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(54) **A WEAR RESISTIVE DEVICE FOR FORMING A LENO WEAVE**

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EP 2 035 607 B1

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Description

Technical field of the invention

[0001] The present invention relates to a lifting heddle for a device for moving leno warp threads to form a leno weave, more particular for a device comprising two lifting heddles and a doup heddle moving along with these lifting heddles. The present invention also relates to a device making use of such a lifting heddle.

Background of the invention

[0002] A device for moving leno warp threads to form a leno weave, is e.g. disclosed in US4967802 or EP371257. Such a device comprises two lifting heddles and one doup heddle, which is also called a half heddle. Each time a lifting heddle is moved i.e. lifted or raised, this doup heddle is moved over a distance, which is approximately half of the distance the lifting heddle is moved. The lifting heddles are made out of polymer material and are provided with a magnet to assist the lifting of the doup heddle, which doup heddle is made out of steel that can be attracted magnetically.

[0003] The devices for moving leno warp threads to form a leno weave are mounted in a weaving loom in such a way that the surfaces of the lifting heddles are oriented in a direction substantially parallel to the warp direction. Warp threads or leno warp threads slide over one of the surfaces of each of the lifting heddles of the device. One of the major problems from which these devices suffer from, is wear by the leno warp threads. The leno warp threads are guided in the device in general, and in the lifting heddles in particular. An improvement is suggested by US5040571, where a metal link is provided between an upper and a lower part of the lifting heddle. As an alternative, BE1012258 suggests the use of a lamella next to the lifting heddle, which lamella shields the polymer lifting heddle from wear caused by the leno warp threads contacting the lifting heddle during use.

[0004] Still an other alternative is suggested in DE4003471, where the lifting heddles are provided with a special shield at the location of the guide opening for guiding the doup heddle in order to provide protection against wear.

[0005] A disadvantage of these known lifting heddles is that all metal parts have to be treated in order not to damage the warp threads when passing the device, e.g. when forming a leno weave. The metal elements have to be processed and smoothened to avoid sharp edges on the metal parts that could damage warp threads or even cause rupture of warp threads.

[0006] Such special treatment is expensive and time consuming. Integrating the metal parts in the leno heddle is to be done very precisely, which is time consuming and which again causes the leno weave device for moving leno warp threads to become even more expensive.

[0007] The use of metal shields in the lifting heddle may disturb the correct functioning of magnets mounted at the lower part of the lifting heddle to assist the movement of the doup heddle along with one of the lifting heddles.

Summary of the invention

[0008] It is an object of the present invention to provide alternative or improved devices for moving leno warp threads to form a leno weave, such as leno heddle devices.

[0009] It is an advantage of such a device according to embodiments of the present invention that they have similar or improved resistance to wear caused by contact with warp threads. It is an advantage of embodiments of the present invention that the device can be produced more cost effectively. It is an advantage of embodiments of the device according to the present invention, that the device can be constructed more easily. It is an advantage of embodiments of the present invention that the device can be constructed more precisely in an easy way. It is as well an advantage of some of the embodiments of the present invention that interference of the magnets at the lower part of the lifting heddle with other parts of the lifting heddle is reduced or even avoided. It is an advantage of embodiments of the present invention that the device can be maintained easily and time effectively.

[0010] An above mentioned objective is accomplished by a lifting heddle according to a first embodiment of the present invention, the lifting heddle comprising an upper part and a lower part, which lower part comprises a section coupling the upper part to the lower part. The lower part comprises a sheath portion of solid material, e.g. provided as a hollow elongated plate, a profiled strip or a flat sheath portion. The sheath comprises a guiding channel, for guiding a part of the doup heddle. The coupling section comprises a guide opening for guiding a doup heddle into the guiding channel, whereby at least at the coupling section of the lifting heddle there is arranged a wire on the lifting heddle for guiding a leno warp thread along the lifting heddle. A lifting heddle according to the first aspect of the present invention allows to limit the wear of a lifting heddle as a result of contact of the leno warp threads with the lifting heddle in a simple manner. The use of a wire with a wire surface is favourable for contacting a leno warp thread moving along said wire, because such a wire can be provided with a smooth surface. Furthermore, a wire can be bent or formed easily into any shape suitable for contacting a leno warp thread.

[0011] According to a preferred embodiment, at least at the coupling section of the lifting heddle a first wire and a second wire may be arranged on the lifting heddle for guiding a leno warp thread along the lifting heddle. This allows to guide at least one leno warp thread at choice at one of both sides of the lifting heddle. Preferably the first wire and second wire are identical, in particular identically shaped.

[0012] Preferably the wire is made of metal, the wire is bent into a suitable shape and/or the wire is fixed to the lifting heddle. This is advantageous for manufacturing the lifting heddle.

[0013] According to an embodiment the first wire and the second wire may be coupled to each other by means of an intermediate part. According to an embodiment the intermediate part may be arranged in a position in order to prevent a doup heddle from sliding down too deeply into a guiding channel of the lifting heddle.

[0014] According to an embodiment the lower part of the lifting heddle may be made of a non-magnetic material. According to an embodiment the lower part of the lifting heddle may be made of polymer material, such as synthetic polymer, and preferably comprises a magnet that can assist a doup heddle to move along with a lifting heddle. Amongst others, this allows to prevent that the functioning of the magnet is disturbed by the wire for guiding leno warp threads that is provided at the lifting heddle.

[0015] According to a second embodiment of the present invention, a device for moving leno warp threads to form a leno weave is provided, which device comprises two lifting heddles and a doup heddle moveable along with the lifting heddles and comprising at least one lifting heddle according to the first aspect of the present invention. A device with moveable lifting heddles disposed adjacent to each other for guiding a doup heddle allows the doup heddle to be carried along alternatively with one of the lifting heddles when the lifting heddles alternatively move reciprocally in order to form a leno weave with leno warp threads and weft threads.

[0016] Particular and preferred embodiments of the invention are set out in the accompanying independent and dependent claims.

[0017] Although there has been constant improvement, change and evolution of devices in this field, the present invention represents substantial new improvements, including departures from prior practices and resulting in the provision of more efficient, stable and reliable devices of this type.

[0018] The above and other characteristics, features and advantages of the present invention will become more apparent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention. This description is given for the sake of example only, without limiting the scope of the invention. The reference figures as quoted below refer to the attached drawings.

Brief description of the drawings

[0019]

Fig. 1 and Fig. 2 show schematically a leno heddle device according to the present invention.

Fig. 3, Fig. 4 and Fig. 5 are details of a lifting heddle according to the invention being part of the leno hed-

dle device of Fig. 1 and Fig. 2.

Fig. 6a, Fig. 6b, Fig. 6c, Fig. 6d and Fig. 6e are respective cross-sections along lines A-A, B-B, C-C, D-D and E-E in Fig. 3.

Fig. 7, Fig. 8 and Fig. 9 show schematically an alternative lifting heddle according to the invention being part of a leno heddle device according to the present invention.

Fig. 10, Fig. 11 and Fig. 12 show schematically a second alternative lifting heddle according to the invention being part of a leno heddle device according to the present invention.

Fig. 13a and Fig. 13b are respective cross-sections along lines F-F and G-G in Fig. 10.

Fig. 14, Fig. 15 and Fig. 16 show schematically an other alternative lifting heddle according to the invention being part of a leno heddle device according to the present invention.

Fig. 17 is a cross-sections along lines H-H in Fig. 14.

[0020] In the different figures, the same reference signs refer to the same or analogous elements.

Description of illustrative embodiments

[0021] The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes. The dimensions and the relative dimensions sometimes do not correspond to actual reductions to practice of the invention.

[0022] Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0023] Moreover, the terms top, bottom, over, under and the like in the description and the claims are used for descriptive purposes and not necessarily for describing relative positions. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other orientations than described or illustrated herein.

[0024] It is to be noticed that the term "comprising", used in the claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. It is thus to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other

features, integers, steps or components, or groups thereof. Thus, the scope of the expression "a device comprising means A and B" should not be limited to devices consisting only of components A and B. It means that with respect to the present invention, the relevant components of the device are A and B.

[0025] Similarly, it is to be noticed that the term "coupled", also used in the claims, should not be interpreted as being restricted to direct connections only. Thus, the scope of the expression "a device A coupled to a device B" should not be limited to devices or systems wherein a part of device A is directly connected to a part of device B. It means that there exists a connection between a part of device A and a part of device B which may be a connection including other devices or means.

[0026] The following terms are provided solely to aid in the understanding of the invention. These definitions should not be construed to have a scope less than understood by a person of ordinary skill in the art.

[0027] The term "non-magnetic" is to be understood as not capable to be magnetized.

[0028] The term "sheath" is to be understood as an at least partly surrounding or partly enveloping structure. The structure may be open at least on one side and at the top.

