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(54) **CONNECTING MEANS FOR DETACHABLY CONNECTING ELEMENTS OF A WARP YARN POSITIONING SYSTEM ON A WEAVING LOOM**

(57) This invention relates to a set of coupling parts for detachably connecting elements of a warp yarn positioning system on a weaving loom, comprising a first (10) and a second coupling part (20) which are not interconnectable and an adaptor (30) designed to connect with connection means (12) of the first coupling part (10), and with connection means (21) of the second coupling part (20), at least one of said connections being detachable; the invention also relates to the adaptor itself as well as to a warp yarn positioning system comprising means for transmitting motion from a motion-inducing device to one or more warp yarns, comprising a first element connected to a first coupling part (10) and a second element connected to a second coupling part (20) which is not interconnectable with said first coupling part (10), and an adaptor (30) connected with the first (12) and the second connection means (21).

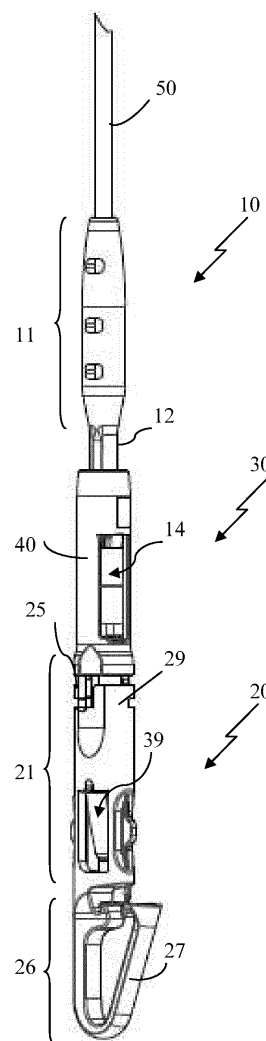


Fig. 5

Description

[0001] This invention relates to a set of coupling parts for detachably connecting elements of a warp yarn positioning system on a weaving loom and to an adaptor for detachably connecting non-interconnectable coupling parts of such a positioning system.

[0002] The invention also relates to a warp yarn positioning system comprising a number of motion-inducing devices and means for transmitting motion from each motion-inducing device to a respective number of warp yarns during a weaving process on a weaving loom, said means for transmitting motion comprising a first element connected to a first coupling part comprising first connection means, and a second element connected to a second coupling part comprising second connection means which are not connectable with said first connection means.

[0003] Known warp yarn positioning systems typically comprise a Jacquard machine comprising a plurality of hooks which are moveable up and down by means of knives in order to position the warp yarns in successive sheds during successive weft insertion cycles on a weaving machine. The positions of the warp yarns in the successive weaving cycles are predetermined in accordance with the weave structure of the fabric that is to be woven.

[0004] Each hook is connected to a jacquard lifting cord. Each warp yarn extends through an eye of a heddle in a harness of the weaving machine and each heddle is connected to a respective harness cord. In order to detachably connect each jacquard lifting cord with one or more harness cords, it is known to use first and second interconnectable connection parts. The first coupling parts are attached to a jacquard lifting cord and the second coupling parts are attached to one or more harness cords. The first and second coupling parts are designed to be coupled in a detachable manner.

[0005] The terms 'detachably connecting' are used in the sense that the coupled elements can be disconnected without the use of tools, for example by applying a pulling force which draws the coupling parts away from one another or by a mutual rotation of the coupling parts, or by a mutual rotation followed by a pulling force. The connection and disconnection preferably can be carried out manually in a swift and easy manner.

[0006] In this patent application, the wording 'warp yarn positioning system' is used in a broad sense, referring to all means contributing to the positioning of the warp yarns on a weaving loom. The harness cords and the coupling parts connected or connectable thereto are thus also parts - or elements - of such a warp yarn positioning system.

