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(54) **TIGHTENABLE CLAMPING DEVICE, SUITABLE FOR APPLICATION IN TIE WRAP**

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(73) Proprietor: **Hienekamp, Willem**  
**3033 XK Rotterdam (NL)**

(72) Inventor: **Hienekamp, Willem**  
**3033 XK Rotterdam (NL)**

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## Description

**[0001]** The present invention relates to a device for receiving and retaining a portion of a body.

**[0002]** Such a device is known, and may be a component of a so-called tie wrap, for example, i.e. an elongated, narrow object which is usually manufactured of a flexible plastic such as nylon, and which is intended to be tightened around one or more other objects. In particular, a tie wrap comprises an elongated, narrow strip and a retaining element which is connected to an end of the strip, which is shaped like a rectangular ring, and which has a projection at an inner surface thereof. In an application of a tie wrap, a closed loop is formed by putting a free end of the strip through the retaining element. The inner dimensions of the retaining element are adapted to receiving the strip with only small play.

**[0003]** A surface of the strip which is located at the side of the projection of the retaining element in forming the loop is provided with teeth having inclined surfaces. The orientation of these surfaces is such that in reducing the size of the loop for the purpose of tightening the tie wrap around one or more objects, an inclined surface of a tooth slides over the projection in a direction in which the surface is rising. Due to this, the strip is pushed away from the projection, and the retaining element is elastically deformed to some extent, until an uppermost point of the inclined, rising surface of the tooth is reached, and the tooth is moved completely beyond the projection. At that point, there is room for the retaining element to assume its original shape, and the tooth is no longer capable of moving back, because the projection is in the way and is located at the side of the uppermost point of the inclined, rising surface of the tooth. Therefore, the strip can only be moved through the retaining element in one direction, namely the direction in which the loop is getting smaller.

**[0004]** During a movement of the strip through the retaining element, successive teeth are constantly displaced beyond the projection by exerting a pulling force on the strip. On the basis of the elastic properties of the material of the strip, it is possible to tighten the tie wrap around one or more objects, wherein the loop of the tie wrap remains closed because at least one of the teeth of the strip is in contact with the projection of the retaining element and cannot move beyond it because the strip is located in the retaining element with only small play.

**[0005]** In spite of the fact that the known tie wrap is suitable for many practical applications, it is a disadvantage of this tie wrap that, taking into account a situation in which the loop has a desired size, in case of an increase of forces which are aimed at making the loop larger, particularly pulling forces which are exerted on the retaining element at the position of the attachment of the strip to the retaining element, the shape of the retaining element eventually changes. Due to this, a coupling which was originally present between the retaining element and a portion of the strip is lost, wherein the tie wrap loses its

functionality as a result of a lasting deformation of the retaining element.

**[0006]** Another disadvantage of the known tie wrap is related to the shape of the retaining element, and the associated fact that a user of the tie wrap needs to take trouble to put the free end of the strip through the retaining element.

**[0007]** It is an objective of the invention to provide a solution for at least one of the above-sketched disadvantages of the known tie wrap. This objective is reached by a device for receiving and retaining a portion of a body, which is adapted to tighten itself around a portion of the body on the basis of a pulling force exerted thereon.

**[0008]** In the known tie wrap, the retaining element functions as device for receiving and retaining a portion of a body, namely a portion of the strip. However, an essential difference between the known clamping device and the clamping device according to the invention is that the clamping device according to the invention is adapted to carry out a function of actively being wrapped tightly around the portion of the body under the influence of a pulling force. In this way, it is achieved that when the pulling force increases, the portion of the body is tightened even more in the clamping device, while pulling open of the clamping device is out of the question. The capability to withstand high pulling forces without loss of the coupling of the clamping device to a portion of a body is an important advantage which is related to the invention.

**[0009]** In a practical embodiment, the clamping device according to the invention comprises force means movably arranged therein, which are destined to engage a portion of the body, wherein the clamping device is adapted to allow the force means to exert a pushing force on the basis of a pulling force which is exerted thereon. The clamping device can be shaped in such a way that a part of the clamping device may be regarded as rod assembly, wherein the rod assembly is adapted to realize a pushing force on one side of the rod assembly on the basis of a pulling force which is exerted on another side of the rod assembly.

**[0010]** The movably arranged force means of the clamping device may, for example, comprise at least two force parts, wherein an arrangement of the force parts in the clamping device is aimed at letting the force parts exert a pushing force from different directions when a pulling force is exerted on the clamping device. With the help of such force parts, it is possible to push against a portion of a body in the clamping device. In a practical embodiment, the clamping device further comprises means for supporting the portion of the body. Such means may comprise, for example, a single support element, which may possibly be pivotably arranged in the clamping device. For the purpose of enhancing a retaining action of the clamping device on the portion of the body, it is advantageous when the force parts and/or the support element are provided with means such as teeth for enhancing engagement to the portion of the body.

**[0011]** Further, the clamping device according to the invention is adapted to pull the force parts towards each other on the basis of a pulling force exerted thereon. By doing so, it is realized that the clamping device may tighten itself around a portion of a body, and that in case of an increase of a pulling force which is exerted on the clamping device, there is no danger of the clamping device bending open or changing its shape in another way.

**[0012]** In various possible embodiments of the clamping device according to the invention, the clamping device is embodied in a mirror-symmetrical manner, in a functional sense, and four important points are distinguishable at both sides of the clamping device, namely an acting point for a pulling force, a basic point of the force means, a contact point on the force means for contact to a portion of a body to be received, and a contact point on another element of the clamping device for contact to a portion of the body to be received. In various embodiments of the clamping device, pulling the clamping device to a closed condition under the influence of a pulling force is achieved when the points are located in one imaginary plane, or when the acting point for the pulling force is located more to the inside in the clamping device.

**[0013]** In an advantageous embodiment, the clamping device according to the invention is shaped in such a way that it is possible to easily insert a portion of a body to be received in the clamping device. This may, for example, be the case when the clamping device has movable elements, and, with these elements, is capable to assume an opened position and a closed position, wherein, in the opened position, the clamping device has a free passage for the portion of the body to and from a space in the clamping device for receiving the portion of the body in a sideward direction, i.e. transverse to a longitudinal direction of the body, and wherein, in the closed position, the clamping device tightens itself around the portion of the body, and there is no free passage any more. It is easier to a user of the clamping device to insert a portion of a body when it is possible to place the said portion directly in the space destined thereto in this way, than when the body needs to be moved through the clamping device along a length first, as is the case with a known tie wrap, for example.

**[0014]** Particularly in an embodiment in which the clamping device according to the invention comprises movable elements which may provide access to a passage in a sideward direction to a space for receiving a portion of a body, it is advantageous when closure means which are destined to get engaged with each other when they are moved towards each other are applied. Due to this, it may be guaranteed that, once established, a coupling of the clamping device and the respective body is not lost when a pulling force on the clamping device is (temporarily) relieved. The application of the closure means provides a locking of said coupling, as it were, wherein, in a condition of engagement, the closure means can also contribute to a certain extent to a clamp-

ing force which is exerted on a portion of a received body by the clamping device. The closure means can be embodied in any suitable way, and may, for example, comprise elements having portions which may catch each other like hooks. Apart from that, the application of closure means as mentioned above is not limited to the clamping device according to the invention, but other types of devices for receiving and retaining a portion of a body may also be provided with such closure means to lock a coupling of the device and the portion of the body.

**[0015]** As is apparent from the foregoing, the invention provides a clamping device in which a portion of a body may easily be inserted, and which is capable of tightening itself around this portion under the influence of a pulling force. When the portion of the body is located in the clamping device, the pulling force may, for example, be realized by pulling the clamping device in one direction and pulling the body in a more or less opposite direction. A tightened condition of the clamping device which is obtained in this way can be locked when the clamping device comprises closure means which are suitable for that purpose. When such closure means are detachable, or not present at all, an engagement of the clamping device to the portion of the body may be detached if so desired by no longer pulling the clamping device and the body, or by realizing another mutual orientation of the directions in which the clamping device and the body are pulled. The possibility to detach said engagement and use the clamping device again is an important advantage which is related to the invention.

**[0016]** In connection with the possibility of realizing a free passage to and from a space in the clamping device for receiving a portion of a body, it is noted that WO 96/18554 shows a tie wrap of which the retaining element has an open shape. Also in this tie wrap, the components thereof are manufactured from a resilient material. The portion of the body can be moved between two parts of the retaining element having inwardly directed teeth, wherein these parts spring outwards to some extent. As soon as the portion of the body is located at the proper position in the retaining element, the retaining element can assume its shape again, wherein the teeth of the two parts engage the portion of the body, and the portion of the body is closely surrounded by an inner surface of the retaining element. Possibly, the portion of the body can be tightened against the parts having the teeth by inserting an element in an opening which is located right underneath the space in which the portion of the body is received, whereby it is achieved that an inner surface of the retaining element is pushed against the portion of the body.

**[0017]** An important disadvantage of this known tie wrap is that the retaining element is not capable of further actively tightening itself around the portion of the body, as a result of which, in case of increasing pulling force in the body, a situation soon arises in which the retaining element bends open, and the engagement to the portion

of the body is lost. Due to the fact that the retaining element of the known tie wrap does not have the functioning of the clamping device according to the invention, this tie wrap may have the advantage of the possibility of easily inserting a portion of a body in the retaining element in a sideward direction, but this tie wrap can only be loaded to a relatively small extent.

**[0018]** Besides to the clamping device as described above, the invention also relates to an assembly of a flexible body having an elongated shape and said clamping device, wherein the body and the clamping device are connected to each other, and wherein the clamping device is destined to be applied for receiving and retaining a portion of the body. The assembly according to the invention may, for example, be suitable to be applied as tie wrap or as waistbelt.

**[0019]** In an advantageous embodiment of the assembly, a portion of the body is split and has two parts, wherein the body is connected to the clamping device through the split part, and wherein the two parts of the split portion are attached to the clamping device at different positions. In this way, it can be achieved that a pulling force exerted on the clamping device through the body acts on the clamping device at two points, with which is it possible to realize a pushing force from two directions.

**[0020]** The invention further relates to a device for receiving and retaining a portion of a body, wherein at least a part of a surface of the clamping device, which is destined to contact a portion of the body, is provided with means such as teeth for enhancing engagement of the surface to the portion of the body, and wherein these means comprise at least two parts such as two rows of teeth, which are arranged substantially parallel with respect to each other. The invention also relates to an assembly of a flexible body having an elongated shape and such a clamping device.

**[0021]** An important advantage of the clamping device of which the means for enhancing engagement of at least a part of a surface of the clamping device to a portion of a body comprise two parts is that when the body is located in the clamping device and is moved through the clamping device, the force which is needed for pulling the body may be lower than when the means for enhancing said engagement would comprise a single part having the size of the said two parts. In the process, a free end of the body is continually moved in alternating directions, wherein the free end of the body is continually positioned inclined and sideward with respect to the clamping device, so that it is achieved that the body passes over the two parts in an alternating fashion. In this way, it may be easier to a user to tighten an assembly of clamping device and body around one or more objects.

**[0022]** An alternative way in which the above-described tightening process may be realized comprises providing two support edges on the clamping device, wherein two separate, parallel extra rows of teeth are also provided, at an outer side of the clamping device, at a place where the body exits the clamping device.

**[0023]** Clamping devices according to the invention, with one or more of the last above mentioned kinds of provisions; teeth for help when tightening, connection of the clamping device through split parts to realize pushing force, are offering solutions to earlier mentioned disadvantages. Other art concerning this issues can be mentioned.

**[0024]** Patent FR 2849146 (LeGrand) can be looked at as an example. This offers an in-line clamping device with a double lever system to release the grip on the body. It is a ring formed coupling device, meaning that the body has to be inserted in the device in a longitudinal way. This makes it incomparable to the first two above mentioned embodiments of the invention that are offering a sideward way of inserting. When looking at the last mentioned features, Legrand describes no provision with extra teeth for tightening. The art of LeGrand does embody a kind of split attachment of the pulling parts on the sideparts. But the way the attachment parts are connected to the device differs from the way that is found here. In the art of Legrand the sideparts cannot move towards each other to exert pushing force, they are connected in a rigid way. Document FR 2849146 discloses a clamping device in accordance with the preamble of claim 1 and 6.