[0029] The invention will now be described by a detailed description of several embodiments of the invention. It is clear that other embodiments of the invention can be configured according to the knowledge of persons skilled in the art without departing from the true spirit or technical teaching of the invention, the invention being limited only by the terms of the appended claims. The invention will now be described by a detailed description of a leno heddle device, but it is understood that such leno heddle device is only one example of a device for forming a leno weave by moving leno warp threads.

[0030] Making reference to Fig. 1 and 2, a leno heddle device 100 as subject of the present invention is shown. Fig. 1 shows the leno heddle device 100 comprising a doup heddle 400 mounted in two lifting heddles 200 and 300, wherein the lifting heddle 300 is lifted to its maximum upper position, whereas Fig. 2 shows the leno heddle device 100 in its separate parts prior to combining the parts.

[0031] A leno heddle device 100 comprises two substantially identical lifting heddles 200 and 300, and a doup heddle 400. Each lifting heddle 200, 300 comprises an upper part 210, 310 and a lower part 220, 320, which lower part comprises a section 221, 321 for coupling the lower part 220, 320 to the upper part 210, 310, the section being preferably bevelled.

[0032] The upper part 210, 310 comprises a driving element 212, 312 for coupling the lifting heddle to a driving system, which causes the lifting heddle to move up and down. Similarly, the lower end of the lower part 220, 320 comprises a similar driving element 222, 322. Any suitable driving element may be used of which the following are several examples. The leno heddles can be

driven using the driving mechanism as described in EP 371257. Alternatively the driving mechanism as disclosed in EP 772703 may be used to move the lifting heddles of the leno heddle device up and down. As another alternative, the leno heddle device as subject of the present invention can be mounted on the harness frames of a weaving machine.

[0033] The lower part 220, 320 is preferably made out of solid, non-magnetic material, e.g. made out of a polymeric material, such as a synthetic polymer, e.g. a thermoset polymer or thermoplastic polymer such as e.g. polyethylene, polypropylene or polyethylene reinforced with carbon, polypropylene reinforced with carbon, ABS, polycarbonate, etc. The lower part 220, 320 is preferably injection moulded but any other suitable manufacturing method may be used.

[0034] The upper part is possibly made out of the same material as the lower part. Most preferred, the upper part is integrated with the lower part, possibly fabricated together to form one entity, e.g. fabricated by injection moulding in one and the same injection moulding step to form one entity.

[0035] The lower part is executed as a sheath comprising a guide channel 223, 323 in which the doup heddle 400 slides in and out during use of the leno heddle device. In the embodiment according to Figs. 1 to 6 the sheath 260 comprises amongst others a structure comprising as shown in Fig. 6e a U-shaped elongated profile having legs 261 and 262 and a connecting wall 263. At the lower end of the lower part, at the bottom of the guiding channel, the lifting heddle comprises, in the example shown, a magnet 225, 325, which assists the doup heddle to move along with the lifting heddle.

[0036] The doup heddle 400 comprises two legs 410 and 420, which legs slide in the guide channels 223 and 323 of the lifting heddles 200 and 300 via the guide openings 224 and 324. Where the two legs 410 and 420 meet at the top of the doup heddle, an eyelet 430 is provided for guiding one or a number of first leno warp threads 501. The leno heddle device is in ground position when the bevelled sections 221 and 321 are at substantially the same height. Starting from this ground position, one or a number of secondary leno warp threads 502 are guided between one of the legs 410 or 420 of the doup heddle 400 and one of the upper parts of one of the lifting heddles 200 or 300, and this in such a way that, when the lifting heddle 200 is moved upwards, the secondary leno warp thread 502 is guided between leg 420 and upper part 310 of lifting heddle 300, or in case the lifting heddle 300 is moved upwards, the secondary leno warp thread 502 is guided between leg 410 and upper part 210 of lifting heddle 200. In a known way, the leno warp threads 501 and 502 form together with weft threads, not shown, a leno weave 505.

[0037] As the leno heddle device is mounted in a weaving machine having one of the lifting heddles located in front of the other lifting heddle in a direction parallel to the warp direction, the leno warp threads will contact the

surface of the lifting heddles at least at one side of the bevelled section of the lifting heddle when one of the lifting heddles is moved upwards.

[0038] According to the present invention, at least one, but preferably both lifting heddles 200, 300 are provided with at least one wire having a rounded contact surface for contacting a warp thread or leno warp thread along the bevelled section 221, 321. As shown in Fig. 2, each of the lifting heddles 200 and 300 is provided with two wires 230 and 330, and 240 and 340.

[0039] Turning to lifting heddle 200 as an example of both the lifting heddles 200 and 300, as more clearly shown in Fig. 1, and more in detail in Fig. 3, Fig. 4 and Fig. 5, the lifting heddle 200 is provided with a wire 230 at a first surface 231 and with a second wire 240 at the second surface 241, extending substantially parallel with the first surface 231. In a similar way, the lifting heddle 300 is provided with a wire 330 at a first surface 331 and with a second wire 340 at the second surface 341, extending substantially parallel with the first surface 331.

[0040] The wires 230, 240 and 330, 340 can easily be shaped or transformed into the requested shape by profiling and/or bending the wire into an appropriate shape. The wire or wires 230, 240 and 330, 340 are at a certain distance of the guide opening 224, 324 for the doup heddle 400, more particularly a distance in the order of magnitude of the thickness of the wire, as shown in the drawings. The wires need not to be self-supporting, as the polymer of the section 226, 326 of the bevelled section 221, 321 of the lifting heddle 200, 300 may support the wire 230, 240, 330, 340. Alternatively the wires may be self-supporting, e.g. free of distributed support by the lifting heddle.

[0041] There are several advantages of using a wire to provide a contact surface for a warp thread, e.g. at least one of the following:

- a) wire manufacture can provide a high quality product at a reasonable cost
- b) wires are available in a wide range of diameters and a wide range of materials, e.g. non-metals, metals and metal alloys, including non-magnetic materials
- c) wires are obtainable with a smooth outer surface of high quality
- d) the wire drawing process work hardens the material thus producing a hard outer surface which is wear resistant
- e) wires can easily be manipulated, e.g. bent and positioned
- f) wires may be removed and replaced if worn which allows the basic lifting heddle to be recuperated and reused. Such a replacement may also even be done at the weaving loom by an operator.

[0042] The provision of two wires, each one near one of the side surfaces of the lifting heddle, also has the advantage that the leno heddle device allows a leno warp

thread to be arranged to slide over a wire mounted near a particular one of the side surfaces of the lifting heddle, such that a warp thread can be guided along a particular side surface of the lifting heddle, i.e. along the left surface 231 or along the right surface 241 of the lifting heddle 200 as shown in Fig. 5. This also allows the leno heddle device to be used in both directions, i.e. whereby the first lifting heddle 200 is arranged in front of the second lifting heddle 300 in production direction, or vice versa. The advantage of reduction of wear to the lifting heddles is thus independent of the way the leno heddle device as a whole is mounted in the weaving machine. Further it is independent at which side surface of the lifting heddle 200, 300 a leno warp thread is running.

[0043] The wire is preferably made out of smooth, strong and possibly non-magnetic material. As an example, a metal wire, more advantageously a normal steel or stainless steel wire having, for example, a diameter in the range of 0.2mm to 2mm, such as a diameter of 0.5mm may be used. Of course any other diameter that allows a thread to be suitably arranged in a lifting heddle can be used. The cross section of the wire is preferably round, although oval profiled wires or profiled wires having another rounded shape may as well be used. Alternative wires are polymer wires, e.g. wires from Teflon (Polytetrafluorethylene). Also ceramic wire-like objects such as e.g. wires with a ceramic or diamond-like outer layer are possible.

[0044] Detailed views of a lifting heddle 200 is shown in Fig. 3, Fig. 4, Fig. 5 and Fig. 6a to Fig. 6e. Identical reference numbers refer to identical features as shown in Fig. 1 and Fig. 2.

[0045] The wires 230 and 240 may be fixed to the upper and lower part of the lifting heddle by means of respective fixing holes 233 and 234, and 243 and 244, in which the outer ends of the wire are fixed, e.g. by inserting the ends in the holes to hold the ends in the holes. This can be done by providing fixing holes having a diameter slightly smaller than the diameter of the wire. The wire is fixed by pressing the outer ends into the fixing holes. Alternatively or additionally, the outer ends of the wire are glued in the fixing holes by means of appropriate glue. Still another alternative is to provide the wire with a glue along at least a portion of its length, and fixing the wire to at least the bevelled section by gluing this at least a portion of its length to the lifting heddle. Any suitable glue or adhesive may be used, e.g. pressure contact adhesive, hot melt adhesive, cross-linking adhesive. Any other mechanical fixing method may be used. For example, also locally partially melting the polymer of the lower part and embedding the wire in this partially molten polymer may be used to fix the wire to the lifting heddle.