[0007] A Jacquard machine comprises a large number of lifting devices for lifting warp yarns. When installing such a harness a large number of jacquard lifting cords have to be connected with harness cords. This is a very time-consuming operation with long idling periods of the

weaving machines and a proportional loss of productivity as a consequence. In order that this connection of cords may be carried out quickly, various types of connecting means were developed. It is important that a reliable connection can be realized by means of these connecting means. Moreover these connecting means should be of a simple construction and be easily to manipulate.

[0008] A first and a second known set of coupling parts - described in EP 1361302 B1 and WO2013/128275A9 - each comprise two interconnectable coupling parts connectable with a respective cord of a Jacquard machine, a male coupling part comprising an inserting member having an elastically deformable head, and a female coupling part comprising a receiving space for this head and a passage through which the receiving space is accessible, such that the head, compressed in a radial direction, may be shifted through said passage until it is situated in the receiving space, and such that the head in the receiving space can adopt a larger radial dimension than in its compressed state.

[0009] In the first known set of interconnectable coupling parts (according to EP 1361302 B1) the receiving space and the head are designed in such a manner that the inserting member may be rotated around its longitudinal axis in order to bring the head from a coupling position in which it is retained in the receiving space into a disengaging position in which it is not retained, and vice-versa.

[0010] In the second known set of interconnectable coupling parts (according to WO 2013/128275 A9) the receiving space comprises, beyond the passage, an axially displaceable uncoupling body with an opening, and the head situated beyond the passage can be displaced into said opening, and said opening is designed to then deform the head in such a manner that it can be introduced into the passage in order to uncouple the coupling parts.

[0011] A male coupling part of the first set and a female coupling part of the second set are not connectable. Also, a male coupling part of the second set cannot be connected with a female coupling part of the first set of known coupling parts.

[0012] A third set of connecting means is known from European patent EP 0 788 562 B1. One coupling part comprises an elongated inserting part, which ends in a radially enlarging head, while the other coupling part comprises a pair of co-acting springy clamping fingers designed to be pushed away from one another through the head and to spring back once the head has passed the clamping fingers. This head is then retained in an axial direction by the springy clamping fingers springing back, so that the connecting means are coupled. To disconnect the connecting means the clamping fingers should be pushed away from one another by means of a slidable sleeve, so that the head may subsequently be drawn from its position between the clamping fingers.

[0013] In the international patent application WO 99/27170, another set of connecting means is described.

One coupling part comprises a number of flexible projections, acting as coupling elements, while the other coupling part comprises an equal number of recesses. In their compressed situation, the flexible projections may be shifted towards the recesses and eventually spring back into these recesses. Then the connecting means are in a coupled position.

[0014] The coupling parts belonging to different sets of coupling parts cannot be connected.

[0015] It can happen that a Jacquard machine provided with coupling parts belonging to one set of coupling parts has to be prepared for cooperation with a harness provided with coupling parts belonging to another set of coupling parts. For example, when the jacquard machine is provided with male coupling parts of the above-mentioned second known set of coupling parts (according to WO 2013/128275 A9) and the harness is provided with female coupling parts of the above-mentioned first known set of coupling parts (according to EP 0 788 562 B1).

[0016] The coupling parts of one set of coupling parts then have to be replaced by coupling parts which are connectable with the coupling parts of the other set. This of course is very time-consuming.

[0017] The aim of the present invention is to provide connecting means providing a less time-consuming solution to the above-mentioned problem while a speedy and reliable connection remains possible and without concessions regarding the efficiency and the adaptability of the warp yarn positioning system.

[0018] This aim is achieved by providing an adaptor for detachably coupling two non-interconnectable elements of a warp yarn positioning system on a weaving loom, comprising third and fourth connection means designed to realize a first connection with first connection means of one element and a second connection with second connection means of the other element respectively, at least one of the two connections being a detachable connection.

[0019] The installation of a warp yarn positioning system including motion transmitting elements which have to be connected with one another, but are provided with respective coupling parts which are not interconnectable, can be carried out more quickly. Moreover, the adaptor is connectable to the elements in a speedy and reliable way, and the adaptability of the system is also guaranteed as at least one of the connections between the adaptor and the elements is a detachable connection.