**[0025]** Another example of known art is EP 1752384 A2. This patent shows a sideward open device. Like above mentioned the pulling force part is here connected at the support part of the clamping device. No tightening of sideparts of the device under the influence of a pulling force is found. The device must stay closed only by keeping its shape, resisting the pushing forces of the pawl when loaded. The same can be seen at other patents disclosing open devices like e.g. US3967345 (Sumimoto), US20070039136A (Assarsson) en WO9721606 (Ahlgren).

**[0026]** The invention will be explained in more detail on the basis of the following description. In the process, reference will be made to the drawing, in which equal reference signs indicate equal or similar components, and in which:

figure 1 shows a partially cut-away perspective view of a first embodiment of a clamping device according to the invention and a portion of a flexible strip connected thereto;

figures 2 and 3 show different views of the clamping device according to the first embodiment of the invention and a portion of the flexible strip, wherein the strip is extending through the clamping device, and the clamping device is in a closed condition;

figure 4 shows a view of a longitudinal section along line A-A in figure 2; figure 5 shows a perspective view of the clamping device according to the first embodiment of the invention and a portion of the flexible strip, wherein the strip is extending through the clamping device, and the clamping device is in a closed condition;

figures 6 and 7 show a view of a cross-section along line B-B in figure 2, in respect of two mutually different positions of closure parts of the clamping device, wherein figure 7 shows an opened position which allows for inserting or removing a portion of the strip in a direction transverse to a longitudinal direction; figure 8 diagrammatically shows a combination of forces which is obtained under the influence of a pulling force in the clamping device according to the first embodiment of the invention; figure 9 diagrammatically shows a combination of forces which is obtained when the clamping device according to the first embodiment of the invention is pulled on the one hand, and the flexible strip is pulled in a position in which it is extending through the clamping device on the other hand;

figure 10 shows a partially cut-away perspective view of a second embodiment of a clamping device according to the invention and a portion of a flexible strip connected thereto; figure 11 shows a top view of the clamping device according to the second embodiment of the invention and a portion of the flexible strip, wherein the strip is extending through the clamping device, and the clamping device is in a closed condition;

figure 12 shows a view of a longitudinal section along line C-C in figure 11; figure 13 diagrammatically shows a combination of forces which is obtained under the influence of a pulling force in the clamping device according to the second embodiment of the invention; figure 14 diagrammatically shows a combination of forces which is obtained when the clamping device according to the second embodiment of the invention is pulled on the one hand, and the flexible strip is pulled in a position in which it is extending through the clamping device on the other hand;

figure 15 shows a partially cut-away perspective view of a third embodiment of a clamping device according to the invention and a portion of a flexible strip connected thereto; figure 16 shows a top view of the clamping device according to the third embodiment of the invention and a portion of the flexible strip, wherein the strip is extending through the clamping device, and the clamping device is in a closed condition;

figure 17 shows a view of a longitudinal section along line D-D in figure 16; figure 18 diagrammatically shows a combination of forces which is obtained under the influence of a pulling force in the clamping device according to the third embodiment of the invention; figure 19 diagrammatically shows a combination of forces which is obtained when the clamping device according to the third embodiment of the invention is pulled on the one hand, and the flexible strip is pulled in a position in which it is extending through the clamping device on the other hand;

figure 20 shows a top view of a clamping device according to a fourth embodiment of the invention and

a portion of the flexible strip, wherein the strip is extending through the clamping device, and the clamping device is in a closed condition;

and figure 21 shows a view of a longitudinal section along line E-E in figure 20.

**[0027]** Figure 1 shows a first embodiment of a clamping device 1 according to the invention and a portion of a flexible strip 20 which is connected to the clamping device 1. The assembly 10 of the clamping device 1 and the strip 20 is particularly destined to be applied as tie wrap, and will therefore be indicated as such in the following. In view of said application, the clamping device 1 and the strip 20 are manufactured from nylon or another suitable, preferably resilient plastic, or a combination of different plastics having possibly one or more other substances.

**[0028]** When the tie wrap 10 is applied by a user, he/she puts the tie wrap 10 to a functional condition by inserting a portion 21 of the strip 20 in the clamping device 1. In figures 2, 3, 4 and 5, a situation in which the strip 20 is extending through the clamping device 1 is illustrated. On the basis of the fact that the strip 20 is fixedly connected to the clamping device 1 at one side, and is extending through the clamping device 1 at another place, a closed loop (not shown) is formed in this situation. In particular, at the position of the attachment to the clamping device 1, the strip 20 is split in two parts 24. The function thereof will be explained in the following. Further, the way in which the strip portion 21 is inserted in the clamping device 1, and the way in which a clamping coupling between the clamping device 1 and the strip portion 21 is subsequently realized will be described in the following.

**[0029]** In figure 6, it can clearly be seen that the clamping device 1 has a space 22 for receiving and accommodating the strip portion 21. In an initial condition of the clamping device 1, as illustrated in figure 6, which will hereinafter be referred to as opened condition of the clamping device 1, the space 22 is freely accessible from a side of the clamping device 1 which will hereinafter be indicated as top side. In a closed condition of the clamping device 1, as illustrated in figure 7, and also in figures 2, 3, 4 and 5, the strip portion 21 is locked in the clamping device 1.

**[0030]** In particular, the clamping device 1 comprises a strip support element 30 to which a number of elements of the clamping device 1 are pivotably connected. In the shown example, these elements comprise ratchet parts 31 and closure parts 32, wherein the closure parts 32 are located closer to the side of the clamping device 1 where the fixed connection to the strip 20 is, which will hereinafter be referred to as back side of the clamping device 1, than the ratchet parts 31. When the clamping device 1 is put from the opened condition to the closed condition, the ratchet parts 31 and the closure parts 32 are rotated inwardly and downwardly, along an axis which is extending parallel with respect to a longitudinal axis of the clamping device 1 and the strip 20 connected thereto, or

is extending with small deviation with respect to said longitudinal axis.

**[0031]** The ratchet parts 31 serve for actually engaging the strip portion 21, while the strip portion 21 is supported by the strip support element 30. In order to enhance the engagement of the ratchet parts 31 to the strip portion 21, both the strip 20 and the ratchet parts 31 are provided with a tothing 23, 33, wherein the shape of the teeth of both toothings 23, 33 are chosen such that the toothings 23, 33 may engage each other in a fitting fashion, as can be seen in figure 4. Apart from that, an alternative embodiment of the clamping device 1 is feasible, wherein the ratchet parts 31 are displaced by components without tothing 33, which are fixedly arranged in the clamping device 1, wherein a tothing 33 is provided on the component which is functioning as strip support element 30 in the shown embodiment, and wherein the tothing 23 of the strip 20 is positioned at another side, so that it is also possible to realize an engagement of both toothings 23, 33 in this embodiment.

**[0032]** The clamping device 1 comprising locking means for locking a coupling between the clamping device 1 and the strip portion 21. When the clamping device 1 is in an opened condition and the strip portion 21 is placed in the clamping device 1, the clamping device 1 is closed by exerting a pulling force through the strip 20, at the position of the attachment of the strip 20 to the clamping device 1, while, at the front side of the clamping device 1, the strip 20 is simultaneously pulled in a more or less opposite direction. This is automatically realized when the strip 20 is tightened around one or more objects. When this pulling force is relieved again, the locking means prevent the clamping device 1 from immediately assuming the opened condition again. To this end, hook elements 34 are provided, which are catching each other when the clamping device 1 is closed, wherein one of the hook elements 34 is situated on a locking element 35 located directly behind the closure parts 32, and wherein another of the hook elements 34 is directly connected to a closure part 32 and a part 24 of the strip 20. Figure 7 shows the coupled condition of the hook elements 34 in the closed condition of the clamping device 1.

**[0033]** As has already been indicated in the foregoing, the clamping device 1 is put to a closed condition, and the tothing 33 of the ratchet parts 31 is put to engagement to the tothing 23 of the strip 20 when a pulling force is exerted on the clamping device 1. Figure 8 serves to illustrate this fact, wherein, for sake of clarity, the strip portion 21 extending through the clamping device 1 is not shown. In the figure, pulling forces are diagrammatically depicted by means of a continuous line, whereas pushing forces are diagrammatically depicted by means of a dashed line.

**[0034]** At the position of the attachment to the clamping device 1, the strip 20 is split in two parts 24, so that it is achieved that the clamping device 1 and the strip 20 are fixedly connected to each other at two positions. When a pulling force is exerted by the strip 20, it is thus realized

that this pulling force acts on the clamping device 1 at two points 41. On the basis thereof, at two sides of the clamping device 1, the following combination of forces is obtained. The pulling force is transmitted to a point 43 on the strip support element 30 where the strip 20 is contacting this element 30, through an attachment point 42 of the ratchet part 31. Because the acting point 41 of the pulling force and the point 43 on the strip support element 30 where the strip 20 is contacting this element 30 are located at different levels, it is hereby achieved that the pulling force is directed around the ratchet part 31, as it were, which has as a consequence that the ratchet part 31 is tightened against the strip portion 21 and exerts a pushing force thereon at the position of a contact point 44. In the process, the strip support element 30 provides the necessary counterpressure.

**[0035]** It follows from the foregoing that, at two sides of the clamping device 1, the ratchet parts 31 are tightened against the strip portion 21 under the influence of a pulling force which is exerted on the clamping device 1. In this respect, it is true that when the pulling force increases, the extent to which the clamping device 1 is tightened around the strip portion 21, in other words, the extent to which the clamping device 1 clamps the strip portion 21, increases as well. It follows that at a higher load of the tie wrap 10, the clamping force 1 is kept closed in an active way. This is an important advantage of this clamping device 1 with respect to known constructions in which there is no situation of active pushing, as a result of which effects as loss of shape and associated loss of an engaging action occur at an increase of the load.

**[0036]** Figure 9 illustrates how pulling and pushing forces are balanced at the position of each point 41, 42, 43, 44, for one side of the clamping device 1, wherein the pulling forces prevailing in the strip 20 are also shown. Just like in figure 8, a continuous line is applied for the indication of pulling forces and a dashed line is applied for the indication of pushing forces in this figure.

**[0037]** In figure 4, it is shown that use can be made of a support basis 40 for supporting the clamping device 1 when it is tightened around the strip portion 21. Shapes of parts with which the clamping device 1 is supported on the support basis 40 are chosen such that the interaction between the clamping device 1 and the support basis 40 can contribute to the combination of forces in the clamping device 1 in a desired way.

**[0038]** Further, it is shown in figure 4 that a space 25 between the two parts 24 which the strip 20 has at the attachment to the clamping device 1 can be applied to let pass a free portion 26 of the strip 20. When it is desired that the loop formed by the strip 20 gets smaller, for example in a situation in which the tie wrap 10 needs to be pulled more tightly around one or more objects, this can be realized by pulling the free portion 26 of the strip 20, wherein the clamping device 1 can be left in a closed condition, assuming that the components of the clamping device 1 are sufficiently pivotable with respect to each other. This exerting of pulling force at the free end 26 of

the strip 20 can take place in upward directions, i.e. directions away from the longitudinal axis of the clamping device 1, wherein the locking element 35 and the hook elements 34 keep the clamping device 1 closed. In the process, it is advantageous that there are two ratchet parts 31, each having their own tothing 33, because it is possible to maneuver the free portion 26 in such a way that the tothing 23 of the strip 20 is continually displaced over the tothing 33 of the one ratchet part 31 by a tooth first, and then is displaced over the tothing 33 of the other ratchet part 31 by a tooth. In the process, the portion 26 of the strip 20 is continually pulled to an inclined position with respect to the longitudinal axis of the clamping device 1, in an alternating movement. The forces which are needed in the process, are smaller than when the tothing 33 needs to be moved over a single tothing which is approximately as wide as a combination of the two toothings 23 of the ratchet parts 31.

**[0039]** In an alternative embodiment of the clamping device 1, the closure parts 32 are adapted to carry out a locking function without further application of hook elements 34 or the like. In such a case, the free portion 26 of the strip 20 can be used to put the clamping device 1 from a closed condition to an opened condition in an easy way, namely by pulling this portion 26 upward.