[0046] The wires 230 and 330, and 240 and 340 extending along the bevelled sections 221 and 321 respectively, may further extend downwards along the section 226, 326 of the bevelled section 221, 321 near lower part 220, 320. Possibly the wires may extend upwards along the section of the upper part which section is to couple

the upper part to the bevelled section of the lower part, i.e. over the whole length of the upper part.

[0047] Detailed views of an alternative lifting heddle 500 are shown in Fig. 7, Fig. 8 and Fig. 9. The same features are indicated with same references as for lifting heddle 200. The lifting heddle 500 comprises a pin 503 extending from the first surface 531 to the second surface 541 substantially parallel to the first surface 531 of the section 226. This pin 503 is to prevent the doup heddle from sliding down into the guiding channel 223 too deeply, thereby contacting the lower edge of the guiding opening 224 and damaging this edge. Such a pin is known from BE1012259. The pin 503 normally does not make contact with a leno warp thread and thus cannot cause damage to a leno warp thread. A sliding of the inner edge of the doup heddle along the pin 503, may sharpen the edges of the doup heddle contacting the pin. As the parts of the doup heddle 400 contacting the pin 503 make no contact with the leno warp threads, this sharpening will not cause additional damage to the leno warp threads.

[0048] Yet another alternative lifting heddle 600 is shown in Fig. 10, Fig. 11, Fig. 12 and Fig. 13a and Fig. 13b. The same features are indicated with same references as for lifting heddle 200. The lifting heddle is provided with a wire 601, 602 for preventing a leno warp thread to contact the side of the polymer bevelled section of the lifting heddle 600, more particularly to the outer surfaces 231, 241. In this embodiment, wires are provided as one entity. The wires 601, 602 are coupled to each other as shown in this case at their lower ends by means of an intermediate part 603, i.e. an intermediate wire part having a shape similar as the one of the wires 601, 602. The intermediate part 603 can be arranged into a fixing hole 604. Also here, the lifting heddle 600 may be provided with a pin 503 extending from the first surface 531 to the second surface 541 substantially parallel to the first surface 531. This pin 503 is to prevent the doup heddle to drop down in to the guiding channel too deep, thereby contacting the lower edge of the guiding opening 224 and damaging its edge, as is already known from BE1012259. Another alternative, not shown in the figures, is that the two wires are coupled to each other at their upper ends by means of an intermediate part in a similar way.

[0049] Another alternative lifting heddle 700 is shown in Fig. 14, Fig. 15, Fig. 16 and Fig. 17. The same features are indicated with same references as for lifting heddle 200. In this particular embodiment, the two wires 701 and 702 form one entity and are coupled to each other at their lower ends by means of an intermediate part 703, which is arranged as and functions as a pin for preventing the doup heddle from sliding down in the guiding channel 223 too deeply, thereby causing contact with the edge of the guiding opening 224.

[0050] Other arrangements for accomplishing the objectives of the leno heddle devices in particular, and devices for providing a leno weave in general, embodying the invention are possible.

[0051] A device for moving leno warp threads to form a leno weave in general, and a leno heddle device as subject of the present invention in particular, may be used to provide a leno selvage at the sides of a woven fabric, or may be used to bind one or more warp threads in a leno. The device for moving leno warp threads to form a leno weave can be used in weaving machines having at least 1000 movements per minute of the device, i.e. the changing of position of the lifting heddles.

[0052] In case a lifting heddle of a device for moving leno warp threads to form a leno weave is worn, i.e. in case wear is noticed at the wire or wires, the wires can easily be replaced without the need to replace the lifting heddle or the whole device for moving leno warp threads to form a leno weave. This replacement of a wire can be done quickly in an accurate way.

[0053] The device for moving leno warp threads to form a leno weave as subject of the present invention may be used in linear or round weaving looms, and is useful to provide any type of woven structure, such as single layer woven structures, double layer woven structures as velvet woven structure or seamless woven bags or any other kind of woven structure. The device can also be applied in weaving machines having any kind of weft insertion principle, such as airjet weaving machines, rapier weaving machines, projectile weaving machines or any other kind of weaving machine.

[0054] It is to be understood that although preferred embodiments, specific constructions and configurations, as well as materials, have been discussed herein for devices according to the present invention, various changes or modifications in form and detail may be made without departing from the scope of this invention as claimed. For example, the upper parts and/or the lower parts of the lifting heddles may be provided with a wire, which is provided as wire according to the invention for contacting the warp threads or leno warp threads along the bevelled section of the lifting heddles.

Claims

1. A lifting heddle for a device (100) for moving leno warp threads (501,502) to form a leno weave (505), the device (100) comprising lifting heddles (200,300,500,600,700) and a doup heddle (400), the lifting heddle (200,300,500,600,700) comprising an upper part (210,310) and a lower part (220,320), the lower part comprising a sheath (260) of solid material, the sheath (260) comprising a guiding channel (223,323) for guiding a part of the doup heddle (400), the lower part (220,320) comprising a section (221,321) coupling the lower part (220,320) to the upper part (210,310), which section (221,321) comprises a guide opening (224,324) for guiding a doup heddle (400) into the guiding channel (223,323), **characterised in that** at least at the section (221,321) of the lifting heddle

(200,300,500,600,700) a wire (230,240,330,340,601,601,701,702) is arranged on the lifting heddle (200,300,500,600,700) for guiding a leno warp thread (501,502) along the lifting heddle (200,300,500,600,700).

5

2. A lifting heddle according to claim 1, **characterised in that** at least at the section (221,321) of the lifting heddle (200,300,500,600,700) a first wire (230,330,601,701) and a second wire (240,340,602,702) are associated to the lifting heddle (200,300,500,600,700).
3. A lifting heddle according to claim 2, **characterised in that** the first wire (601,701) and the second wire (602,702) are coupled to each other by means of an intermediate part (603,703).
4. A lifting heddle according to claim 3, **characterised in that** the intermediate part (703) is arranged in a position in order to prevent a doup heddle (400) from sliding down too deeply into a guiding channel (223) of the lifting heddle (700).
5. A lifting heddle according to any one of the claims 1 to 4, **characterised in that** the wire (230,240,330,340,601,601,701,702) is made of metal.
6. A lifting heddle according to any one of the claims 1 to 5, **characterised in that** the wire (230,240,330,340,601,601,701,702) is fixed to the lifting heddle (200,300,500,600,700).
7. A lifting heddle according to any one of the claims 1 to 6, **characterised in that** the wire (230,240,330,340,601,601,701,702) is bended into a shape.
8. A lifting heddle according to any one of the claims 1 to 7, **characterised in that** the lower part (220,320) of the lifting heddle (200,300,500,600,700) is made of non-magnetic material.
9. A lifting heddle according to any one of the claims 1 to 8, **characterised in that** the lower part (220,320) of the lifting heddle (200,300,500,600,700) is made of polymer material, such as synthetic polymer.
10. A lifting heddle according to any one of the claims 1 to 9, **characterised in that** the lower part (220,320) comprises a magnet (225,325) that can assist a doup heddle (400) to move along with a lifting heddle (200,300,500,600,700).
11. A device (100) for moving leno warp threads (501,502) to form a leno weave (505) comprising two lifting heddles (200,300,500,600,700) and a doup

heddle (400) moveable along with the lifting heddles (200,300,500,600,700), **characterised in that** the device (100) comprises at least one lifting heddle (200,300,500,600,700) according to any one of the claims 1 to 10.

Patentansprüche

1. Hebelitze für eine Vorrichtung (100) zum Bewegen von Dreherkettfäden (501, 502) zum Bilden einer Dreherbindung (505), die Vorrichtung (100) enthaltend Hebelitzen (200, 300, 500, 600, 700) und eine Dreherlitze (400), die Hebelitze (200, 300, 500, 600, 700) enthaltend einen oberen Teil (210, 310) und einen unteren Teil (220, 320), der untere Teil enthaltend einen Mantel (260) vom festen Material, der Mantel (260) enthaltend einen Führungskanal (223, 323) zum Führen einen Teil der Dreherlitze (400), der untere Teil (220, 320) enthaltend eine Sektion (221, 321), die den unteren Teil (220, 320) an den oberen Teil (210, 310) verbindet, welche Sektion (221, 321) eine Führungsöffnung (224, 324) enthält zum Führen einer Dreherlitze (400) in dem Führungskanal (223, 323), **dadurch gekennzeichnet dass** mindestens an der Sektion (221, 321) der Hebelitze (200, 300, 500, 600, 700) ein Draht (230, 240, 330, 340, 601, 601, 701, 702) auf der Hebelitze (200, 300, 500, 600, 700) angeordnet ist zum Führen eines Dreherkettfadens (501, 502) entlang der Hebelitze (200, 300, 500, 600, 700).
2. Hebelitze nach Anspruch 1, **dadurch gekennzeichnet dass** mindestens an der Sektion (221, 321) der Hebelitze (200, 300, 500, 600, 700) ein erster Draht (230, 330, 601, 701) und ein zweiter Draht (240, 340, 602, 702) zu der Hebelitze (200, 300, 500, 600, 700) zugeordnet sind.
3. Hebelitze nach Anspruch 2, **dadurch gekennzeichnet dass** den ersten Draht (601, 701) und den zweiten Draht (602, 702) mittels eines Zwischenteils (603, 703) miteinander verbunden sind.
4. Hebelitze nach Anspruch 3, **dadurch gekennzeichnet dass** den Zwischenteil (703) in einer Position angeordnet ist, um zu verhindern, dass eine Dreherlitze (400) zu tief in das Führungskanal (223) der Hebelitze (700) gleitet.
5. Hebelitze nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet dass** den Draht (230, 240, 330, 340, 601, 601, 701, 702) aus Metall hergestellt ist.
6. Hebelitze nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet dass** den Draht (230, 240, 330, 340, 601, 601, 701, 702) an der Hebelitze (200,

300, 500, 600, 700) befestigt ist.

