2012/0310273 A1. This known venous tourniquet has a constricting strap with a smooth side and a fuzzy side, wherein the strap has elastic threads running parallel to one another in the longitudinal direction, and threads running parallel to one another and at a right angle to the longitudinal threads in the transverse direction. Loop-like filament threads are placed around the
15 longitudinal threads. The fuzzy side forms loops for a hook and loop fastener, and sections with hook elements are applied to the smooth side.

[0003] Such a venous tourniquet is disclosed in US 3,930 506. An adhesive section for fastening a tensioning loop placed around the body part under tension stress is applied
20 to an end section of the constricting strap. If said adhesive section is not fastened in the correct position during the first fastening attempt, a reliable repeated fastening is not ensured, resulting in possible disadvantages for its use. The application of the adhesives is associated with a corresponding effort.

25 **[0004]** US 3,628,536 describes a further venous tourniquet. This tourniquet has a closure device with openings distributed over the length and a protrusion applied to one end, which is adapted to mesh with the openings.

[0005] DE 20 2013 100 312 U1 shows a venous tourniquet with a tension indicator
30 which is made from a flexible, non-elastic material and designed as a web section bridging, with a defined excess length with regard to the constricting strap, an elastic section on a constricting strap between two fastening points. In addition, a closure device with a retaining part is mentioned, which is designed as a hook and loop fastener section.

[0006] A further venous tourniquet is disclosed in US 3,930 506. An adhesive section for fastening a tensioning loop placed around the body part under tension stress is applied to an end section of the constricting strap. If said adhesive section is not fastened in the correct position during the first fastening attempt, a reliable repeated fastening is not ensured, resulting in possible disadvantages for its use. The application of the adhesives is associated with a corresponding effort.

[0007] A further venous tourniquet is described in US 3,628,536. This tourniquet has a closure device with openings distributed over the length and a protrusion applied to one end, which is adapted to mesh with the openings.

[0008] US 2012/0071917 A1 describes a constricting device for body parts for preventing heavy blood loss in case of injuries. In this known constricting device, a tensioning device for achieving high tension of the constricting strap placed around the body part and forming a loop, and a tension indicator, with which a generated tension of the constricting strap can be determined in a tactile or visual manner, are provided. For example, for this purpose, as shown with a description in Figures 14A and 14B therein, a tensioning webbing is pleated and in the pleated area, attachment locations are determined, which tear in case of excessive tension. Over the width of the tensioning webbing, the attachment locations can have different numbers of attachment points, and the attachment locations thus tear at correspondingly different tension stresses. However, such a high tension stress must first be generated in order to effect a tearing at or of the attachment locations, which is then followed by an abrupt decrease of the tension stress. With such measures, a dosed tension, which comes into effect with venous tourniquets in orders to prevent a venous blood flow, is difficult to achieve and recognize. The closure device is also relatively elaborate.

[0009] Further constricting devices for body parts are shown in US 5,653,728 A, WO 2006/015987 A1, GB 2 424 189 A, US 6,525,238 B2, US 2008/0312682 A1, and in US 6,250,047 B1. The constricting devices are provided with different closure devices, wherein the locking or fastening is sometimes cumbersome or the design is elaborate. For example, US 5,653,728 A and WO 2006/015987 A1 also disclose embodiments of constricting devices which are disposable after use, as they are frequently required in a clinical setting for complying with hygiene regulations.

[0010] DE 10 2009 025 416 B4 discloses a supporting or fastening belt having at least one flexible, non-elastic segment and fastening devices for fastening belt areas to each other or to orthopedic devices. The fastening devices can be designed as hook and loop fasteners and be sewed on, glued on, or welded on, or sewed to ends of a belt strap. The upper side of a continuous elastic belt section can be provided with a fuzzy layer, while on the underside, fastening devices for fastening the end sections to one another or to the orthopedic devices are provided. Such a supporting or fastening belt with fastening devices in its end areas cannot be adjusted to variable loop sizes and is not usable as a venous tourniquet.

[0011] Further web-like belts or belt sections with a hook and loop fastener are shown in EP 2 045 047 A2, GB 479 442 A, and in GB 1 033 130 A.

[0012] The problem addressed by the invention is that of providing a venous tourniquet of the initially described type, which has a simple design and secure function and which facilitates the use.