**[0040]** Figure 10 shows a second embodiment of a clamping device 2 according to the invention and a portion of a flexible strip 20 which is connected to the clamping device 2. As is the case with the first embodiment of the clamping device 1 described in the foregoing, the assembly 10 of the second embodiment of the clamping device 2 and the strip 20 is destined to be applied as tie wrap 10. In general, the second embodiment of the clamping device 2 functions in the same way as the first embodiment of the clamping device 1, in the sense that it is capable of tightening itself around a strip portion 21 under the influence of a pulling force.

**[0041]** The second embodiment of the clamping device 2 comprises a single ratchet part 31, which is pivotably arranged to a limited extent, and which, in comparison with the first embodiment of the clamping device 1, is located at the place of a part of the strip support element 30 that is most at the back. Due to this, it is achieved that the tothing 33 of the ratchet 31 is directed at the closure parts 32. In comparison with the first embodiment of the clamping device 1, only a part of the strip support element 30 that is most at the front is present in the second embodiment of the clamping device 2.

**[0042]** Just like the first embodiment of the clamping device 1, the second embodiment of the clamping device 2 can assume an opened condition and a closed condition. Figures 11 and 12 show the second embodiment of the clamping device 2 in a closed condition, wherein a strip portion 21 is located in the clamping device 2. In figure 12, it can be seen that in this condition, the tothing 23 of the strip portion 21 and the tothing 33 of the ratchet portion 31 are engaging, while the closure parts 32 are contacting a side of the strip portion 21 where no teeth

are present. On the basis of the pivotable arrangement of the ratchet part 31, it is possible to pull the strip 20 further through the clamping device 2 in a closed condition of the clamping device 2, if so desired.

**[0043]** In accordance with the first embodiment of the clamping device 1, the second embodiment of the clamping device 2 may comprise means like hook elements 34 for maintaining the closed condition, wherein these means may, for example, be provided on the closure means 32. In this respect, it is noted that it is possible that the pivot places which are located between the ratchet part 31 and the closure parts 32 on the one hand and the strip support element 30 on the other hand are embodied in such a way that not all pivot points are located at a single line. Due to this, it is achieved that by an elastic deformation during a pivoting movement, an opened position and a closed position are distinguished and stabile, wherein a closure force exerted by the closure means is enhanced.

**[0044]** Figure 13 is comparable to figure 8, and illustrates a combination of force's which is realized when a pulling force is exerted on the clamping device 2. In this case, the point 41 on which the pulling force is acting and the attachment point 42 of a part for exerting a pushing force on the strip portion 21, in this case a closure part 32, are coinciding. The pulling force is transmitted to a fixed point 43 on the strip support element 30 -through a pivot point 45 between the closure part 32 and the strip support element 30. The acting point 41 for the pulling force and the fixed point 43 at the strip support element 30 are located at different levels, and due to this, a pushing force on the strip 20 is realized, as is the case with the first embodiment of the clamping device 1. In this second embodiment of the clamping device 2, the closure parts 32 are pulled against the strip portion 21 under the influence of the pulling force, and are exerting a pushing force thereon at the position of contact points 44. In the process, both the strip support element 30 and the ratchet part 31 provide a counterpressure.

**[0045]** In figure 13, it is also illustrated that the pushing force exerted by the closure parts 32 acts in a plane 46 which is extending substantially perpendicular to a longitudinal axis of the clamping device 2. Further, it is shown in figure 12 that use can be made of a support basis 40 to support the clamping device 2 when it is tightened around the strip portion 21.

**[0046]** Figure 14 is comparable to figure 9, and illustrates how pulling and pushing forces are balanced at the position of a number of points 41, 42, 44, 45, for one side of the clamping device 2, wherein the pulling forces prevailing in the strip 20 are also shown. Further, figure 14 shows the plane 46 in which the pushing force exerted by a closure part 32 is acting.

**[0047]** Figure 15 shows a third embodiment of a clamping device 3 according to the invention and a portion of a flexible strip 20 which is connected to the clamping device 3. As is the case with the first embodiment of the clamping device 1 and the second embodiment of the

clamping device 2 described in the foregoing, the assembly 10 of the third embodiment of the clamping device 3 and the strip 20 is destined to be applied as tie wrap 10. In general, the third embodiment of the clamping device 3 functions in the same way as the first embodiment of the clamping device 1 and the second embodiment of the clamping device 2, in the sense that it is capable of tightening itself around a strip portion 21 under the influence of a pulling force.

**[0048]** A notable difference between the third embodiment of the clamping device 3 with respect to the first embodiment of the clamping device 1 and the second embodiment of the clamping device 2 is that it has a closed shape, i.e. that it is not capable of allowing a side-ward inserting of a strip portion 21. Instead, a user of the tie wrap 10 needs to put a free end of the strip 20 through an opening 22 in the clamping device 3, and subsequently pull the strip 20 over such a length that a desired size of a thus formed loop is obtained in the strip 20, as is the case with conventional tie wraps having a ring-shaped retaining element. By pivotably arranging components of the clamping device 3 with respect to each other, it is achieved that the clamping device 3 is capable of both tightening itself around a strip portion 21 and allowing a displacing of the strip 20 through the clamping device 3, depending on the way in which the strip 20 and/or the clamping device 3 are loaded. The clamping device 3 distinguishes itself by the possibility to remove the strip 20 again when a space around the strip portion 21 which is located in the clamping device 3 is increased by exerting force in certain directions, wherein the strip portion 21 is detached from one or more components of the clamping device 3 to which it was engaged in an earlier stage.

**[0049]** In the clamping device 3, the following components are distinguishable: a strip support element 30 which is located at the side of the fixed connection to the strip 20, two closure parts 32 pivotably connected to the strip support element 30, and a ratchet part 31 which is connected to both closure parts 32, and of which the tothing 33 is directed at the strip support element 30.

**[0050]** Figure 16 illustrates how the strip 20 is placed in the clamping device 3. When the strip 20 is pulled through the clamping device 3, the ratchet part 31 of the strip support element 30 is continually pushed away when the toothings 23, 33 of the strip 20 and the ratchet part 31 are moving over each other, each time until teeth of the toothings 23, 33 end up behind each other, and the toothings 23, 33 are exactly engaging, as illustrated in figure 17. A limited relative movement of the components of the clamping device 3 is possible on the basis of the pivotable connection between the closure parts 32 and the strip support element 30.

**[0051]** Figure 18 is comparable to figures 8 and 13, and figure 19 is comparable to figures 9 and 14. Therefore, both figures relate to a combination of forces as may occur in the clamping device 3. In these figures, it can be seen that when a pulling force is exerted on the clamp-

ing device 3, it acts at a single point 41 on the clamping device 3. A side of the clamping device at which this point 41 is located, will hereinafter be indicated as top side.

**[0052]** From the top side of the clamping device 3, the pulling force is transmitted more downward through a attachment point 42 of a closure part 32, and travels further to the ratchet part 31 through a point 45 at the position of a connection between the closure part 32 and the ratchet part 31. When a strip portion 21 is located in the clamping device 3, the clamping device 3 is tightened around the strip portion 21 under the influence of the pulling force, wherein the various components of the clamping device 3 are pushing against the strip portion 21. Particularly the closure parts 32 play an important role in this process. Apart from that, a plane 46 in which the pushing force exerted by the closure parts 32 is acting in this clamping device 3 is substantially parallel with respect to a direction in which the pulling force is acting from the attached strip 20 on the clamping device 3. Figure 19 illustrates the fact that the combination of forces described in the foregoing is obtained when the strip is pulled against the ratchet part 31 in an upward direction, i.e. when a free portion 26 of the strip 20 is at an angle with respect to the portion 21 of the strip 20 which is located in the clamping device 3.

**[0053]** In the case of the shown third embodiment of the clamping device 3 it may be more bothersome to position the strip 20 in the proper manner therein than in the case of the first embodiment of the clamping device 1 and second embodiment of the clamping device 2 described in the foregoing. On the other hand, there is no need to apply means for the locking of a coupling between the clamping device 3 and a strip portion 21 in the third embodiment of the clamping device 3, because this clamping device 3 is not capable of assuming an opened condition.

**[0054]** Figures 20 and 21 show a fourth embodiment of a clamping device 4 according to the invention and a portion of a flexible strip 20 which is connected to the clamping device 4, in a condition in which a portion 21 of the strip 20 is extending through the clamping device 4.

**[0055]** The fourth embodiment of the clamping device 4 is almost equal to the third embodiment of the clamping device 3. A difference to the third embodiment of the clamping device 3 is that the tothing 33 of the ratchet part 31 of the fourth embodiment of the clamping device 4 comprises two strips 36 having teeth. Due to this, the possibility of alternately moving the teeth of the tothing 23 at the strip 20 along the teeth of these strips 36, which has been described earlier, is offered, as a result of which a force which is needed to pull the strip 20 through the clamping device 4, may be less high than when the tothing 33 of the ratchet part 31 would not be divided in two parts 36.

**[0056]** It will be clear to a person skilled in the art that the scope of the present invention is not limited to the examples discussed above, but that various amendments and modifications thereof are possible without de-



viating from the scope of the invention as defined in the appended claims.

**[0057]** In the shown examples, the strip 20 has a cross-section which is generally rectangular. That does not alter the fact that the cross-section of the strip 20 may have other shapes. It may, for example, also be circular, triangular or V-shaped. In general, it is true that a proper functioning of the clamping device 1, 2, 3, 4 is guaranteed when a shape of the space 22 in the clamping device 1, 2, 3, 4 for receiving a strip portion 21 is adapted to the shape of the cross-section of the strip 20.

**[0058]** The way in which in clamping devices 1, 2 which are capable of assuming an open position, a closure of the clamping devices 1, 2 is locked, can correspond to applying hook elements 34, as has been described in the foregoing. However, within the scope of the invention, various other possibilities are feasible. The same is true for the way in which the engagement of the at least one ratchet part 31 of the clamping device 1, 2, 3, 4 to a strip portion 21 is guaranteed. In connection with the shown examples, an application of engaging toothings 23, 33 has been described, but there are also other possibilities, for example an application of one or more pins which are fixedly connected to the ratchet part 31, and which are capable of pushing themselves in the strip 20. Even an embodiment in which the engagement only takes place on the basis of friction between surfaces of the clamping device 1, 2, 3, 4 and the strip portion 21, wherein no further auxiliary means are being applied, is one of the possibilities.

**[0059]** The clamping device 1, 2, 3, 4 can be provided with a handle for facilitating the handling of the clamping device 1, 2, 3, 4, wherein such a handle is preferably positioned at a side of the clamping device 1, 2, 3, 4 where the strip 20 enters the clamping device 1, 2, 3, 4.

**[0060]** Whenever a pivotable arrangement of a component of the clamping device 1, 2, 3, 4 is part of the shown examples, such an arrangement is realized on the basis of a recess of material at the position of an abutment of the respective component to another component. This way of realizing a pivoting action is very practical, which does not alter the fact that there are other possibilities within the scope of the present invention. When components of the clamping device 1, 2, 3, 4 are manufactured from a material such as nylon, and pivots are realized on the basis of recesses in the material, it is advantageous when a reinforcing technique such as cold-pressing is applied.

**[0061]** The clamping device 1, 2, 3, 4 according to the invention may be manufactured by means of injection molding. It is advantageous for clamping devices 1, 2 which may have an opened position when they are manufactured in said opened position.

**[0062]** The invention can be applied in a great variety of fields, including the field of tie wraps, tension belts, waistbelts and closing arrangements of bags.

**[0063]** In the foregoing, a tie wrap 10 has been described, which comprises a clamping device 1, 2, 3, 4

and a flexible strip 20 connected thereto, wherein the clamping device 1, 2, 3, 4 is adapted to receive a portion 21 of the strip 20 and retain the strip portion 21. Different from what is the case with known tie wraps, the clamping device 1, 2, 3, 4 is adapted to actively tighten itself around a strip portion 21 under the influence of a pulling force. Preferably, the clamping device 1, 2, 3, 4 is adapted to direct a pulling force around a strip portion 21 received in the clamping portion 1, 2, 3, 4, wherein, also under the influence of the pulling force, parts 31, 32 which are contacting the strip portion 21 are pushing off against the strip portion 21 and are exerting a pushing force thereon by doing so. The higher the pulling force, the more tightly the clamping device 1, 2, 3, 4 wraps itself around the strip portion 21. On the basis of this fact, a clamping action of the clamping device 1, 2, 3, 4 on the strip portion 21 is guaranteed in a large range of pulling forces, wherein high pulling forces can be accounted for.