7. Hebelitze nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet dass** den Draht (230, 240, 330, 340, 601, 601, 701, 702) in einer Form verbogen wird. 5
8. Hebelitze nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet dass** den unteren Teil (220, 320) der Hebelitze (200, 300, 500, 600, 700) aus einem nicht-magnetischen Material hergestellt ist. 10
9. Hebelitze nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet dass** den unteren Teil (220, 320) der Hebelitze (200, 300, 500, 600, 700) aus einem polymeren Material, wie synthetisches Polymer hergestellt ist. 15
10. Hebelitze nach einem der Ansprüche 1 bis 9, **dadurch gekennzeichnet dass** den unteren Teil (220, 320) einen Magnet (225, 325) enthält, der eine Dreherlitze (400) helfen kann, um sich mit einer Hebelitze (200, 300, 500, 600, 700) zu bewegen. 20
11. Vorrichtung (100) zum Bewegen von Dreherkettfäden (501, 502) zum Bilden einer Dreherbindung (505) enthaltend zwei Hebelitzen (200, 300, 500, 600, 700) und eine Dreherlitze (400) bewegbar mit den Hebelitzen (200, 300, 500, 600, 700), **dadurch gekennzeichnet dass** die Vorrichtung (100) mindestens eine Hebelitze (200, 300, 500, 600, 700) nach einem der Ansprüche 1 bis 10 enthält. 25
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Revendications

1. Lisse de levage pour un dispositif (100) pour déplacer des fils de chaîne de gaze (501, 502) pour former une armure de gaze (505), le dispositif (100) comprenant des lisses de levage (200, 300, 500, 600, 700) et une lisse culotte (400), la lisse de levage (200, 300, 500, 600, 700) comprenant une partie supérieure (210, 310) et une partie inférieure (220, 320), la partie inférieure comprenant une gaine (260) d'un matériau solide, la gaine (260) comprenant un canal de guidage (223, 323) pour guider une partie de la lisse culotte (400), la partie inférieure (220, 320) comprenant une section (221, 321) accouplant la partie inférieure (220, 320) à la partie supérieure (210, 310), quelle section (221, 321) comprend une ouverture de guidage (224, 324) pour guider une lisse culotte (400) dans le canal de guidage (223, 323), **caractérisée en ce qu'au moins à la section (221, 321) de la lisse de levage (200, 300, 500, 600, 700) un fil (230, 240, 330, 340, 601, 601, 701, 702) est disposé sur la lisse de levage (200, 300, 500, 600, 700) pour guider un fil de chaîne de gaze (501, 502) le long de la lisse de levage (200, 300, 500, 600, 700).** 55

2. Lisse de levage selon la revendication 1, **caractérisée en ce qu'au moins à la section (221, 321) de la lisse de levage (200, 300, 500, 600, 700) un premier fil (230, 330, 601, 701) et un deuxième fil (240, 340, 602, 702) sont associés à la lisse de levage (200, 300, 500, 600, 700).**
3. Lisse de levage selon la revendication 2, **caractérisée en ce que** le premier fil (601, 701) et le deuxième fil (602, 702) sont accouplés au moyen d'une partie intermédiaire (603, 703) l'un à l'autre.
4. Lisse de levage selon la revendication 3, **caractérisée en ce que** la partie intermédiaire (703) est disposée dans une position afin d'éviter une lisse culotte (400) de glisser trop profondément dans un canal de guidage (223) de la lisse de levage (700).
5. Lisse de levage selon l'une quelconque des revendications 1 à 4, **caractérisée en ce que** le fil (230, 240, 330, 340, 601, 601, 701, 702) est rendu du métal.
6. Lisse de levage selon l'une quelconque des revendications 1 à 5, **caractérisée en ce que** le fil (230, 240, 330, 340, 601, 601, 701, 702) est fixé à la lisse de levage (200, 300, 500, 600, 700).
7. Lisse de levage selon l'une quelconque des revendications 1 à 6, **caractérisée en ce que** le fil (230, 240, 330, 340, 601, 601, 701, 702) est plié dans une forme.
8. Lisse de levage selon l'une quelconque des revendications 1 à 7, **caractérisée en ce que** la partie inférieure (220, 320) de la lisse de levage (200, 300, 500, 600, 700) est rendue d'un matériau non-magnétique. 35
9. Lisse de levage selon l'une quelconque des revendications 1 à 8, **caractérisée en ce que** la partie inférieure (220, 320) de la lisse de levage (200, 300, 500, 600, 700) est rendue d'un matériau polymère, comme polymère synthétique. 40
10. Lisse de levage selon l'une quelconque des revendications 1 à 9, **caractérisée en ce que** la partie inférieure (220, 320) comprend un aimant (225, 325) qui peut assister une lisse culotte (400) pour se déplacer avec une lisse de levage (200, 300, 500, 600, 700). 45
11. Dispositif (100) pour déplacer des fils de chaîne de gaze (501, 502) pour former une armure de gaze (505) comprenant deux lisses de levage (200, 300, 500, 600, 700) et une lisse culotte (400) déplaçable avec des lisses de levage (200, 300, 500, 600, 700), **caractérisé en ce que** le dispositif (100) comprend 50

au moins une lisse de levage (200, 300, 500, 600, 700) selon l'une quelconque des revendications 1 à 10.