[0020] In a preferred embodiment of this adaptor, the third connection means comprises retaining means for retaining a coupling head and the fourth connection means comprises an elastically deformable coupling head. In another preferred embodiment the adaptor is provided to couple two coupling parts belonging to different sets of coupling parts for connecting cords of a warp yarn positioning system on a weaving loom.

[0021] This aim is also achieved by means of a set of coupling parts for detachably connecting elements of a warp yarn positioning system on a weaving loom, com-

prising such an adaptor as an essential part of it.

[0022] The set of coupling parts according to the invention comprises a first coupling part comprising

- first connection means, and
- a second coupling part comprising second connection means which are not connectable with said first connection means, and
- an adaptor comprising
 - third connection means designed to connect with the first connection means so as to connect the adaptor to said first coupling part, said first and third connection means forming a first pair of cooperatable connection means, and
 - fourth connection means designed to connect with the second connection means, so as to connect the adaptor to said second coupling part, said second and fourth connection means forming a second pair of cooperatable connection means, at least one of said pairs of cooperatable connection means being designed to realize a detachable connection.

[0023] It is preferred that in at least one pair of cooperatable connection means, one connection means comprises an inserting portion and the other connection means comprises a receiving portion designed to receive and retain said inserting portion.

[0024] A preferred set of coupling parts according to the invention is characterized in that, in at least one pair of cooperatable connection means, one connection means comprises an elastically deformable coupling portion and the other connection means comprises a receiving portion designed to receive and retain said elastically deformable coupling portion.

[0025] In this patent application, the term 'elastically deformable' is used in the sense that at least a part of the element concerned (i.e. at least a part of the coupling portion or the head) is deformable by applying a force to it and that the deformation at least partly disappears after removal of the force. Elements of which the deformation is partly elastic and partly permanent are thus also considered to be 'elastically deformable'. An element is considered to be deformable when its size and/or its shape can be changed by applying a force to it.

[0026] The fact that only one elastically deformable part is needed, will favour the reliability of the connection and will simplify the production. These connecting means may be disconnected very quickly in one swift movement and will produce an efficient and reliable connection of the cords of a Jacquard machine.

[0027] The coupling portion preferably is elastically deformable so that its radial dimension can be reduced. In another advantageous embodiment, the elastically deformable coupling portion comprises an elongate insertion member terminating in a larger head which is elastically deformable. The head preferably has a non-circu-

lar cross-section.

[0028] In the set of coupling parts, the adaptor preferably comprises third connection means comprising a receiving portion designed to receive and retain an elastically deformable coupling portion of the first connection means of the first coupling part, and fourth connection means comprising an elastically deformable coupling portion designed to be received and retained in a receiving portion of the second connection means of the second coupling part.

[0029] In a much preferred embodiment of the invention, in at least one pair of cooperatable connection means, the receiving portion comprises a receiving space and a passage through which the elastically deformable coupling portion in a radially compressed state is moveable to said receiving space, the elastically deformable coupling portion in this receiving space having the possibility to adopt a larger radial dimension than in said compressed state such that it is retained in the receiving space.

[0030] The passage for example is designed to allow the head through in the deformed state on account of a coupling force. Beyond this passage, the coupling portion reaches the receiving space in which it is allowed to return to a state with a larger transverse dimension so that it is detained there and the connection means are connected.

[0031] In an advantageous embodiment of the invention, in at least one pair of cooperatable connection means, the receiving portion and the elastically deformable coupling portion are designed such that the coupling portion received in the receiving portion may be rotated about its longitudinal axis in order to be brought from a coupling position in which it is retained in the receiving portion into a disengaging position in which it is not retained in the receiving portion, and vice-versa.

[0032] The head preferably has a non-circular cross-section and may for example be arrow-shaped.