**[0064]** In an embodiment, the clamping device 1, 2 comprises pivotably arranged parts 31, 32, and the clamping device is capable of assuming an opened condition and a closed condition, wherein, in the opened condition, the clamping device 1, 2 allows for free passage for a strip portion 21 to and from a space 22 in the clamping device 1, 2 for receiving and accommodating the strip portion 21, and wherein, in the closed condition, the clamping device 1, 2 retains the strip portion 21. In this embodiment, inserting a strip portion 21 in the clamping device 1, 2 is facilitated, and it can also be possible to use the tie wrap 10 several times, namely by putting the clamping device 1, 2 to the opened condition again after an application.

## Claims

1. Clamping device (1, 2) for receiving and retaining a portion (21) of a flexible body (20) having an elongated shape, comprising: a support element (30); a space (22) for receiving the portion (21) of the body (20); and with reference to support element (30) movable elements which are adapted to function as force means, wherein the force means comprise at least two force parts (31, 32), which are capable of assuming a first mutual position in which free passage to and from the receiving space (22) is possible for the portion (21) of the body (20) by lateral movement through an open side of the clamping device (1, 2) in a direction of passage transverse to a longitudinal direction of the portion (21) of the body (20), and a second mutual position for being wrapped tightly around the portion (21) of the body (20), wherein at least one part of a surface of the clamping device (1, 2) which is destined to contact a portion (21) of the body (20) is provided with means for enhancing engagement of the surface to the portion (21) of the body (20), wherein an arrangement of the force parts (31, 32) in the clamping device (1, 2) is

aimed at pulling the support element (30) and the force parts (31,32) towards each other and letting the support element (30) and the force parts (31, 32) exert a pushing force from different directions on the portion (21) of the body (20) when a pulling force is exerted on the clamping device (1, 2), **characterized in that** the attachment of the clamping device (1, 2) for the purpose of exertion of force is realized through two or more attachment parts (24), wherein these attachment parts (24) are attached to the clamping device (1, 2) at different attachment points in which acting points (41) of the exertion of the pulling force are determinable, wherein these acting points (41) are located on the force parts (31, 32), are movable together with the force parts (31, 32) and are located at a level which is perpendicular to the said direction of passage and is situated at a distance from the portion (21) of the body (20) towards the said open side of the clamping device.

2. Clamping device (1, 2) according to claim 1, wherein it is true for at least two said force parts (31, 32) in the clamping device (1, 2) that four points can be determined as part of it, the points comprising the said acting point (41) for a pulling force, a basic point (42) of the force part (31, 32), a first contact point (44) at the force part (31, 32) for contact to a portion (21) of the body (20), and a second contact point (43) for contact to the support element (30), wherein each point forms at least one pair with another of these four points by being attached to it, wherein the force part (31, 32) is aimed at enabling a force being transmitted between the points of the pair and wherein these pairs to some extent are pivotable around the points.
3. Clamping device (1) according to claim 2, wherein each of the the said acting points (41) is located in a closing direction of the clamping device (1) with respect to an imaginary plane in which the other three points (42, 43, 44) of the said four points of the respective assembly of force parts (31, 32) are located.
4. Clamping device (1) according to claim 3 wherein each of the said first contact points (44) is located at a part of the surface of the respective force part (31, 32) that is provided with means (33) for enhancing engagement to the portion (21) of the body (20).
5. Clamping device (1, 2) according to any of the claims 1,2, 3 or 4 comprising closure means (34) which are located on the force parts (31, 32), and which are destined to engage each other when the force parts (31, 32) are put to the second mutual position and to lock the force parts (31, 32) in that position.
6. Clamping device (3, 4) for receiving and retaining a portion (21) of a flexible body (20) having an elon-

gated shape, comprising: a support element (30); a space (22) for receiving the portion (21) of the body (20); and assemblies of force parts (31, 32), movable with reference to support element (30), comprising closure parts (32) and ratchet parts (31), which are adapted to function as force means (31, 32), which are capable of assuming a first mutual position in which free passage to and from the receiving space (22) is possible for the portion (21) of the body (20) by movement in a longitudinal direction of the portion (21) of the body (20), and a second mutual position for being wrapped tightly around the portion (21) of the body (20), wherein at least one part of a surface of the clamping device (3, 4) which is destined to contact a portion (21) of the body (20) is provided with means for enhancing engagement of the surface to the portion (21) of the body (20), and wherein an arrangement of the assemblies of force parts (31, 32) in the clamping device (3, 4) is aimed at pulling the support element (30) and the assemblies of force parts (31, 32) towards each other and letting the support element (30) and the assemblies of force parts (31, 32) exert a pushing force from different directions on the portion (21) of the body (20) when a pulling force is exerted on the clamping device (3, 4), **characterized in that** the said force means comprise at least two assemblies of force parts (31, 32), wherein the assemblies of force parts (31, 32) are positioned with small deviation in a mirror-symmetrical manner and are pivotably connected to the support element (30), wherein the ratchet parts (31) are pivotably connected to the closure parts (32), wherein a tothing (33) of ratchet part (31) is directed at the support element (30), wherein a pushing force is acting in the clamping device (3, 4) exerted by the closure parts (32) and wherein the attachment of the clamping device (3, 4) for the purpose of exertion of pulling force is realized through two or more attachment parts (24), wherein these attachment parts (24) are attached to the clamping device (3, 4) at different attachment spots in which acting points (42) of the exertion of the pulling force are determinable, and wherein these acting points (42) are located on the closure parts (32) and are movable together with the closure parts (32).

7. Clamping device (3, 4) according to claim 6, wherein it is true for at least two said assemblies of force parts (31, 32) in the clamping device (3, 4) that four points can be determined as part of it, the points comprising an acting point (41) for a pulling force, a basic point (42) of the assembly of force part (31, 32), a first contact point (44) at the support element (30), and a second contact point (45) for contact to the ratchet part (31), wherein each point forms at least one pair with another of these four points by being attached to it, wherein the assembly of force parts (31, 32) is aimed at enabling a force being transmitted between

the points of the pair and wherein these pairs to some extent are pivotable around the points.

8. Clamping device (4) according to claim 6 or 7, wherein the means for enhancing engagement of the surface to the portion (21) of the body (20) comprise at least two separate, parallel rows of teeth (36) at a location where the space (22) for receiving a portion (21) of the body (20) exits the clamping device (4), wherein these teeth (36) are destined to engage teeth on the body (20) to exert a pulling force on the portion (21) of the body (20) in a longitudinal direction.
9. Assembly of a flexible body (20) having an elongated shape and a clamping device (1, 2, 3,4) according to one of the claims 1- 8, wherein an end of the body (20) is attached to the clamping device (1, 2, 3, 4), and wherein the clamping device (1, 2, 3, 4) is destined to be applied for receiving and retaining a portion (21) of the body (20).

#### Patentansprüche

1. Klemmvorrichtung (1, 2) zum Aufnehmen und Halten eines Teils (21) aus einem flexiblen Körper (20) mit einer länglichen Form, umfassend: ein Stützelement (30); ein Raum (22) zur Aufnahme des Teils (21) des Körpers (20); und in Bezug auf das Unterstützelement (30) beweglichen Elementen, die dazu geeignet sind als Kraftmittel zu funktionieren, wobei die Kraftmittel mindestens zwei Kraftteile (31, 32) umfassen, die in der Lage sind eine erste gegenseitige Position einzunehmen, in dem freien Durchgang zu und von dem Aufnahmeraum (22) möglich ist für dem Teil (21) des Körpers (20) durch eine seitliche Bewegung, durch eine offene Seite der Klemmvorrichtung (1, 2) in einer Durchgangsrichtung quer zu einer Längsrichtung des Teils (21) des Körpers (20), und eine zweite gegenseitige Position, um den Teil (21) des Körpers (20) eng zu umschließen, wobei zumindest ein Teil einer Oberfläche der Klemmvorrichtung (1, 2) dass dazu bestimmt ist kontakt zu machen mit einem Teil (21) des Körpers (20), ist vorgesehen mit Mitteln zur Erhöhung der Oberflächeneingriff mit dem Teil (21) der Körper (20), wobei eine Anordnung von die Kraftteilen (31, 32) in der Klemmvorrichtung (1, 2) darauf gerichtet ist Stützelement (30) und die Kraftteilen (31, 32) zueinander zu ziehen und das Stützelement (30) und die Kraftteile (31, 32) eine Druckkraft auszuüben zu lassen aus verschiedenen Richtungen auf dem Teil (21) des Körpers (20) wenn eine Zugkraft auf die Klemmvorrichtung (1, 2) ausgeübt wird, **dadurch gekennzeichnet dass** die Befestigung der Klemmvorrichtung (1, 2) zum Zweck der Ausübung von Kraft realisiert ist durch zwei oder mehrere Befestigungsteile (24), wo-

bei diese Befestigungsteile (24) an der Klemmvorrichtung (1, 2) an unterschiedlichen Befestigungsstellen befestigt sind; in der Wirkungspunkte (41) der Ausübung der Zugkraft bestimmbar sind, wobei diese Wirkungspunkte (41) auf die Kraftteile (31, 32) liegen und zusammen mit den Kraftteilen (31, 32) beweglich sind und sich auf einem Niveau befinden dass senkrecht zu der vorgenannter Durchgangsrichtung steht und gelegen ist in einem Abstand von dem Teil (21) des Körpers (20) in Richtung der offenen Seite der Klemmvorrichtung.

2. Klemmvorrichtung (1, 2) nach Anspruch 1, wobei es zutrifft für mindestens zwei der Kraftteile (31, 32) in der Klemmvorrichtung (1, 2), dass vier Punkte als Teil davon bestimmt werden können, wobei die Punkte umfassen: der vorgenannter Wirkungspunkt (41) für eine Zugkraft; ein Grundpunkt (42) der Kraftteil (31, 32); ein erster Kontaktpunkt (44) an der Kraftteil (31, 32) für den Kontakt mit einem Teil (21) des Körpers (20) und eine zweite Kontaktpunkt (43) für den Kontakt mit dem Stützelement (30), wobei jeder Punkt zumindest ein Paar bildet mit einem anderen der vier Punkte, die mit ihm verbunden sind, wobei der Kraftteil (31, 32) darauf gerichtet ist, eine Kraft zwischen den Punkten des Paares zu übertragen und wobei diese Paare zu einem gewissen Grad um die Punkte schwenkbar sind.
3. Klemmvorrichtung (1) nach Anspruch 2, wobei jedes der genannten Wirkungspunkte (41) sich an einem Ort befindet in einer Schließrichtung der Klemmvorrichtung (1) relativ zu einer imaginären Ebene, in der die anderen drei Punkte (42, 43, 44) der genannten vier Punkte der jeweiligen Kraftteil (31, 32) gelegen sind.
4. Klemmvorrichtung (1) nach Anspruch 3, wobei jedes der genannten ersten Kontaktpunkte (44) auf einem Teil der Oberfläche des jeweiligen Kraftteil (31, 32) angeordnet ist dass mit Mitteln (33) zum Verstärken von Eingriff mit dem Teil (21) des Körpers (20) vorgesehen ist.
5. Klemmvorrichtung (1, 2) nach einem der Ansprüche 1, 2, 3 oder 4, umfassend Verschlussmittel (34), die auf den Kraftteilen (31, 32) angeordnet sind, und die dazu bestimmt sind, in Eingriff miteinander zu kommen wann die Kraftteile (31, 32) an der zweiten gegenseitigen Stellung gebracht werden und die Kraftteile (31, 32) in dieser Position zu verriegeln.
6. Klemmvorrichtung (3, 4) zum Aufnehmen und Halten eines Teils (21) aus einem flexiblen Körper (20) mit einer länglichen Form, umfassend: ein Stützelement (30); ein Raum (22) zur Aufnahme des Teils (21) des Körpers (20) und in Bezug auf das Stützelement (30) beweglichen Anordnungen von Kraftteile (31, 32),