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Fig. 1

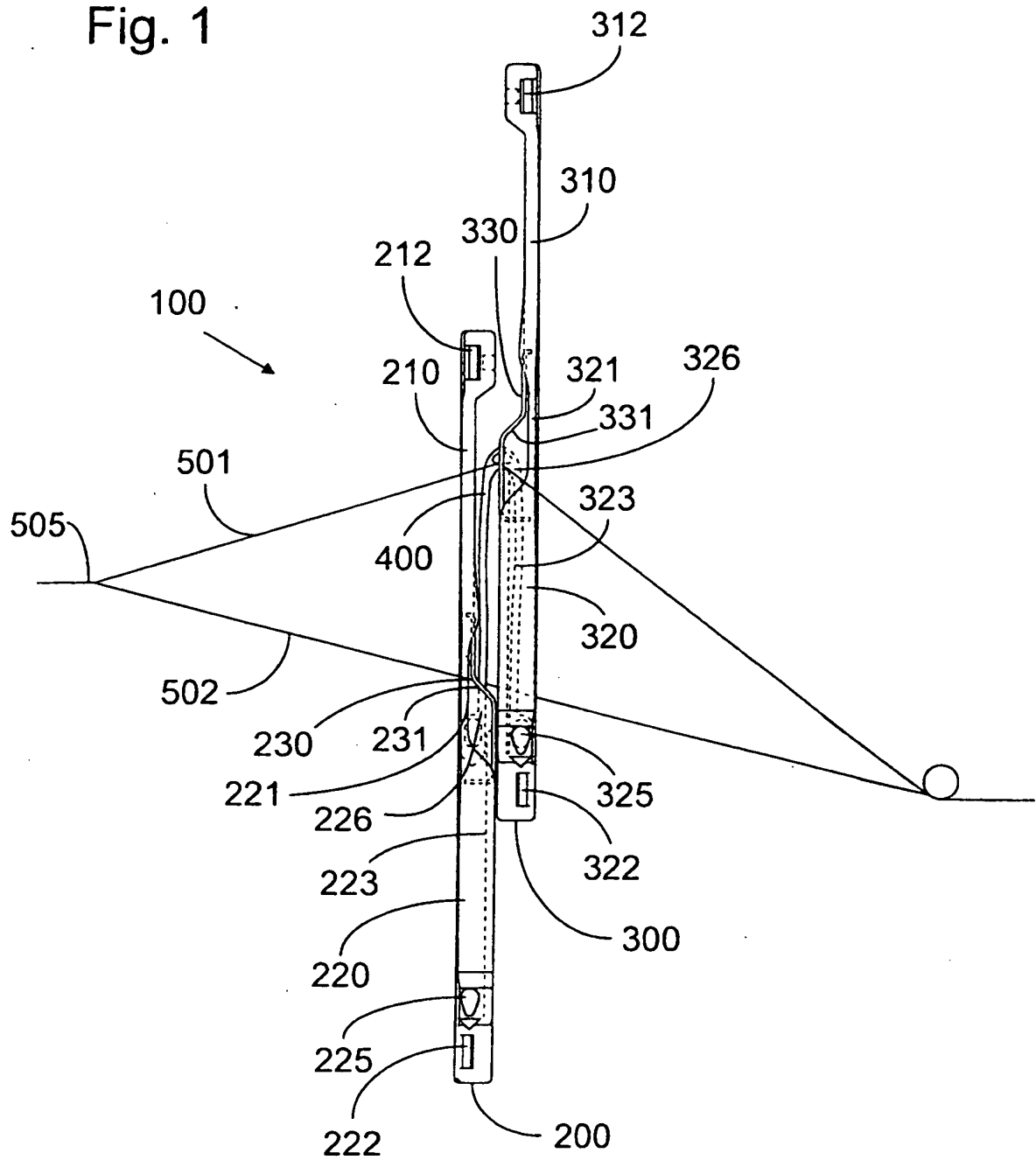


Fig. 2

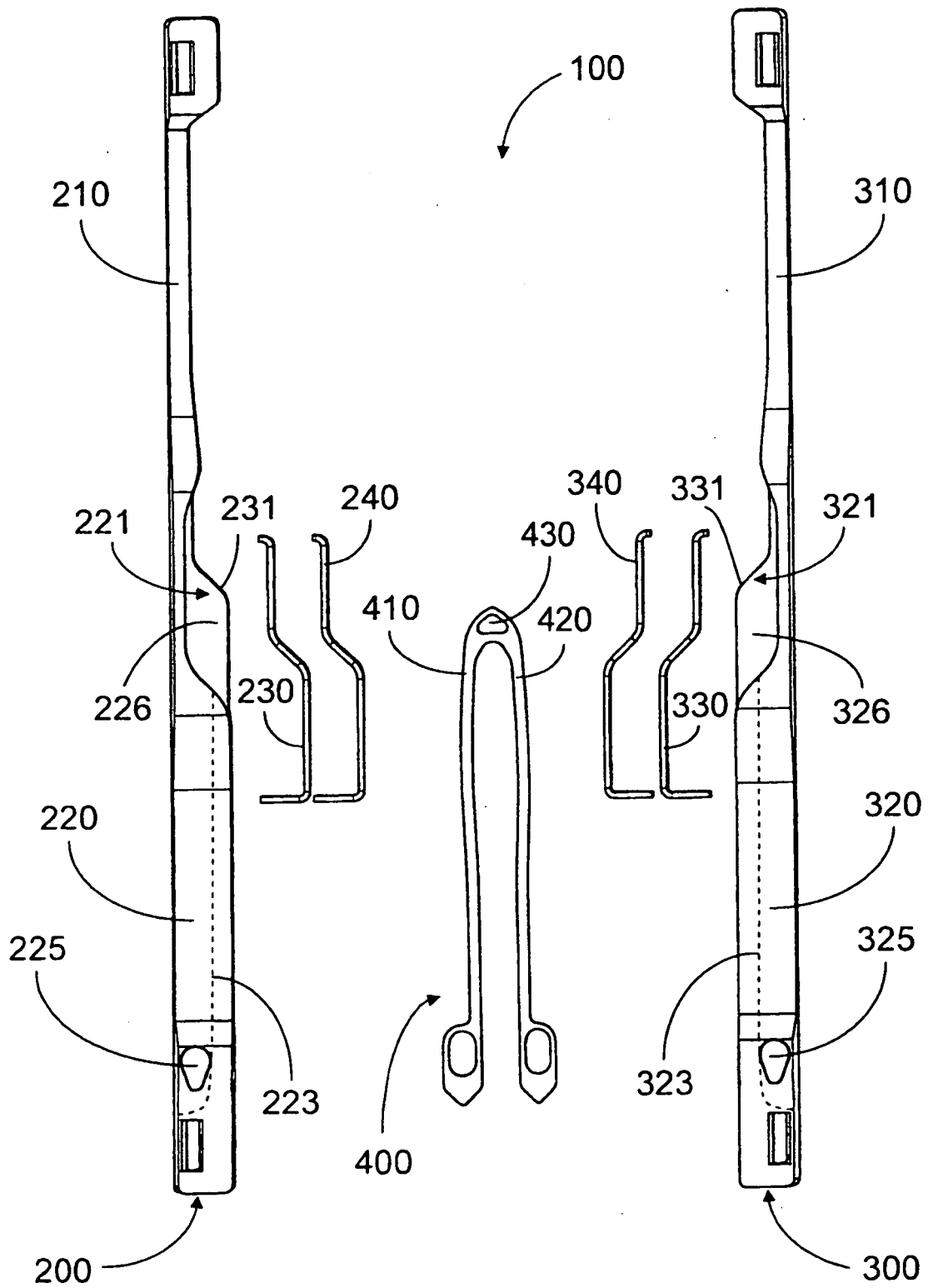


Fig. 3

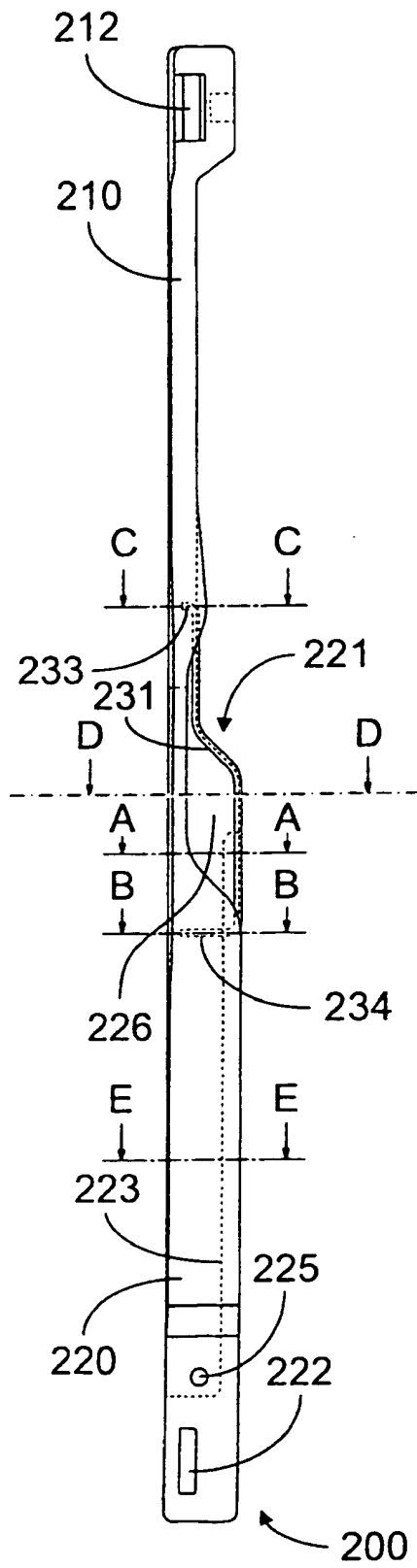


Fig. 7

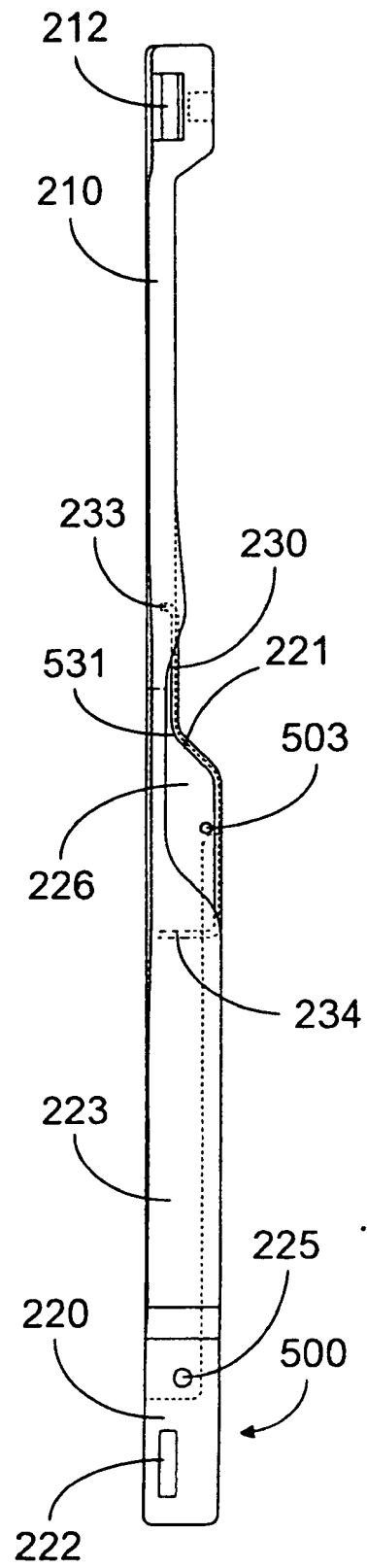


Fig. 4

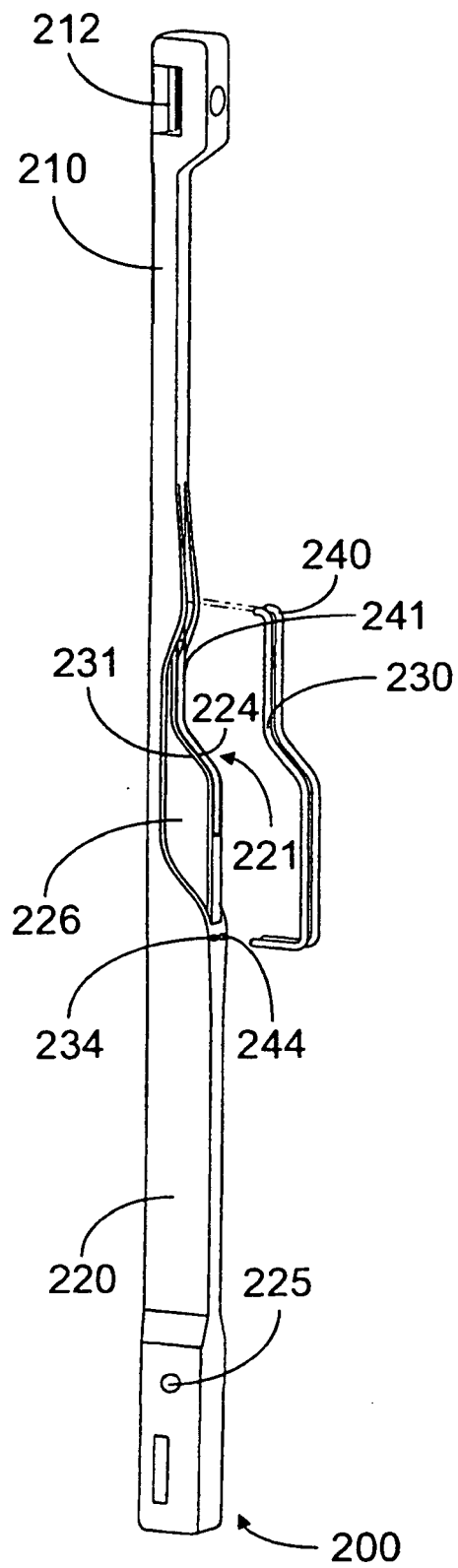


Fig. 5