[0013] This problem is solved with the features of claim 1. For that purpose, it is provided that the closure device is designed as a hook and loop fastener with two interlocking fastening parts. The design allows for easy handling with few hand movements when placed on the body part, particularly an arm, with sufficient tension stress for preventing a blood flow of a vein. Advantageously, the constricting device is designed for one-time use in order to comply with hygiene requirements. The two fastening parts, having hook elements on one side and loops on the other side, form a sturdy connection with high tensile strength in the surface and circumferential direction of the body part. A particularly advantageous design for the production and easy use is achieved in that a first fastening part is formed from the strap material of the constricting strap itself, and a second fastening part is formed of a section of material fastened to the strap material or is integrated in the strap material.

[0014] A design advantageous for the function and application provides that the constricting strap is made of fuzzy, tear-resistant material of high tensile strength.

[0015] A further advantageous embodiment is achieved in that the constricting strap is produced from a nonwoven, e.g., a spun-bonded nonwoven, or felt or papery material

with a surface that is either roughened or has fine hairs. The nonwoven can be produced, e.g., by hydroentanglement.

5 [0016] In the configuration according to the invention, the constricting strap is produced from a spun-bonded nonwoven.

[0017] Different further advantageous embodiment are achieved, in that the constricting strap is made of polyester, polypropylene and/or viscose material.

10 [0018] For the function and operation, it is further advantageous that the constricting strap and the second fastening part have the same width in the range from 1 cm to 4 cm, preferably between 1.5 cm and 3 cm.

15 [0019] Further advantages for the use are achieved, in that at least one tension indicator, for determining the state of tension of the constricting strap, is provided, which indicator is designed in such a way that a defined state of tension is recognizable by a user.

20 [0020] With these measures, the user can precisely adjust the relatively low tension stress (of e.g., approximately 10 mm Hg in the area of the capillary vessels or <25 mm Hg in the area of the larger veins) required for preventing the blood flow, of the constricting device designed as a venous tourniquet. As a result, the person treated is also not burdened more than is necessary.

25 [0021] In a configuration according to the invention for recognizing the generated tension stress, the tension indicator is designed as a web section, made of a flexible non-elastic material, bridging an elastic section on the constricting strap between two fastening points in the stretching direction with a defined excess length with respect to the unstressed constricting strap. If the web section provided with an excess length with respect to the distance of the fastening points in the tension-free state of the constricting strap (e.g., as
30 pleated section) is still loose, a defined predetermined state of tension has not yet been reached. However, if the flexible non-elastic web section extends entirely along the constricting strap due to the stretched elastic section, the defined state of tension for preventing the venous blood flow is achieved. Due to the excess length of the web section between the two fastening points, a desired defined state of tension for a respective case of

application can thus be predetermined by the manufacturer, said state of tension being easily and clearly recognizable and adjustable by a user during application.

[0022] An advantageous embodiment provides that the constricting strap is formed from a flexible, non-elastic material, and wherein the web section forms an integral part of the constricting strap, with an elastic element forming the elastic section is connected at the fastening points.

[0023] A further advantageous embodiment provides that the constricting strap itself is formed, at least in sections, as an elastic strap and the web section, made of non-elastic material is connected at the fastening points to the elastic strap.

[0024] A constricting device advantageous for one-time use provides that the elastic section or another section of the elastic strap is provided with a use indicator, made, e.g., of paper or varnish, that is irreversibly torn through or damaged when first stretched. For this purpose, the tear force of the use indicator is advantageously low, so that it influences the tensioning process of the constricting strap as little as possible and the tear already occurs, for example, at a slight stretch of a few percent of the stretch in the defined state of tension (e.g., no more than 10% or 20% of the stretch in the defined state of tension). This can be achieved, e.g., by appropriate material selection and/or material strength and or shape of the use indicator, or by tearing off at a connection point.

[0025] The measures that the connection of the second fastening part and optionally the elastic section or the web section to the constricting strap is made by attachment at the fastening points by means of bonding, welding, thermoplastic processes or sewing, are advantageous for production and function.

[0026] In the following, the invention shall be described in more detail using embodiments with reference to the drawings.

Figures 1A and 1B show two different perspective views of a first embodiment of a constricting device;

Figure 2 shows a top view, a side view and a bottom view of the constricting device according to Figure 1A;

Figures 3A and 3B show a top view, a side view, a bottom view, and a perspective view of a further embodiment of the constricting device in the untensioned and

tensioned state of the constricting strap, and enlarged sectional views in both states; and

Figures 4A and 4B show a side view and a bottom view of a further embodiment of the constricting device in the untensioned and tensioned state.