umfassend Verschußteile (32) und Sperrkörper (31), die dazu geeignet sind als Kraftmittel (31, 32) zu funktionieren und die in der Lage sind eine erste gegenseitige Position einzunehmen, in dem freien Durchgang zu und von dem Aufnahmeaum (22) möglich ist für dem Teil (21) des Körpers (20) durch eine Bewegung in einer Längsrichtung, und eine zweite gegenseitige Position, um den Teil (21) des Körpers (20) eng zu umschließen, wobei zumindest ein Teil einer Oberfläche der Klemmvorrichtung (3, 4) dazu bestimmt ist kontakt zu machen mit einem Teil (21) des Körpers (20), ist vorgesehen mit Mitteln zur Erhöhung der Oberflächeneingriff mit dem Teil (21) der Körper (20) und wobei eine Anordnung von die Kraftteilen (31, 32) in der Klemmvorrichtung (3, 4) darauf gerichtet ist Stützelement (30) und die Kraftteilen (31, 32) zueinander zu ziehen und das Stützelement (30) und die Anordnungen von Kraftteile (31, 32) eine Druckkraft auszuüben zu lassen aus verschiedenen Richtungen auf dem Teil (21) des Körpers (20) wenn eine Zugkraft auf die Klemmvorrichtung (3, 4) ausgeübt wird, **dadurch gekennzeichnet dass** die vorgenannten Kraftmittel (31, 32) mindestens zwei Anordnungen von Kraftteile (31, 32) umfassen, wobei die Anordnungen von Kraftteile (31, 32) mit geringer Abweichung in spiegelsymmetrischer Weise positioniert sind und schwenkbar an dem Trägerelement (30) verbunden sind, wobei die Sperrkörper (31) schwenkbar an den Verschußteilen (32) verbunden sind, wobei eine Verzahnung (33) des Sperrkörper (31) an dem Stützelement (30) gerichtet ist, wobei eine Druckkraft in der Klemmvorrichtung (3, 4) wirkt ausgeübt von den Verschußteilen (32) und wobei die Befestigung der Klemmvorrichtung (3, 4) zum Zweck der Ausübung von Zugkraft realisiert ist durch zwei oder mehrere Befestigungsteile (24), wobei diese Befestigungsteile (24) an der Klemmvorrichtung (3, 4) an unterschiedlichen Befestigungsstellen befestigt sind, in der Wirkungspunkte (42) der Ausübung der Zugkraft bestimmbar sind, wobei diese Wirkungspunkte (42) auf die Verschußteilen (32) liegen und zusammen mit den Verschußteilen (32) beweglich sind.

7. Klemmvorrichtung (3, 4) nach Anspruch 6, wobei es zutrifft, für mindestens zwei der Anordnungen von Kraftteile (31, 32) in der Klemmvorrichtung (3, 4) dass vier Punkte als Teil davon bestimmt werden können, wobei die Punkte umfassen: der vorgenannter Wirkungspunkt (41) für eine Zugkraft, ein Grundpunkt (42) der Anordnung von Kraftteile (31, 32), ein erster Kontaktpunkt (44) am Stützelement (30) und eine zweite Kontaktpunkt (45) für den Kontakt mit dem Sperrkörper (31), wobei jeder Punkt zumindest ein Paar bildet mit einem anderen der vier Punkte, die mit ihm verbunden sind, wobei die Anordnung der Kraftteile (31, 32) darauf gerichtet ist, eine Kraft zwischen den Punkten des Paares zu

übertragen und wobei diese Paare zu einem gewissen Grad um die Punkten schwenkbar sind.

8. Klemmvorrichtung (4) nach Anspruch 6 oder 7, wobei die Mittel zum Verbessern des Eingriffs der Oberfläche mit dem Teil (21) des Körpers (20) mindestens zwei getrennte, parallele Reihen von Zähnen (36) umfassen an einer Stelle wo der Raum (22) zur Aufnahme eines Teils (21) der Körper (20) aus der Klemmvorrichtung (4) tritt, wobei diese Zähne (36) dazu bestimmt sind, die Zähne an dem Körper (20) ein zu greifen um eine Zugkraft auf den Teil (21) des Körpers (20) in Längsrichtung aus zu üben.
9. Montage eines flexiblen Körper (20) mit einer länglichen Form und einer Klemmvorrichtung (1, 2, 3, 4) nach einem der Ansprüche 1 - 8, wobei ein Ende des Körpers (20) an der Klemmvorrichtung befestigt ist, und wobei die Klemmvorrichtung (1, 2, 3, 4) dazu bestimmt ist, zum Aufnehmen und Halten eines Teils (21) des Körpers (20) verwendet zu werden.

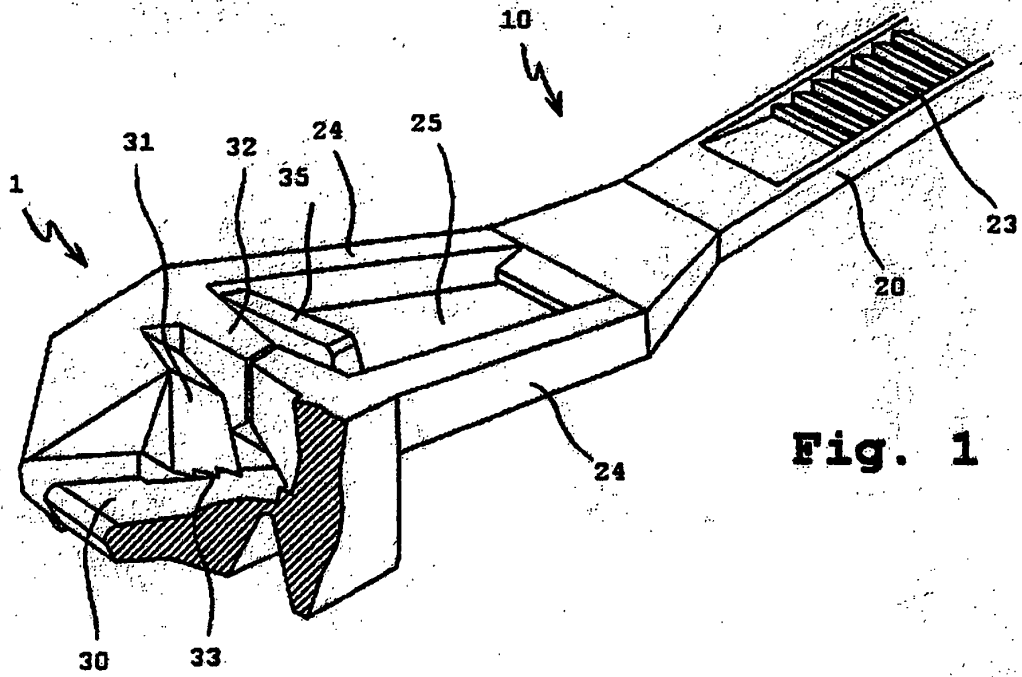
#### Revendications

1. Dispositif de serrage (1, 2) pour recevoir et retenir une partie (21) d'un corps flexible (20) ayant une forme allongée, comprenant: un élément de soutien (30); un espace (22) pour recevoir une partie (21) du corps (20); et des éléments qui sont mobiles à l'égard de l'élément de soutien (30) qui sont agencées pour fonctionner comme des moyens de force dans lequel les moyens de force comprennent au moins deux parties de force (31, 32), qui sont capables d'assumer une première position mutuelle dans lequel un passage libre est possible pour la partie (21) du corps (20) dans et hors de l'espace de réception (22) par un mouvement latéral à travers un côté ouvert du dispositif de serrage (1, 2) dans une direction de passage transversale à une direction longitudinale de la partie (21) du corps (20), et une seconde position mutuelle pour fermer la travée de la partie (21) du corps (20), dans lequel au moins une partie d'une surface du dispositif de serrage (1, 2) qui est destinée à communiquer avec une partie (21) du corps (20) est muni de moyens pour améliorer l'engagement de la surface de la partie (21) du corps (20), dans lequel un agencement des parties de force (31, 32) dans le dispositif de serrage (1, 2) est destiné à tirer l'élément de soutien (30) et les parties de force (31, 32) l'une vers l'autre et à laisser l'élément de soutien (30) et les parties de force (31, 32) exercent une force de poussée à partir de directions différentes sur la partie (21) du corps (20) quand une force de traction sur le dispositif de serrage (1, 2) est appliquée, **caractérisé en ce que** la fixation du dispositif de serrage (1, 2) aux fins de l'application de la force est réalisée par l'intermédiaire