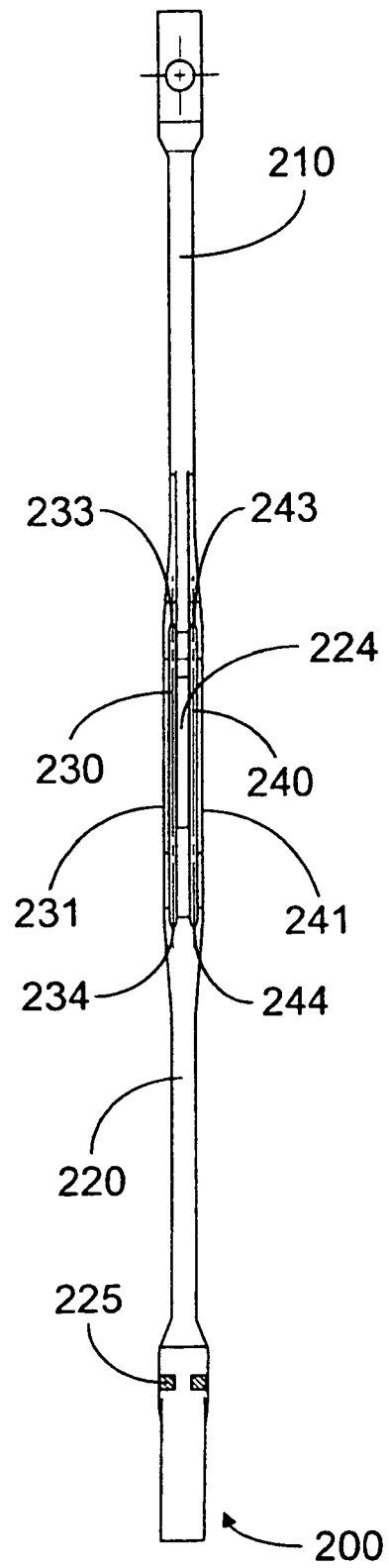


Fig. 6a

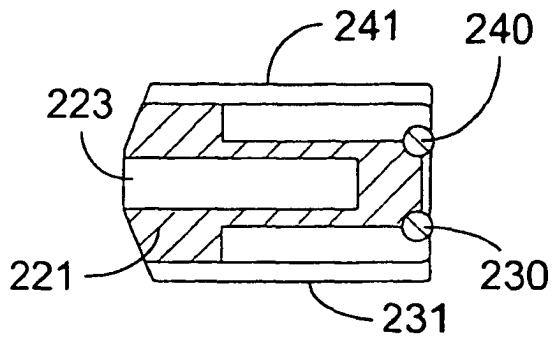


Fig. 6b

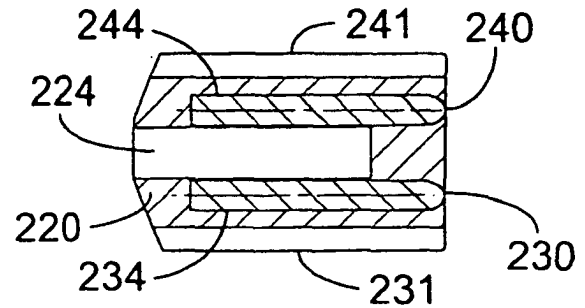


Fig. 6c

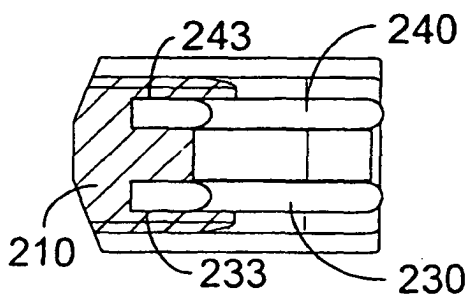


Fig. 6d

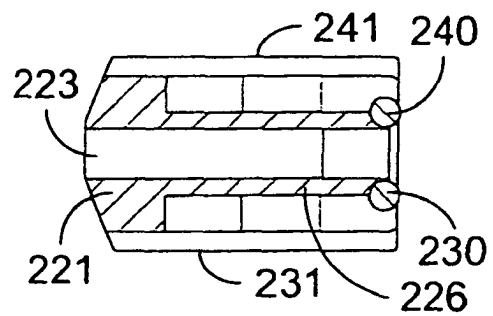


Fig. 6e

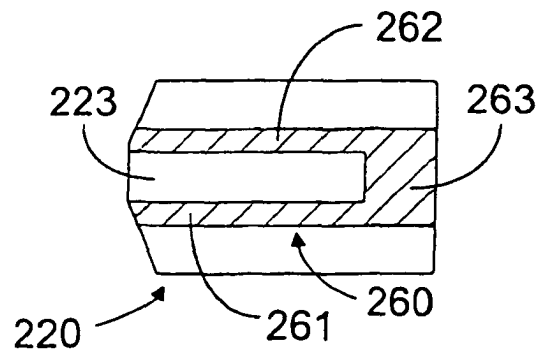


Fig. 8