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[0027] Figures 1A and 1B show a first embodiment of a constricting device 1 designed as a venous tourniquet, with a constricting strap 10, which is placeable around a body part in the form of a tensioning loop for the at least partial prevention of blood flow, and which is securable in the tensioned state by means of a closure device 30. The closure device 30 is designed as a hook and loop fastener with two interlocking fastening parts, namely a first fastening part 300 and a second fastening part 301.

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[0028] In the depicted embodiment, the constricting device 1 has a tension indicator 101, with which the tensional force of the constricting strap 10 in the area of the tensioning loop placed around a body part is recognizable by a user. The tension indicator 101 is preferably arranged near the web section on the side of the closure device, so that it is, in any case, subject to the tensional force applied by the tensioning loop placed on the body part.

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[0029] In the embodiment shown in Figures 1A and 1B, the constricting strap 10 itself is designed as a first fastening part 300 of the closure device 30, while the second fastening part 301 is designed as a section of material fastened to the constricting strap 10. In this case, a design according to the invention provides that the constricting strap 10 is made of fuzzy material, which is sufficiently tear-resistant or has high tensile strength with regard to the occurring stretching force, and which forms loops for the hook and loop fastener, while the second fastening part 301 is designed as a short section made of flat material with hook elements adapted to the loops of the first fastening part 300.

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[0030] The hook elements preferably have hooks which are directed opposite the tensile force or tensional force of the web section placed around the respective body part; they can also be designed as mushroom heads, scale-like elements or the like, wherein the loops or the looped fabric containing said loops is adapted accordingly. The loops, which do not necessarily have to be designed as closed loops, and the hook elements can, particularly in a miniaturized design, hook into one another in a multiplicity of fine hairs in the manner of a gecko effect. Advantageously, the loops and hook elements of the two

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fastening parts are designed as microelements such that the constricting strap feels fuzzy even when in direct contact with the skin of a body part to be constricted.

5 [0031] Test have shown that the hook and loop fastener designed in such a manner absorbs sufficiently high tensile forces (shearing forces) parallel to the surface or in circumferential direction of the constricting strap 10 in order to ensure the required constriction, e.g., of veins, wherein a state of tension of the constricting strap 10 for generating a pressure of, e.g., up to 10 mm Hg or up to 25 mm Hg in the area of the veins, can be reliably reached. For applying and removing, the hook and loop fastener can be
10 closed or opened easily and quickly.

[0032] The constricting strap 10 with a width, e.g., between 1 and 5 cm (preferably between 1.5 cm and 3 cm), can be cut from very thin (less than 1 mm) roll or sheet material and is very flexible at a high tear strength. Itself, it can have, e.g., a low inherent elasticity,
15 so that, after it is placed on the body part, it generates an elastic tensional force by itself. Alternatively or additionally, the tensional force can be generated by an elastic element 20 which is made from a suitable material and attached in the area, or outside, of the tension indicator 101 to the constricting strap 10.

20 [0033] Advantageously, the second fastening part 301 has the same width as the constricting strap 10 and preferably a shorter length, e.g., between 1 cm and 5 cm. Alternatively, it can also extend over the entire or almost the entire length of the constricting strap 10. The second fastening part 301 is made of a thin, flexible material and fastened, e.g., by means of welding (laser welding, ultrasound welding or the like), bonding,
25 thermoplastic processes, sewing or the like, to an end section, or the entire or almost the entire length, of the constricting strap 10. For locking or closing the hook and loop fastener, only the other loop section, which is placed around the body part, has to be pressed onto the fastening part 301, resulting in the fastening parts to interlock. A further embodiment provides that loops are integrated in one another in the same layer of the non-woven fabric
30 or the looped fabric.

[0034] Suitable materials for the constricting strap or the hook and loop fastener are viscose, polyester, polypropylene, wherein, according to the invention, spun-bonded nonwoven with a skin-friendly design is used.

[0035] Figure 2 shows a top view, a side view, and a bottom view of a section of the constricting device designed as a venous tourniquet with the constricting strap 10, a tension indicator 101 with a stretching section 100 and a bridging elastic element as well as a second fastening part 301 of the hook and loop fastener.

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[0036] Figure 3A shows a top view, a side view, and a bottom view of the constricting device 1 designed as a venous tourniquet in the untensioned state of the constricting strap 10. Figure 3B shows the constricting device or the venous tourniquet in a tensioned state of the constricting strap 10 also with an enlarged section B in the area of the tension indicator 101, wherein the constricting strap 10, in the area of a stretching section 100, in which an elastic element 20 is arranged, is stretched by a defined path length. Once said defined path length, proceeding from the untensioned state of the constricting strap 10, or a less tensioned state, is reached, a defined state of tension of the constricting strap 10 is present. The thus effected tensional force can be adjusted in a defined manner during production by the design of the stretching section 100, e.g., by a corresponding material selection (material properties and/or geometric properties, such as length, thickness, width, recesses or the like). Figures 3A and 3B also show a use indicator 40 described below in more detail.