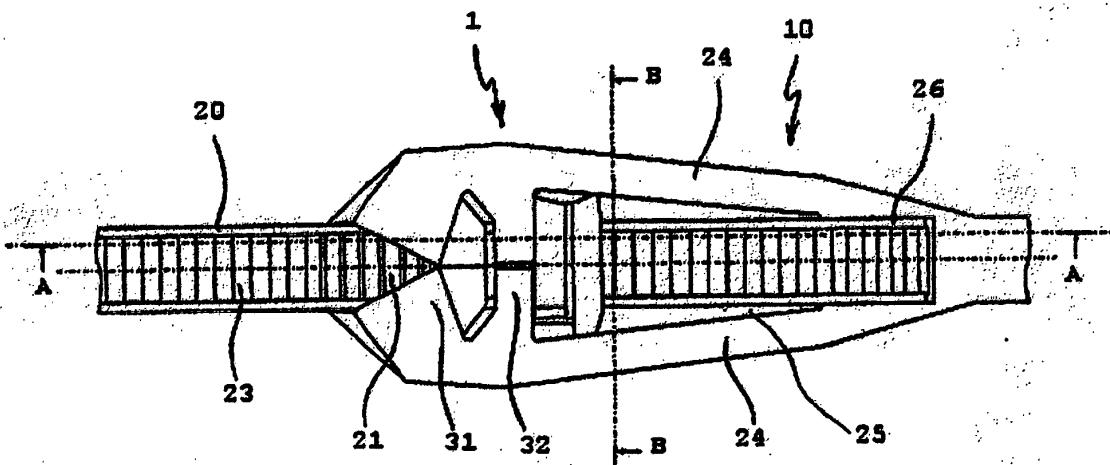
- re de deux ou plusieurs d'éléments de fixation (24), dans lequel lesdites éléments de fixation (24) sont fixés à différents points de fixation sur le dispositif de serrage (1, 2), dans lequel des points d'acteur (41) de l'exercice de la force de traction sont déterminables, dans lequel lesdits points d'acteur (41) sont situés sur les parties de force (31, 32) et sont mobiles conjointement avec parties de force (31, 32), et sont situés dans un plan qui est perpendiculaire à ladite direction de passage et qui est à une distance de la partie (21) du corps (20) dans la direction dudit côté ouvert du dispositif de serrage (1, 2).
2. Dispositif de serrage (1, 2) selon la revendication 1, dans lequel il est vrai pour au moins deux desdites parties de force (31, 32) dans le dispositif de serrage (1, 2) que quatre points peuvent être déterminés en tant que partie de celui-ci, les points comprenant ledit point d'acteur (41) pour une force de traction, un point de base (42) de la partie de force (31, 32), un premier point de contact (44) à la partie de la force (31, 32) pour le contact d'une partie (21) du corps (20), et un deuxième point de contact (43) pour le contact de l'élément de soutien (30), dans lequel chaque point fait au moins une paire avec un autre de ces quatre points en étant attaché à elle, dans lequel la partie de force (31, 32) est destinée à permettre à une force d'être transmis entre les points de la paire, et dans lequel ces paires dans une certaine mesure peuvent pivoter autour des points.
  3. Dispositif de serrage (1) selon la revendication 2, dans lequel chacun des desdits points d'acteur (41) est situé dans une direction de fermeture du dispositif de serrage (1) par rapport à un plan imaginaire dans lequel les trois autres points (42, 43, 44) desdits quatre points de l'ensemble respectif de parties de force (31, 32) sont situés.
  4. Dispositif de serrage (1) selon la revendication 3, dans lequel chacun desdits premiers points de contact (44) est situé à une partie de la surface de la partie de force respective (31, 32) qui est fourni avec des moyens (33) pour renforcer engagement de la portion (21) du corps (20).
  5. Dispositif de serrage (1, 2) selon l'une quelconque des revendications 1, 2, 3 ou 4, comprenant des moyens de fermeture (34) qui sont situés sur les parties de force (31, 32), et qui sont destinés à s'engager les uns les autres lorsque les parties de force (31, 32) sont mis à la seconde position mutuelle, et pour verrouiller les parties de force (31, 32) dans cette position.
  6. Dispositif de serrage (3, 4) pour recevoir et retenir une partie (21) d'un corps flexible (20) ayant une forme allongée, comprenant: un élément de soutien (30); un espace (22) pour recevoir une partie (21) du corps (20); et des assemblages de parties de force (31, 32), mobiles à l'égard de l'élément de soutien (30), comprenant des parties de fermeture (32) et des parties d'encliquetage (31), qui sont adaptés pour fonctionner en tant que pièces de force (31, 32), qui sont capable d'assumer une première position mutuelle dans laquelle le passage libre vers et depuis l'espace de réception (22) est possible pour la partie (21) du corps (20) par un mouvement dans une direction longitudinale de la partie (21) du corps (20), et une seconde position mutuelle en étant serrée autour de la partie (21) du corps (20), dans lequel au moins une partie d'une surface du dispositif de serrage (3, 4) qui est destinée à communiquer avec une partie (21) du corps (20) est muni de moyens pour améliorer l'engagement de la surface de la partie (21) du corps (20), et dans lequel un agencement des assemblages de parties de force (31, 32) dans le dispositif de serrage (3, 4) est destiné à tirer l'élément de soutien (30) et les assemblages de parties de force (31, 32) l'une vers l'autre et à laisser l'élément de soutien (30) et les assemblages de parties de force (31, 32) exercent une force de poussée à partir de directions différentes sur la partie (21) du corps (20) quand une force de traction sur le dispositif de serrage (3, 4) est appliquée, **caractérisé en ce que** lesdits pièces de force comprennent au moins deux assemblages de parties de force (31, 32), dans lequel les assemblages de parties de force (31, 32) sont positionnés avec un petit écart à la manière d'une symétrie spéculaire et sont montés à pivot sur l'élément de soutien (30), dans lequel les parties d'encliquetage (31) sont montés à pivot sur les parties de fermeture (32), dans lequel une denture (33) de la partie d'encliquetage (31) est dirigé sur l'élément de soutien (30), dans lequel une force de poussée agit dans le dispositif de serrage (3, 4), exercée par les éléments de fermeture (32), et dans lequel la fixation du dispositif de serrage (3,4) aux fins de l'application de la force est réalisée par l'intermédiaire de deux ou plusieurs d'éléments de fixation (24), dans lequel lesdites éléments de fixation (24) sont fixés à différents points de fixation sur le dispositif de serrage (3,4), dans lequel des points d'acteur de l'exercice de la force de traction (42) sont déterminables, dans lequel lesdits points d'acteur (42) sont situés sur les parties de fermeture (32) et sont mobiles conjointement avec les parties de fermeture (32).
  7. Dispositif de serrage (3, 4) selon la revendication 1, dans lequel il est vrai pour au moins deux desdites assemblages de parties de force (31, 32) dans le dispositif de serrage (3, 4) que quatre points peuvent être déterminés en tant que partie de celui-ci, les points comprenant ledit point d'acteur pour une force de traction (41), un point de base (42) de l'assem-

blage de parties de force (31, 32), un premier point de contact (44) à l'élément de soutien (30), et un deuxième point de contact (45) pour le contact de la partie à rochet (31), dans lequel chaque point fait au moins une paire avec un autre de ces quatre points en étant attaché à elle, dans lequel l'assemblage de parties de force (31, 32) est destiné à permettre à une force d'être transmis entre les points de la paire, et dans lequel ces paires dans une certaine mesure peuvent pivoter autour des points.

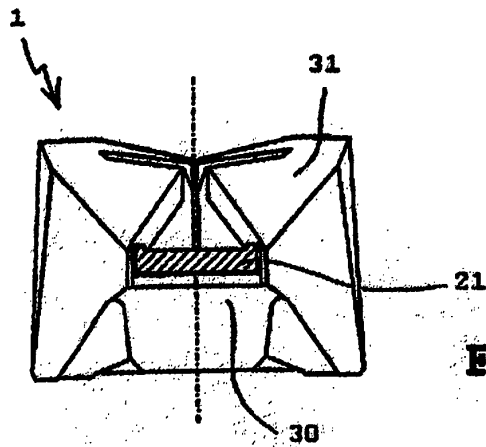
8. Dispositif de serrage (4) selon la revendication 6 ou 7, dans lequel les moyens destinés à renforcer l'engagement de la surface de la partie (21) du corps (20) comprennent au moins deux rangées parallèles, séparées des dents (36) à un endroit où l'espace (22) pour recevoir une partie (21) du corps (20) sort du dispositif de serrage (4), dans laquelle ces dents (36) sont destinés à s'engager les dents sur le corps (20) pour exercer une force de traction sur la partie (21) du corps (20) dans une direction longitudinale.
9. Assemblage d'un corps flexible (20) ayant une forme allongée et un dispositif de serrage (1, 2, 3, 4) selon l'une quelconque des revendications 1 à 8, dans lequel une extrémité du corps (20) est fixé au dispositif de serrage (1, 2, 3, 4), et dans lequel le dispositif de serrage (1, 2, 3, 4) est destinée à être appliquée pour recevoir et retenir une partie (21) du corps (20).