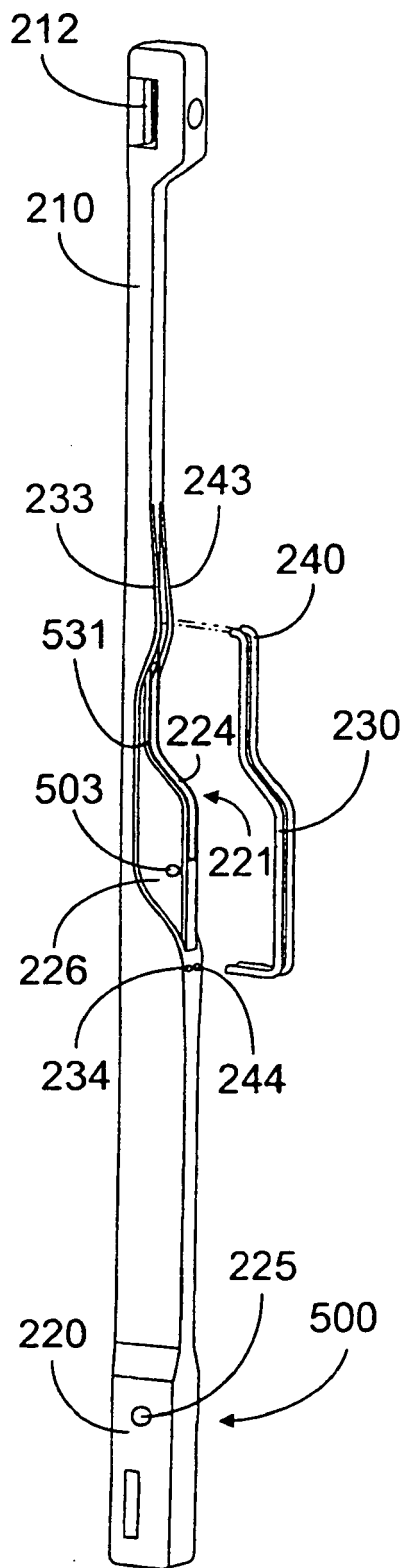


Fig. 9

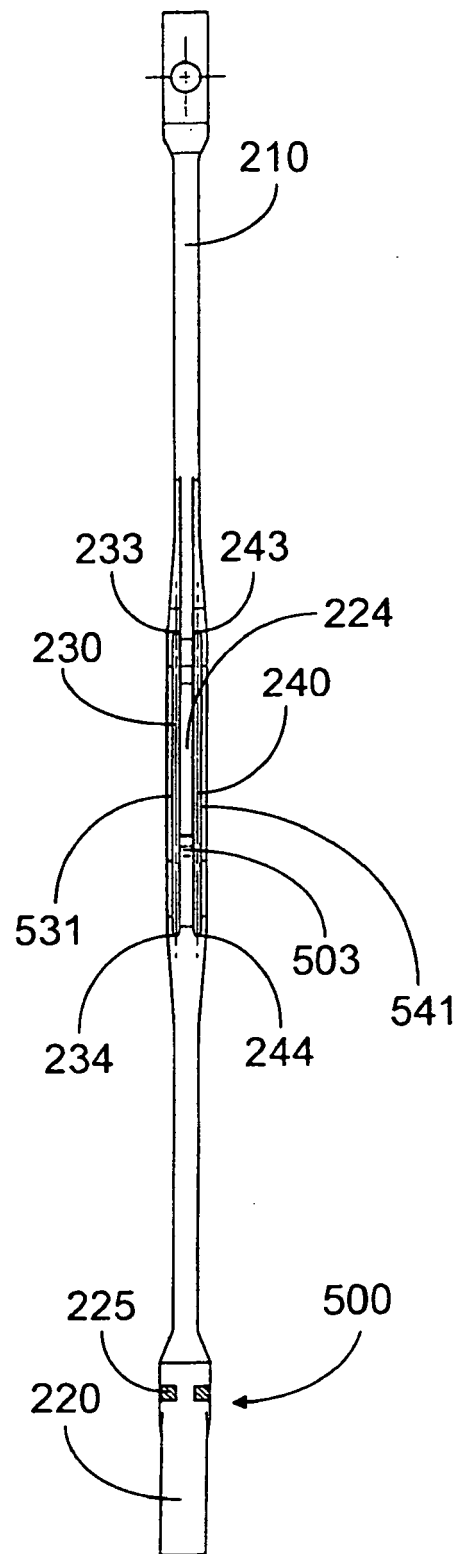


Fig. 10

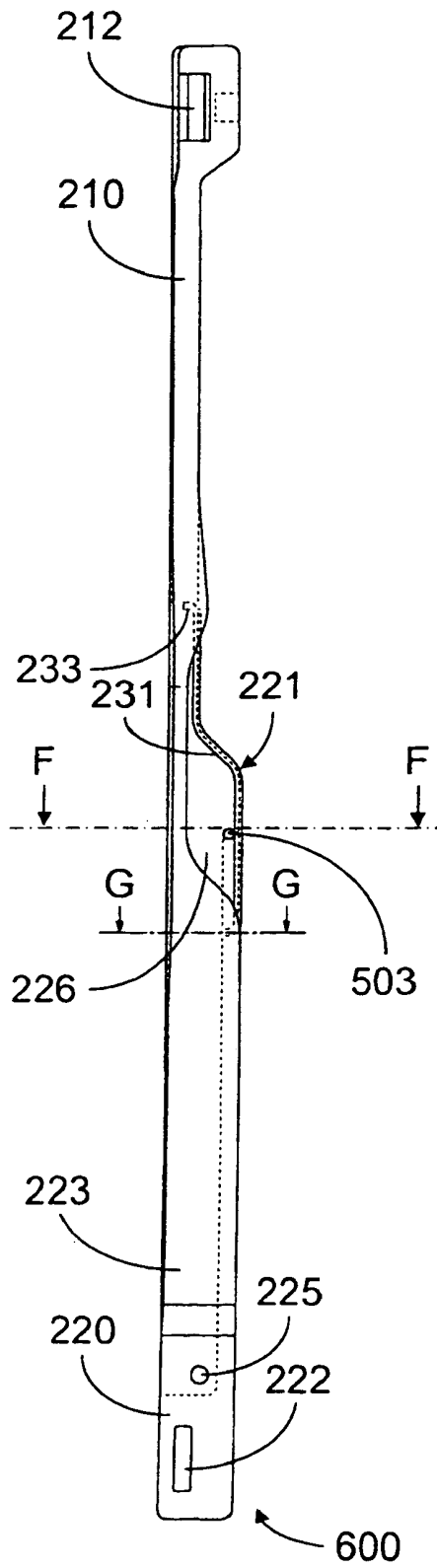


Fig. 13a

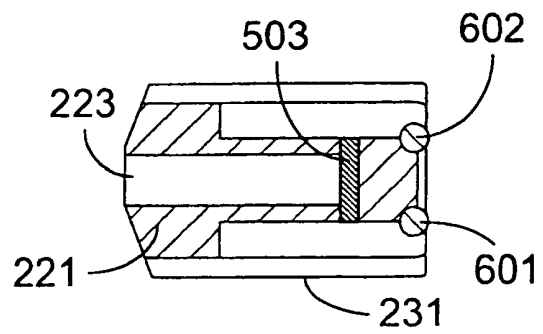


Fig. 13b

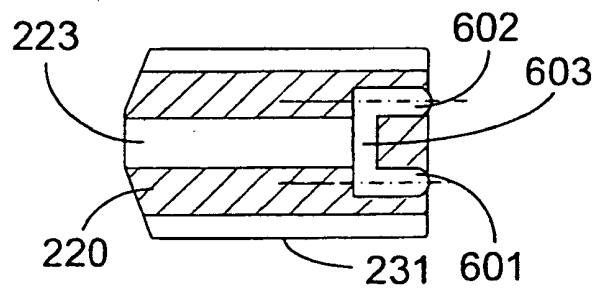


Fig. 17

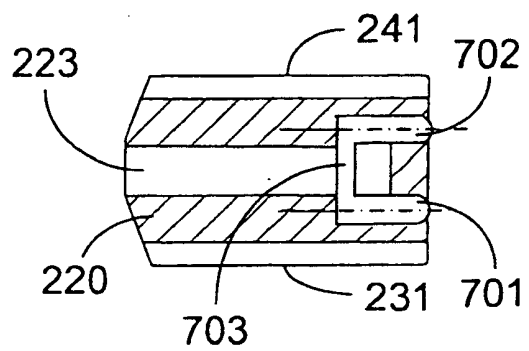


Fig. 11