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[0037] In the depicted embodiment, the constricting strap 10 itself can be made from a non-elastic but flexible material. During the production of the constricting device 1, it can be available as roll product and cut to length according to the desired length of the constricting strap 10. A recyclable material is advantageous, wherein, e.g., natural reinforcement fibers made of renewable raw materials can also be integrated, and the remaining parts, such as closure device, stretching section, fastening means and the like can also be selected on the basis of good recyclability. Production, functionality and configuration of the constricting device 1 can advantageously also be designed with regard to a single use.

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[0038] The tension indicator 101 in the embodiment shown in Figures 1A and 1B is designed, e.g., as part of an essentially non-elastic constricting strap 10 itself, in that it is fastened with excess length to two fastening points spaced apart from one another in the stretching direction on the stretching section 100 made of an elastic material. Between the fastening points, the constricting strap 10 forming the tension indicator 101 in that area runs in a pleated manner, wherein the excess length is adapted to the desired defined state

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of tension to be generated also on the basis of the design of the stretching section 100. The connection at the fastening points is established sufficiently secure, e.g., by means of bonding, welding (laser welding, ultrasound welding or the like), thermoplastic processes, sewing or the like. When tensioning the constricting strap 10, the user, by means of the pleat, which increasingly nears the stretching section 100, can control and clearly recognize the stretching process and thus the increasing tensional force when the web section of the constricting strap 10 bridging the two fastening points has reached its maximum stretching position. At this moment, the adjusted defined state of tension or the optimal tensional force of the constricting strap 10 thus generated is also reached. If, e.g., the venous blood flow is supposed to be prevented in the area of the capillaries in the transition area between the arterioles and venules, a correspondingly adjusted defined state of tension of approximately 10 mm Hg is sufficient, wherein the person to be treated is only slightly stressed. In the area of the veins, the blood flow or the pulsation can be achieved, e.g., by a state of tension of the constricting strap 10 in accordance with a pressure of less than 25 mm Hg. For this purpose or other applications, constricting devices 1 appropriately formed with the above-mentioned measures can be provided, wherein the tension indicator 101 and the stretching section 100 are precisely adjusted to the respective case of application.

[0039] In a corresponding manner, more than one tension indicator, preferably with differently defined states of tension, can also be attached.

[0040] In another embodiment of the constricting device 1, the constricting strap 10 itself can be made from an elastic material. If a tension indicator 101 with a defined excess length is attached thereto at fastening points spaced apart from one another in the stretching direction, it is advantageously made of a flexible, non-elastic material, similar to the previous embodiment. If the constricting strap 10 is stretched, the pleated web section of the tension indicator 101 bears increasingly against the outside surface of the constricting strap 10. For this purpose, the excess length of the web section is adapted to the bridged section of the elastic constricting strap, which section then corresponds to the elastic element 20 according to the previous embodiments in such a way that, in the case of a complete extension of the web section along the corresponding section of the constricting strap 10, the desired defined state of tension is achieved without a pleat. In this state, the loop is secured by the user by means of the hook and loop fastener without stretching the constricting strap even further.

[0041] A further embodiment of the constricting device 1 is shown in Figures 3A and 3B. In this case, the constricting device is, in accordance with the embodiment in Figure 1A, provided with a tension indicator 101 which, as a web section with excess length regarding the unstressed constricting strap, bridges an elastic element 20 between two fastening points, as described in detail above. The closure device 30 is also designed in accordance with the embodiment in Figure 1A. However, there is an additional use indicator 40 which, in the depicted embodiment, also bridges the elastic element 20 or at least a section thereof extending in the longitudinal direction.

[0042] The use indicator 40 is designed as a tear element which extends in the longitudinal direction or stretching direction and, when the elastic element 20 is stretched, tears under a slight exertion of force, before the final stretch is reached which is present at the defined state of tension. Similar to the tear element, another irreversibly damageable element, e.g., a varnish, can be applied. With a specific excess length between two fastening points or attachment points of the tear element, it can also be determined on the elastic element 20, in which area the tear element is supposed to tear during the stretching process, but wherein the excess length of the tear element is in any case shorter than the excess length of the web section provided for the tension indicator 101. For example, in this manner, it is possible to determine that the tear element already tears when the stretch of the elastic element has reached, e.g., approximately 20 %, approximately 50 %, or approximately 80 %, or a different lower intermediate value relative to the stretch present at the defined state of tension. In this manner, any intermediate values for a tearing can be precisely adjusted. A torn tear element of the use indicator 40 indicates that the constricting device 1 has already been used and this is therefore not its first use, as is required for constricting devices 1 for a single use. The tear element can be made, e.g., from an easily tearable paper strip or fiber strip and is preferably non-elastic but flexible.