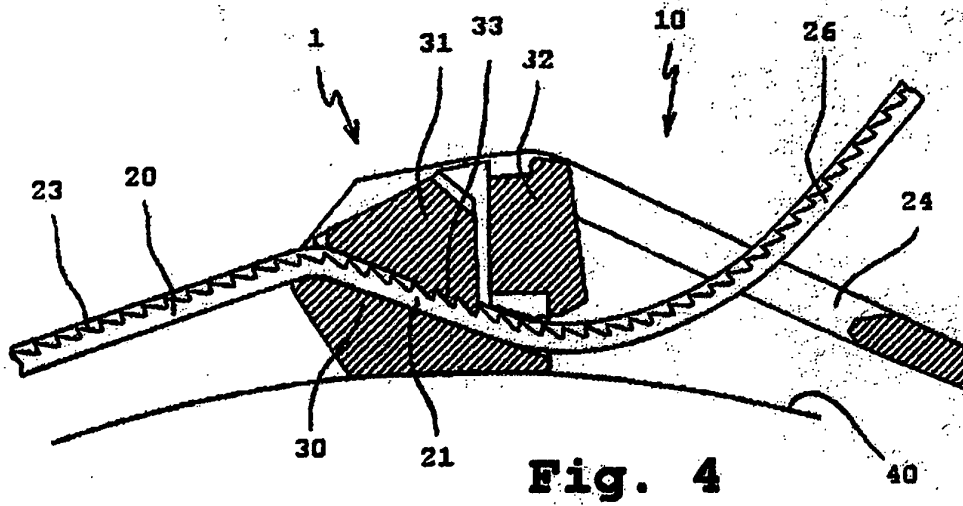
**Fig. 1**



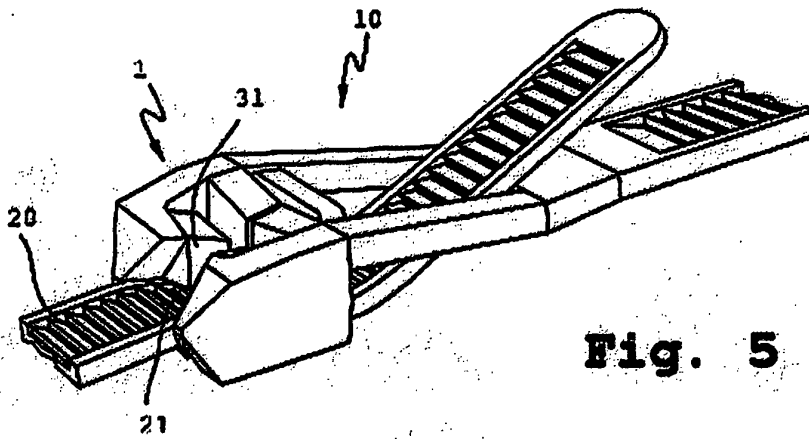
**Fig. 2**



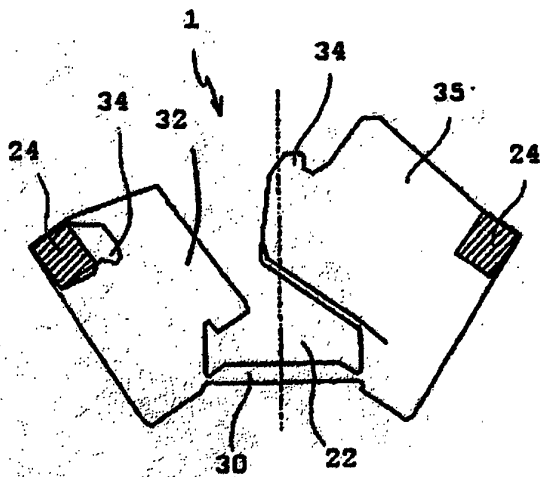
**Fig. 3**



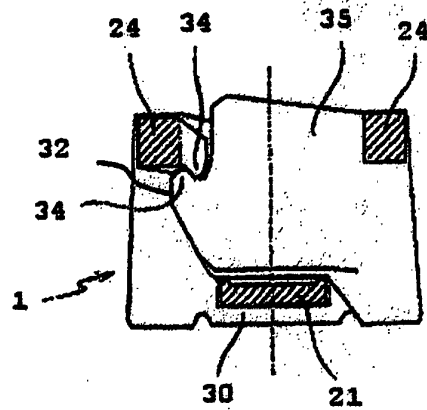
**Fig. 4**



**Fig. 5**

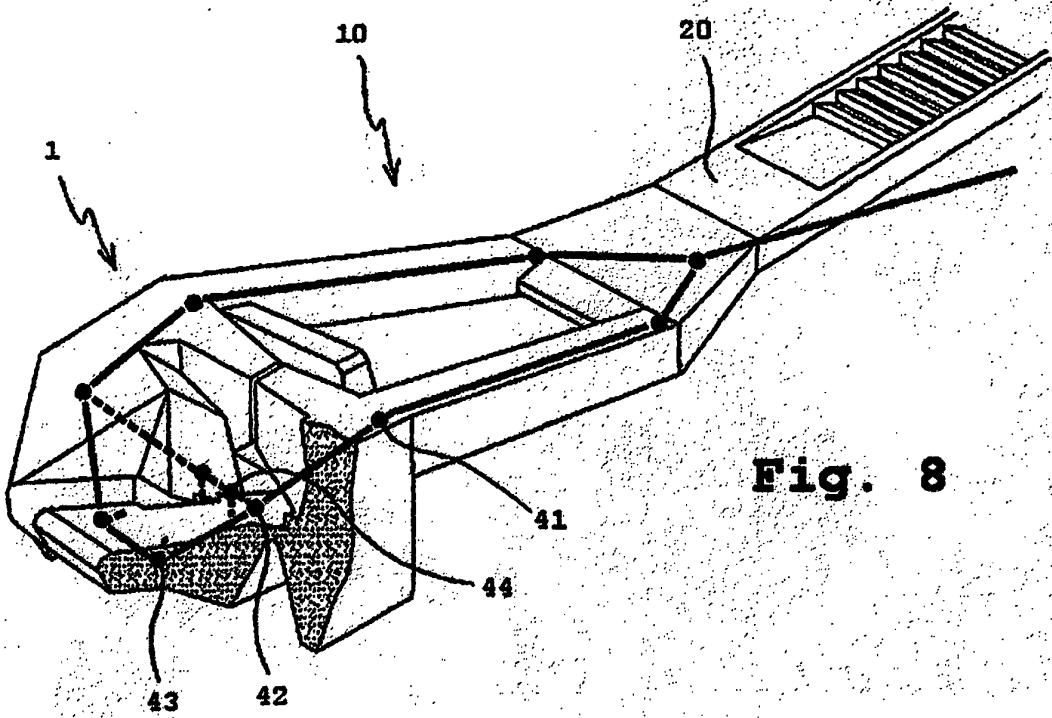


**Fig. 6**

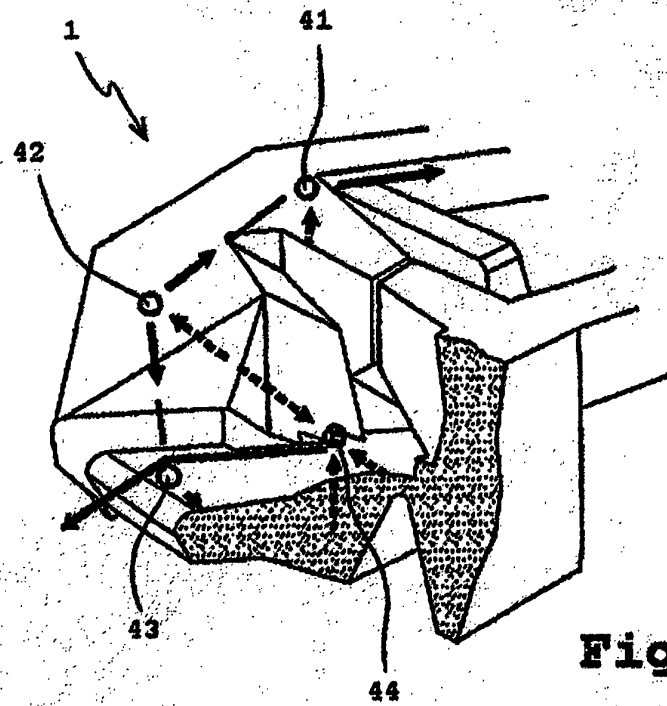


**Fig. 7**

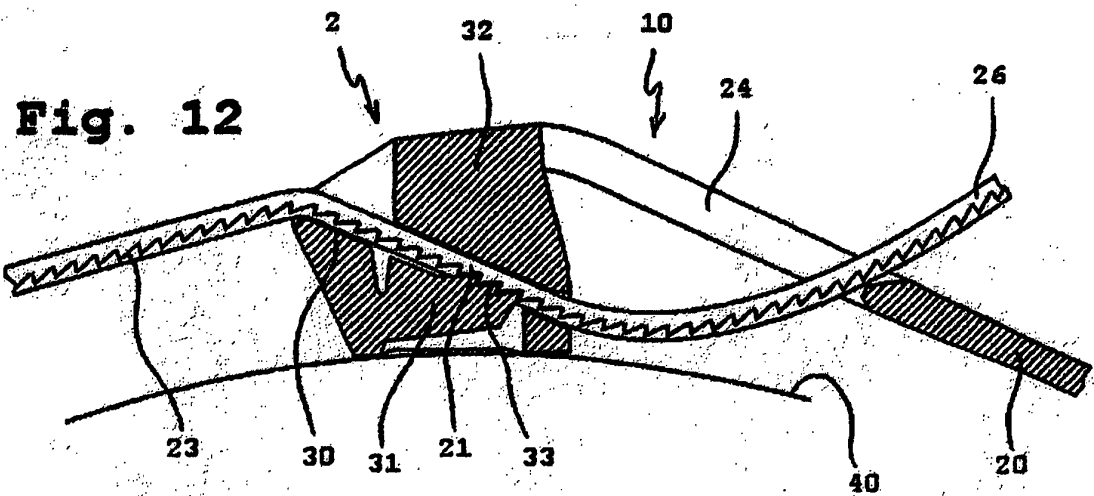
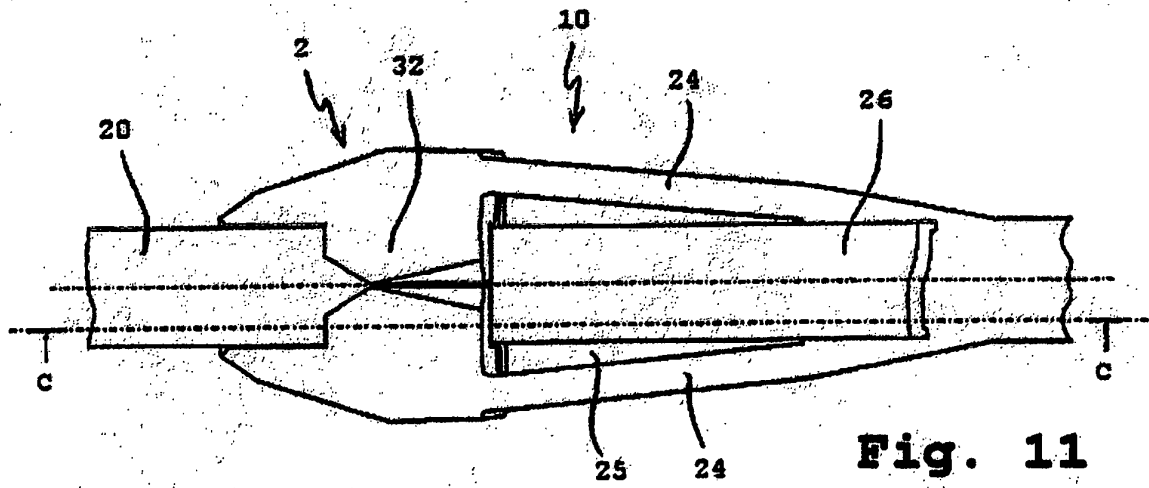
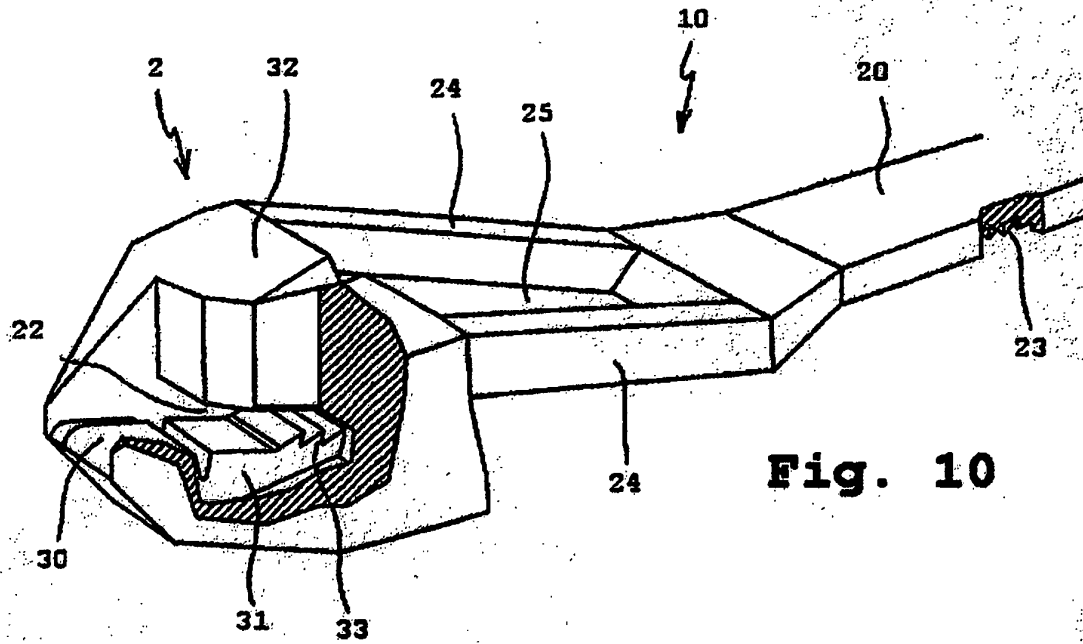