[0033] These coupling parts may be carried out being compact in the transverse direction (e.g. with a maximum diameter of 6 mm). Therefore these connecting means allow for a large number of hooks and are also easy to disconnect. A simple rotating movement (around the longitudinal axis) of the coupling parts with respect to one another will do to bring the coupling portion into its disconnecting position. As during this rotation, the coupling element remains in the receiving part, this rotation may occur without any deformation of the coupling element. This also is in favour of a speedy disconnection without any problems.

[0034] Furthermore, a rotating movement has to be performed, contrary to the translating movement with other known coupling parts, in order to perform a disconnection. This reduces the risk of an undesired disconnection of the coupling parts.

[0035] In another preferred embodiment, the passage is designed to let pass the elastically deformable coupling portion in a substantially non-deformed state when the coupling portion is rotated into said disengaging position.

[0036] In a further preferred embodiment, the elastically deformable coupling portion is designed such that it comprises at least one radially projecting bumper edge, the receiving portion comprises at least one retaining edge provided for retaining at least one bumper edge of the elastically deformable coupling portion situated in the receiving space in order to prevent disconnection of the connection means, and the elastically deformable coupling portion and the receiving portion are carried out such that the coupling means in the receiving space may be brought from a coupling position in which at least one bumper edge is retained by a retaining edge into a disengaging position in which not any bumper edge is retained by a retaining edge so that said disconnection is no longer prevented.

[0037] In a further preferred embodiment of the invention, in at least one pair of cooperatable connection means, the elastically deformable coupling portion comprises two radially projecting flanks with respective end faces, forming two radially projecting bumper edges, and the receiving space is delimited by a side wall in which two windows are provided, such that a respective flank of the elastically deformable coupling portion may be situated in each window and an edge of each window acts as a retaining edge for said bumper edges of the elastically deformable coupling portion.

[0038] Advantageously, in at least one pair of cooperatable connection means, the receiving portion is designed to retain the elastically deformable coupling portion in a substantially non-deformed state. When disconnecting, the first connecting means may be withdrawn freely from the second connecting means. Because of this, a particular user-friendly set of connecting means is obtained.

[0039] Preferably, the receiving portion is provided with at least one cam, preventing a rotating movement around the longitudinal axis of the one connection means with respect to the other when the connection means have been connected. Because of this, bringing the elastically deformable coupling portion of the first connection means into the disconnecting position by simply rotating the first connection means with respect to the second connection means is made impossible. To disconnect the connection means an additional operation is required.

[0040] Said edge of each window preferably comprises a first edge part, acting as a retaining edge and which is changing stepwise into a second edge part, so that this step will form said cam, by which a rotation of the connection means with respect to one another is prevented.

[0041] At least one of the coupling parts may be provided with a springy element, which exercises a spring force on the other coupling part, which pushes the coupling parts, coupled with respect to one another, into the disconnecting direction.

[0042] In a possible embodiment, in at least one pair of cooperatable connection means, the receiving portion comprises, beyond said passage, an axially displaceable uncoupling body comprising an opening into which the

coupling portion can be introduced when it is in the receiving space, and in that said opening is designed to deform the coupling portion introduced in the opening in such a manner that it can be withdrawn from the receiving space via the passage in order to disconnect the connection means.

[0043] In a further preferred embodiment, one pair of cooperatable connection means is designed to realize a non-detachable connection. This can be done by omitting the uncoupling body in the embodiment according to the preceding paragraph of this description.

[0044] The first coupling part and the second coupling part for example belong to a different set of interconnectable coupling parts.

[0045] In the most preferred embodiment of this invention the adaptor comprises an elongate body having two opposing ends, said body terminating in an elongate inserting member with an elastically deformable head at one end, and terminating in a hollow portion delimited by a side wall defining a receiving space and a passage at the other end, the inserting member and the hollow portion forming said coupling portion and said receiving portion respectively.