[0043] If the fastening points of the tension indicator 101 and the attachment points of the use indicator 40 are congruent when seen from above, both indicators can be easily produced in a common work step and also precisely adjusted to one another in a desired manner as a functional unit.

[0044] The tear element used for the use indicator 40 can be connected to the appropriate fastening points or attachment points in a corresponding manner as described in connection with the elastic element 20, i.e., for example, by means of bonding, welding

(laser welding, ultrasound, printing using print technology or the like), sewing or a thermoplastic connection technology or another suitable type of fastening. The enlarged depiction of section A shows a connecting section (attachment point), wherein the elastic element 20 is fastened on its upper side to the constricting strap 10, and on its underside, it is connected to the respective attachment section of the tear element.

[0045] Figure 3B shows the stretched state of the constricting strap 10, as it is present, for example, in the defined state of tension. In this case, the tear element of the use indicator 40 is already torn due to stretching, wherein the two edges on the side of the tear are spaced apart from one another by a relatively large stretching gap, i.e., tearing took place at a correspondingly early stage of the stretching. In the enlarged depiction of the tear area (detail B), the one remaining section (on the closure side) of the tear element, the elastic element 20 which becomes thinner during stretching, and the stretched web section of the tension indicator 101 can be seen.

[0046] As Figures 4A and 4B show, the constricting device 1 can also have, independently from a tension indicator 101 or offset therefrom in the longitudinal direction, a use indicator 40 on the constricting strap 10, wherein the latter bridges an elastic element 20 between two fastening points or attachment points with (or alternatively without) excess length, as described similarly for the embodiment in Figures 3A, 3B. Outside of the elastic element 20, the constricting strap 10 can once again be made from a non-elastic (= inelastic), flexible material or an elastic material.

Patentkrav

1. Årepresse med et omsnøringsbånd (10), der kan lægges omkring en kropsdel, hvilken årepresse selv er udført elastisk i omkredsretningen eller er forsynet med mindst et elastisk afsnit, og med en lukkeanordning (30), ved hjælp af hvilken omsnøringsbåndet (10) i sin spændte tilstand omkring en kropsdel kan låses til en spændeløkke, hvor lukkeanordningen er udført som burrelukning med to lukkedele, der griber låsende ind i hinanden, hvor en første lukkedel (300) er dannet af selve omsnøringsbåndets (10) båndmateriale og en anden lukkedel (301) af et materialeafsnit fastgjort på båndmaterialet, og den første lukkedel (300) er forsynet med løkker og den anden lukkedel (301) med krogelementer, som er udformet til at hægte sig sammen med løkkerne, og hvor omsnøringsbåndet (10) er fremstillet af rivefast loddent materiale med høj trækstyrke, hvor det rivefaste lodne materiale med høj trækstyrke er fremstillet af spunbonded non-woven, og hvor der er en spændingsindikator (101) til bestemmelse af omsnøringsbåndets (10) spændingstilstand, som er udformet på den måde, at en fra producentside defineret indstillet spændingstilstand på < 25 mm Hg kan registreres af en bruger til hindring af en venøs blodstrøm, hvor spændingsindikatoren (101) er udformet som et baneafsnit af et fleksibelt uelastisk materiale, som dækker et elastisk afsnit på omsnøringsbåndet (10) mellem to fikseringspunkter i udvidelsesretningen med defineret ekstra længde i forhold til det ikke-belastede omsnøringsbånd (10).
2. Årepresse ifølge krav 1, **kendetegnet ved, at** omsnøringsbåndet er fremstillet af polyester, polypropylen og/eller viskosemateriale.
3. Årepresse ifølge et af de foregående krav, **kendetegnet ved, at** omsnøringsbåndet og den anden lukkedel (301) har samme bredde i området fra 1 cm til 4 cm.
4. Årepresse ifølge et af de foregående krav, **kendetegnet ved, at** omsnøringsbåndet (10) er fremstillet af et fleksibelt uelastisk materiale, og at baneafsnittet udgør en integreret bestanddel af omsnøringsbåndet (10), hvor et elastisk element (20), som danner det

elastiske afsnit, er forbundet på fikseringspunkterne.