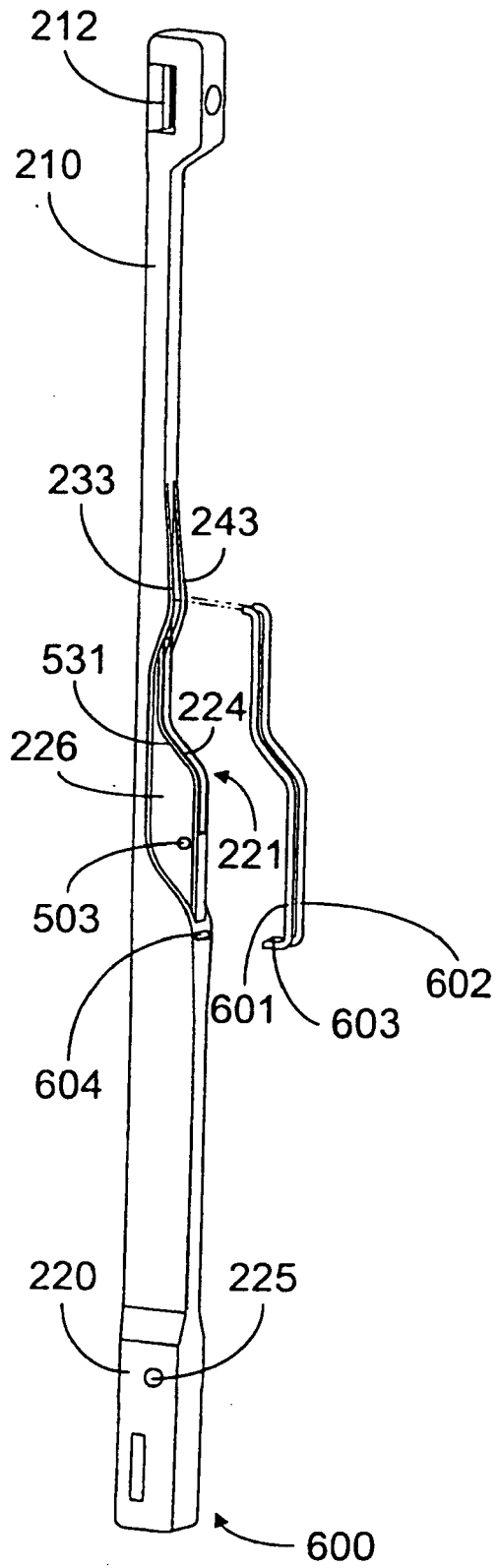


Fig. 12

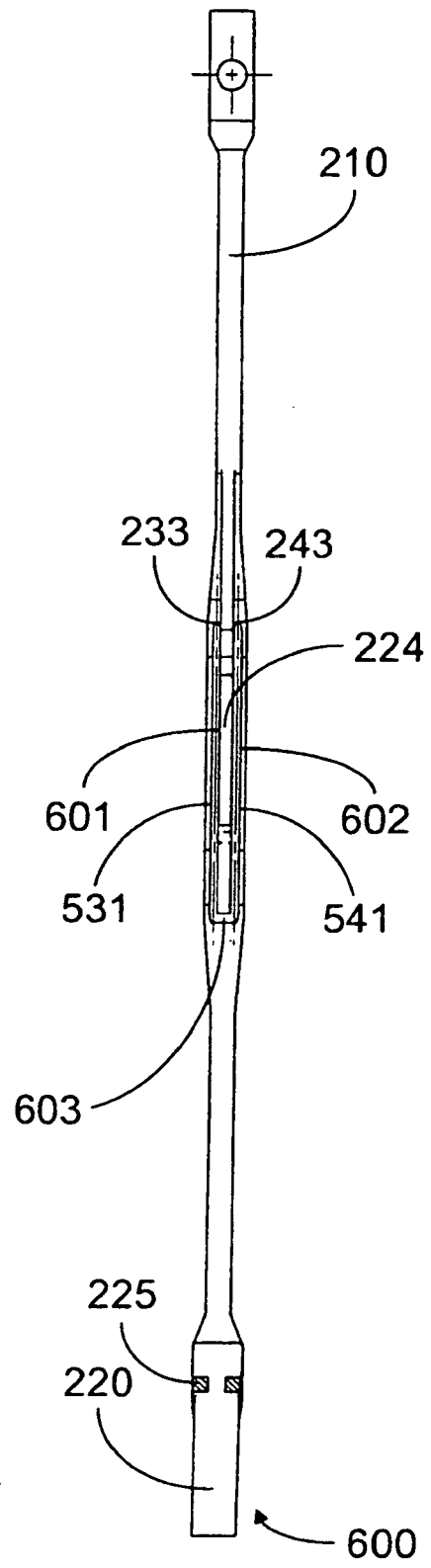


Fig. 14

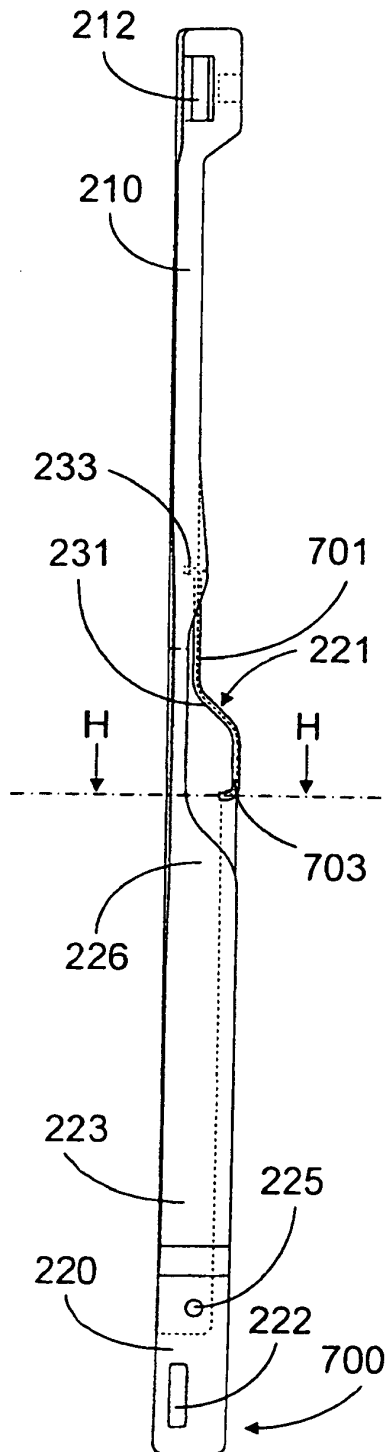


Fig. 15

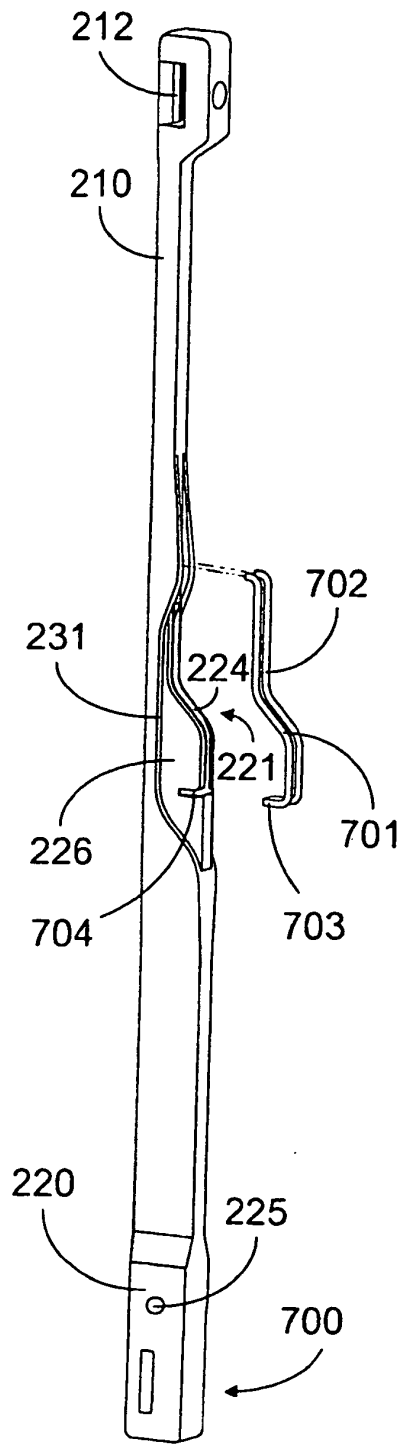
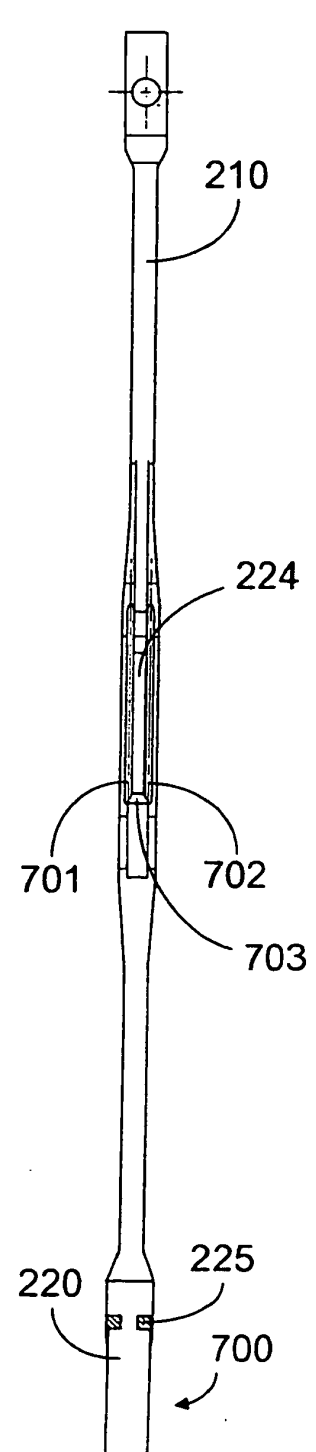


Fig. 16



REFERENCES CITED IN THE DESCRIPTION

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