[0046] Preferably, each coupling part comprises means for connecting the coupling part with one or more respective cords, or is connected to one or more respective cords of the warp yarn positioning system. The coupling parts may be made, at least partly, of synthetic material and comprise one or more respective cords, extruded into the synthetic material.

[0047] The aim of the invention is also achieved by providing a warp yarn positioning system having the features mentioned in the second paragraph of this description, wherein the means for transmitting motion further comprise an adaptor comprising third connection means connected with the first connection means, and fourth connection means connected with the second connection means, so that the adapter is connected to said first coupling part and to said second coupling part, at least one of the connections being a detachable connection.

[0048] Other important features of the coupling parts and the adaptor of this warp yarn positioning system are described in claims 15 to 28. These features correspond to the above-identified features of the warp yarn positioning device and any of the above-mentioned comments or advantageous effects with respect to any of these features also applies to the corresponding features of claims 15 to 28.

[0049] In the following detailed description a preferred embodiment of a set of connecting means according to the present invention is described in more detail. Its only purpose is to clarify said characteristics of the invention by means of a description of a specific embodiment. It should therefore be obvious that nothing in this description may be interpreted as being a restriction of the scope of the patent rights expressed in the claims, nor as a restriction of the field of application of the present invention.

[0050] In this description, by means of reference numbers, reference is made to the attached drawings of which:

- 5 • figure 1 is a perspective view of a first coupling part according to this invention;
- figure 2 is a perspective view of a second coupling part according to this invention;
- 10 • figure 3 is an adaptor according to this invention;
- figure 4 is a cross-section along the longitudinal axis A of the adaptor of figure 3;
- figure 5 is a perspective view of the first and the second coupling part of figures 1 and 2 respectively, connected with the adaptor of figures 3 and 4.

[0051] The first coupling part (10) of the set of coupling parts according to this invention is a coupling part of a first set of interconnectable coupling parts described in the international patent publication WO 2013/128275 A9.

20 **[0052]** The first coupling part is identical to the male coupling part of this first set of coupling parts and comprises an elongate, substantially cylindrical shaft (11) with a longitudinal axis (A), comprising a first portion (11a) forming one end of the coupling part (10), to which a cord (not shown on figure 1) can be attached, and a second portion (11b) having a larger diameter than the first portion (11a). In an advantageous embodiment, the male coupling part (10) is moulded onto the cord by means of an injection-moulding technique.

25 **[0053]** The second portion (11b) adjoins an inserting member (12) having opposite flattened sides (13) and an elastically deformable head (14). The inserting member extends according to the axis (A) and forms the other end of this first coupling part (10).

30 **[0054]** A crossing recess (15) is provided in the inserting member (12), so that two legs (16), (17) are formed which are separated by the recess (15). Via a stepped widened section, each leg (16), (17) adjoins a respective lateral part (14a), (14b) with two flattened parallel sides and rounded-off lateral flanks which converge symmetrically from the stepped widened section and terminate in a top part (14c). The lateral parts (14a), (14b) and the top part (14c) together form the arrow-shaped head (14) with a respective rear end which forms a transverse retaining surface (14e), (14f) extending in a radial direction due to the stepped widened section, and with a width which gradually decreases from the rear end to its top end.

35 **[0055]** This male coupling part (10) is designed to be connected with an associated female coupling part (not shown of the figures). This coupling part is described below but is not part of the set of coupling parts according to this invention.

40 **[0056]** The associated female coupling part (not part of this invention) comprises a substantially hollow receiving part in which a receiving space for the head of the male coupling part (10) is provided and which is accessible via a passage which is provided from the free end

of the female coupling part and ends in the receiving space. The passage extends along the longitudinal axis of the female coupling part and has a substantially cylindrical shape with a conically narrowing inlet at the end of it. An edge situated around the outlet of the passage in the receiving space serves as a retaining means for the head (14). The receiving space is provided with a cylindrical uncoupling body in which a central opening which is likewise cylindrical is provided. This uncoupling body can be displaced along the longitudinal axis of the coupling part in the receiving space.