5. Årepresse ifølge et af kravene 1 til 3,

kendetegnet ved,

- 5 **at** omsnøringsbåndet (10) selv, i det mindste afsnitsvist, er udført som elastisk bånd, og baneafsnittet af uelastisk materiale er forbundet med det elastiske bånd på fikseringspunkterne.

6. Årepresse ifølge et af de foregående krav,

kendetegnet ved,

- 10 **at** det elastiske afsnit eller et andet afsnit af det elastiske bånd er forsynet med en brugsindikator (40), som gennembrydes ved første udvidelse.

7. Årepresse ifølge et af de foregående krav,

kendetegnet ved,

- 15 **at** forbindelsen af den anden lukkedel (301) og i givet fald det elastiske afsnit eller baneafsnittet med omsnøringsbåndet (10) på fikseringspunkterne er tilvejebragt ved hjælp af klæbning, svejsning, termoplastiske fremgangsmåder eller syning.

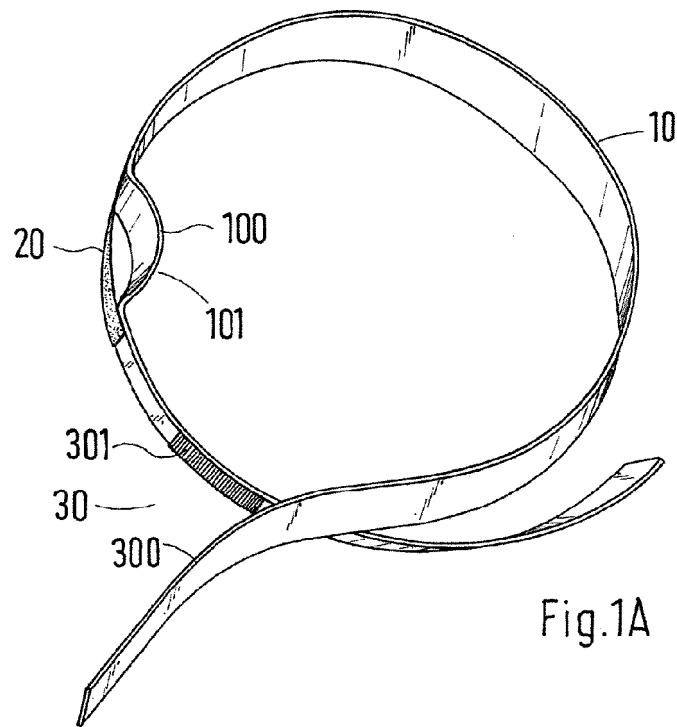


Fig. 1A

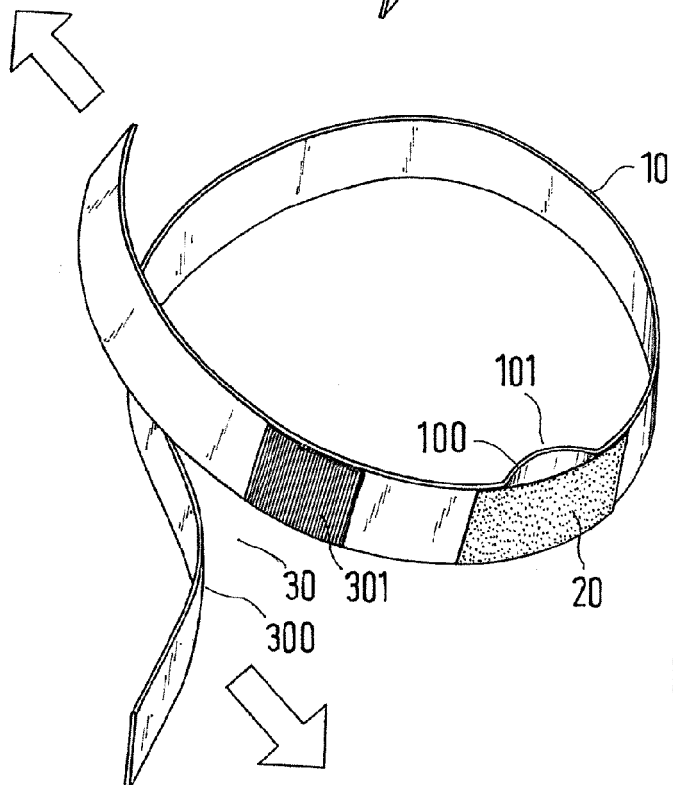


Fig. 1B

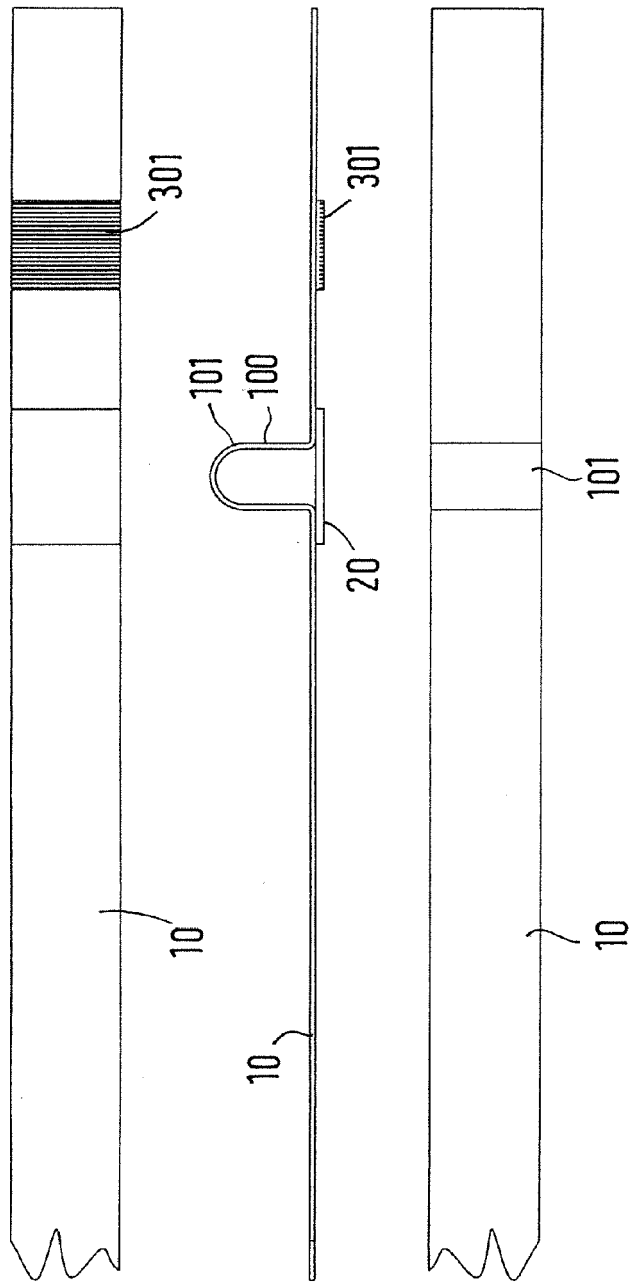
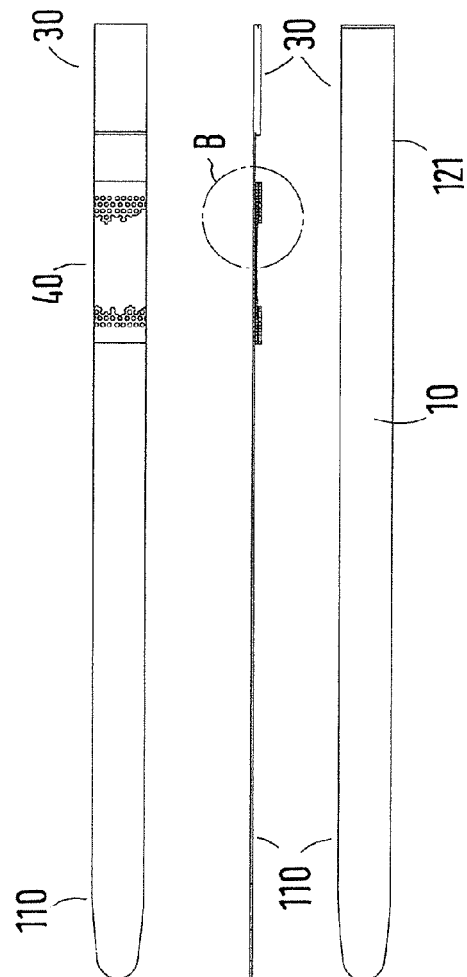
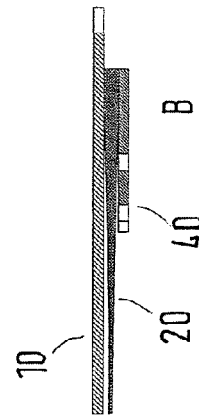
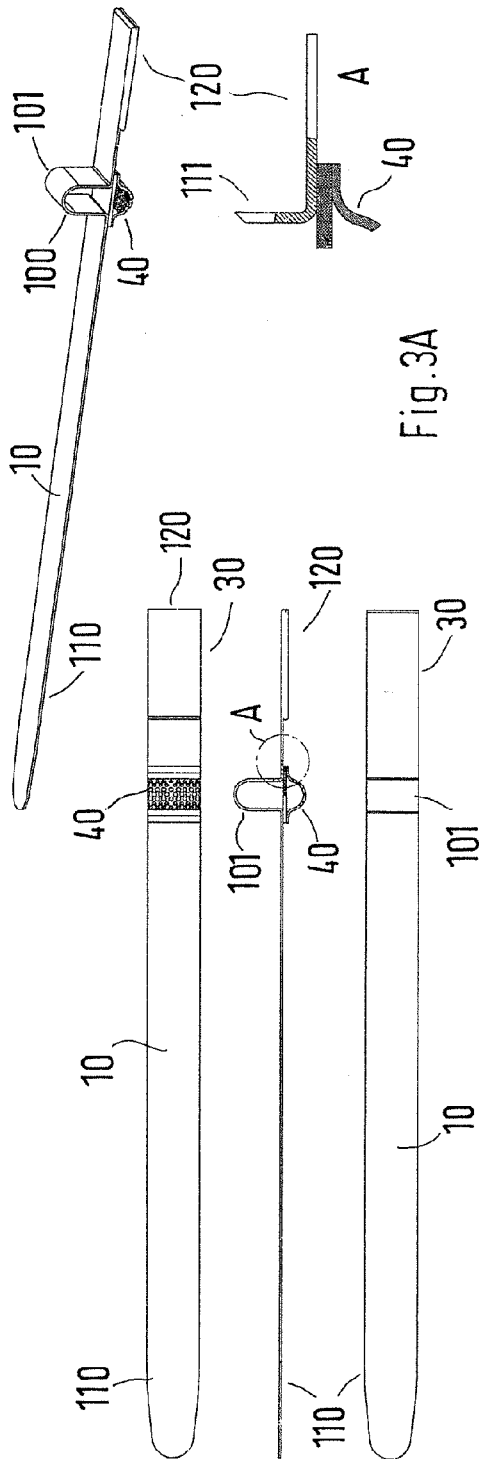