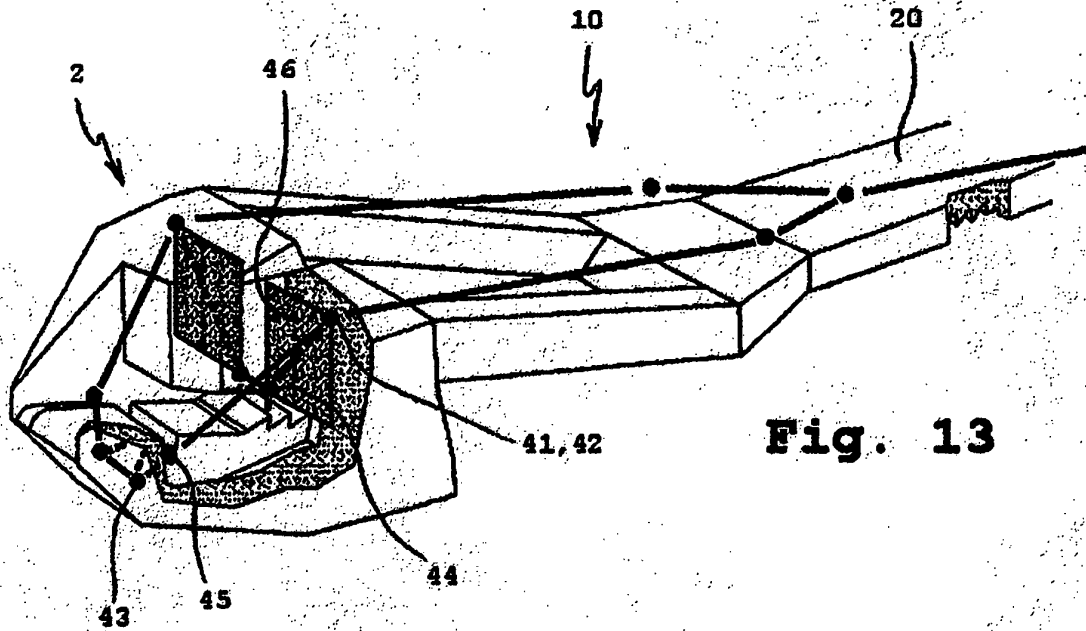


**Fig. 8**

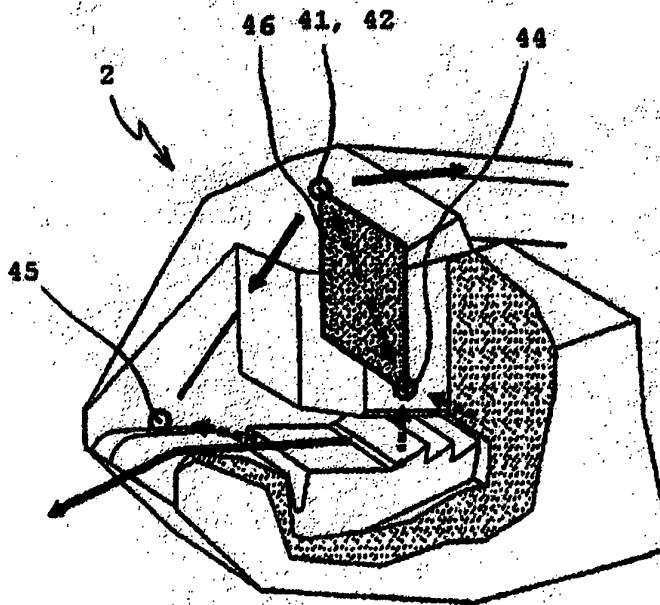


**Fig. 9**

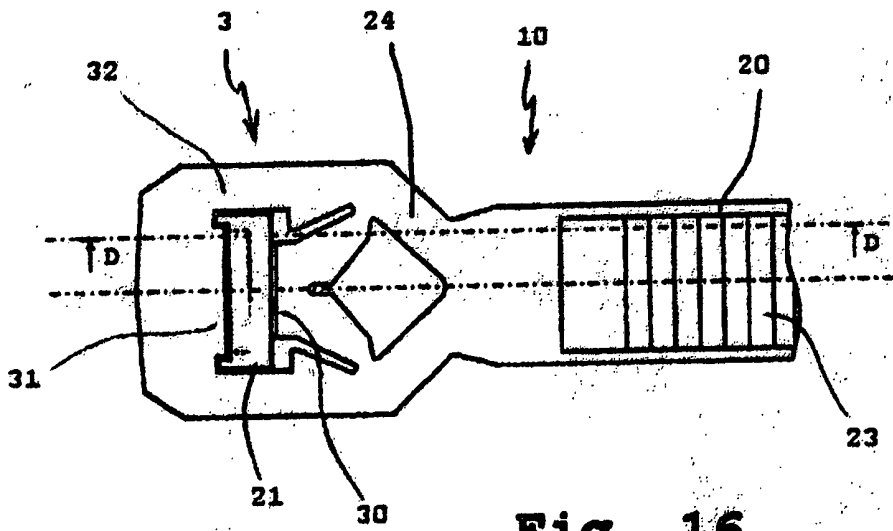
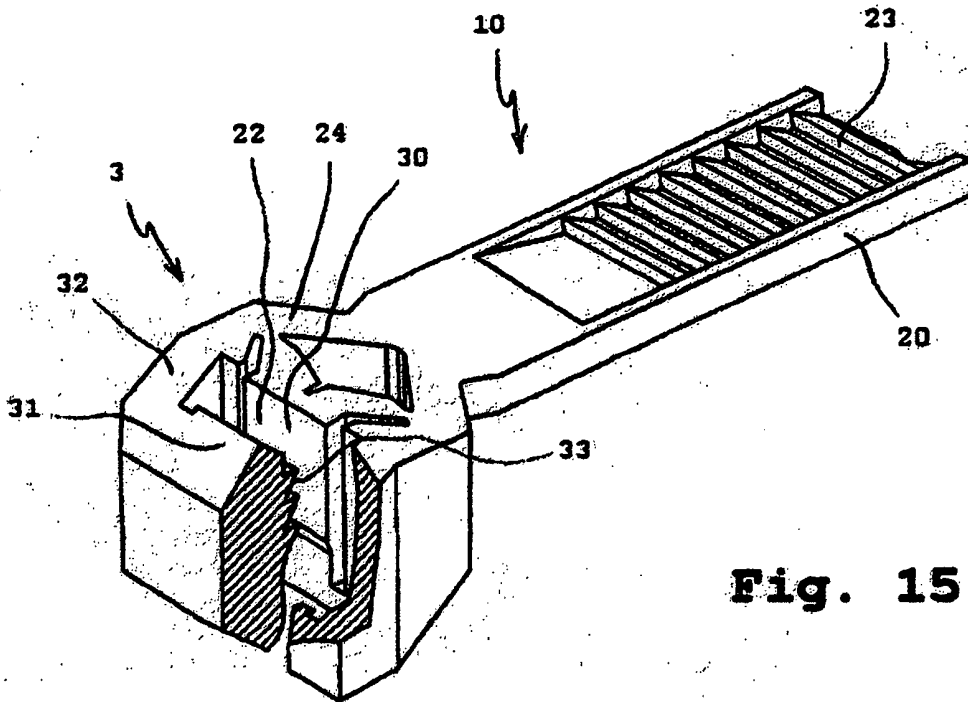


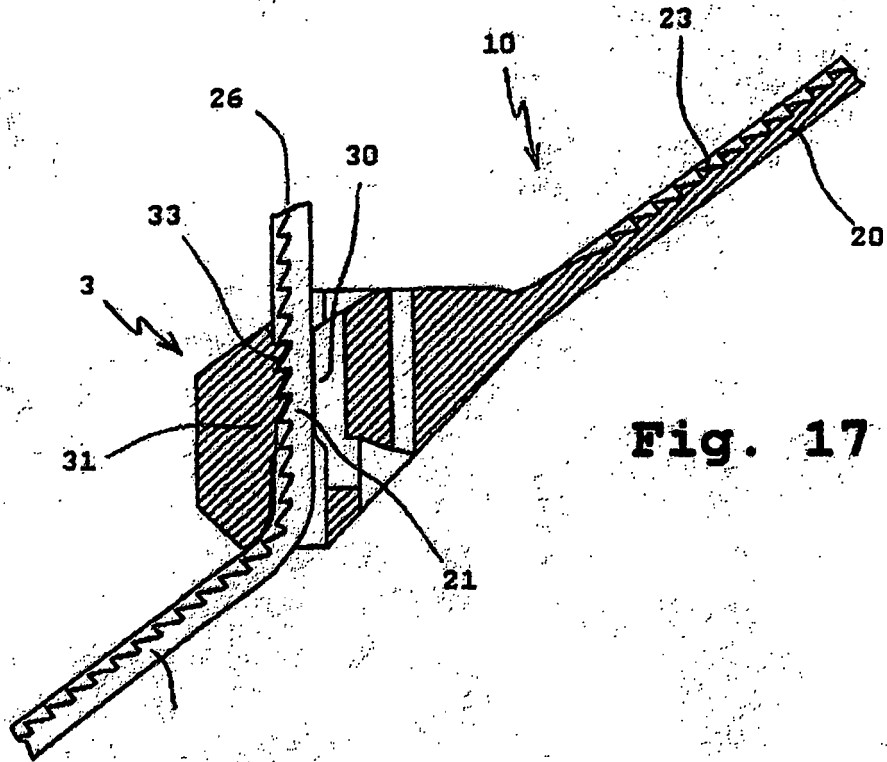


**Fig. 13**

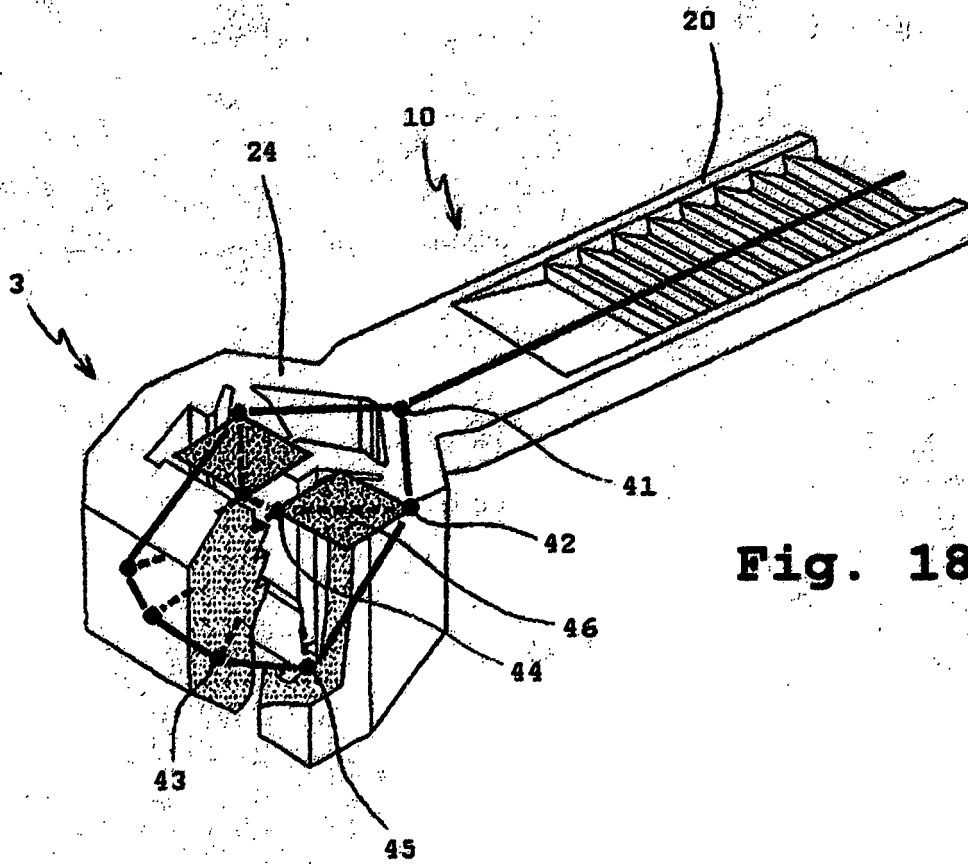


**Fig. 14**

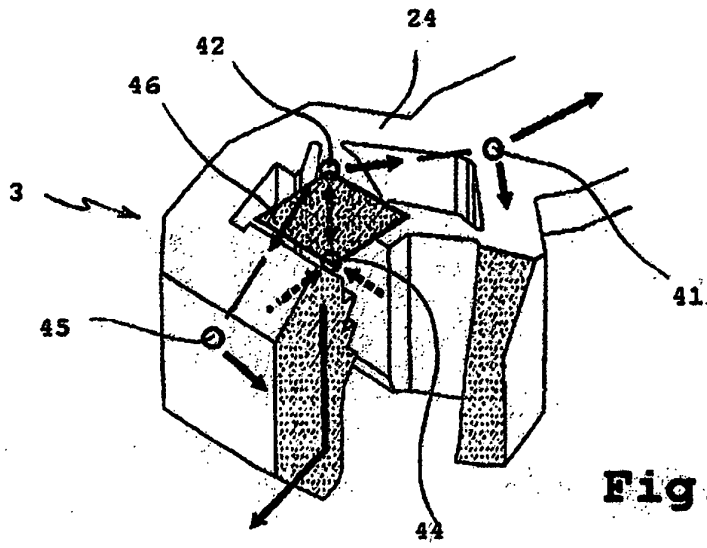




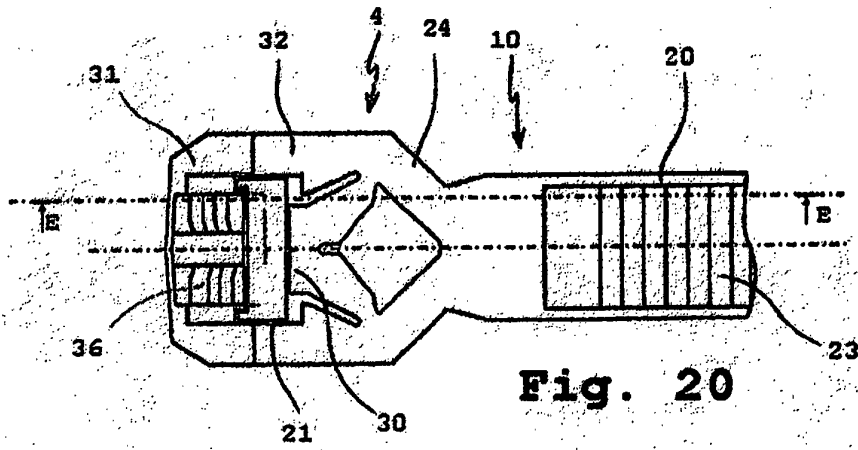
**Fig. 17**



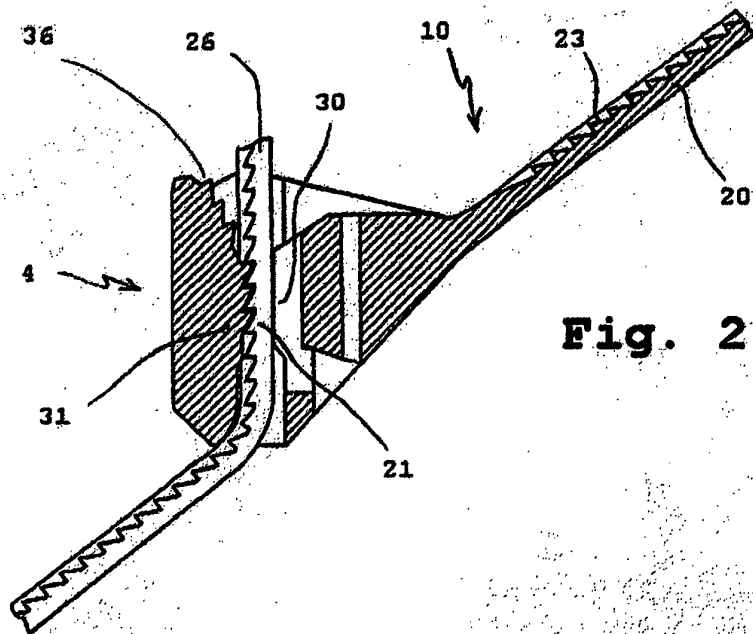
**Fig. 18**



**Fig. 19**



**Fig. 20**



**Fig. 21**

**REFERENCES CITED IN THE DESCRIPTION**

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