Fig.2



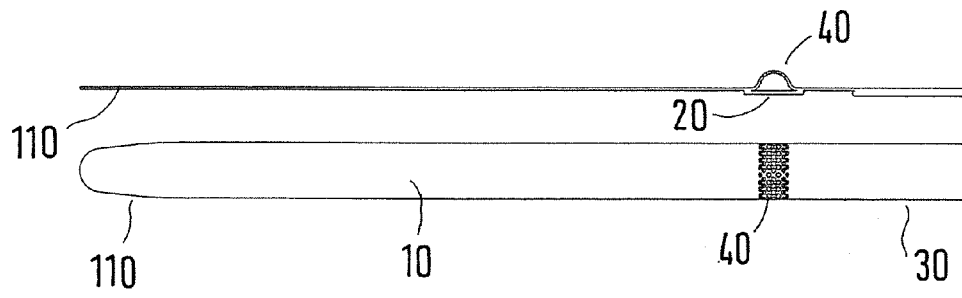


Fig. 4A

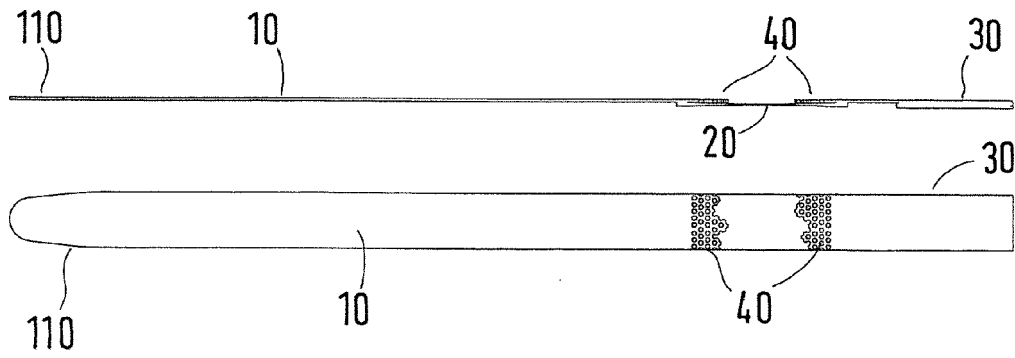


Fig. 4B