[0057] At the head (14) of the male coupling part (10), a laterally protruding protuberance (14d) is provided on one of the lateral parts (14a), (14b). During coupling, the male coupling part (10) is introduced, head (14) first, into the passage of the associated female coupling part via the conical narrowing. This causes the head (14) to deform elastically. The male coupling part (10) is pushed further into this passage until the head has reached the receiving space. In the receiving space, the head (14) assumes a larger transverse dimension.

[0058] When the male (10) and the associated female coupling part are being moved closer together, the radially protruding protuberance (14d) of the head (14) comes into contact with the uncoupling body. In case this uncoupling body is not situated completely at the bottom in the receiving space, said protuberance (14d) ensures that the head (14) does not immediately slide into the cylindrical opening of the uncoupling body (16) and is compressed, but a further displacement of the head (14) in the receiving space results, firstly, in that the uncoupling body is moved concomitantly into the vicinity of its end position against the bottom end face of the receiving space. In this state, the two coupling parts are coupled and if a load were to pull both coupling parts away from each other, this would result in the male coupling part (10) being displaced with respect to the female coupling part until the rear retaining surfaces (14e), (14f) of the head (14) knock against the edge which is situated around the outlet of the passage and serves as a retaining surface. The male coupling part (10) is thus detained in the receiving space of the associated female coupling part, thus securing the coupling.

[0059] In order to uncouple the coupling parts again, the male coupling part (10) is pushed further in the connection direction until the head (14) is pushed into the cylindrical opening of the uncoupling body, and the front part of the head (14) is situated in a cavity which is provided in the bottom end face of the receiving space. The head (14) is pushed completely into the cylindrical opening of the uncoupling body, so that the head (14) is compressed in the transverse direction. In this situation, the retaining surfaces (14e), (14f) of the head (14) are situated in the vicinity of and preferably just beyond the top edge of the uncoupling body.

[0060] In this position, the protuberance (14d) is deformed, and the rebound force of this protuberance (14d) and the associated friction force against the uncoupling

body, ensures that when a force is applied in a direction opposite to the insertion direction of the male coupling part, the uncoupling body moves concomitantly until it reaches a position in which it bears against the edge of the female coupling part which serves as retaining means for the head (14). Now, the male coupling part (10) can be pulled out of the female coupling part without any problems as the head can be pulled, in the compressed state, from the opening of the uncoupling body into the passage of the female coupling part.

[0061] The second coupling part (20) of the set of coupling parts according to this invention however is not the associated female coupling part described above, but a female coupling part belonging to a second set of interconnectable coupling parts which is different from said first set and which is described in EP 1361302 B1. This second coupling part (shown in figure 2) is not directly connectable with the first coupling part (10) described above.

[0062] The second coupling part (20) comprises an elongate body having a hollow cylindrical upper part (21) with an internal space (22) in which an elastically deformable head of a corresponding coupling part (which is not part of the set of coupling parts according to the invention) may be retained, and a lower part (26) with a so-called carbine coupling (27) for attaching one or several harness cords (not represented in figure 2). In an alternative embodiment, the lower part (26) is made, at least partly, of synthetic material and comprises a number (one of more) of respective cords, extruded into the synthetic material.

[0063] The head of the corresponding coupling part differs from the head of the first coupling part (10) according to the invention.

[0064] The internal space (22) of this second coupling part (20) is accessible through a passage (23), which exits at the top end of the second coupling part (20). In the walls of the second connecting means (20), near the receiving part, two windows (24) are provided, situated opposite one another (only one window being visible in figure 2). These windows (24) have an upper limiting edge (24a) acting as a retaining edge for retaining the end surfaces of the flanks of the head (described below) of the corresponding coupling element, when this coupling element is situated in the receiving part. This retaining edge (24a) changes stepwise into an edge part (24b) situated lower, so that a cam (24c) is formed. The cam (24c) is provided to prevent rotation of the corresponding connecting means when it is received in the internal space in a position in which the bumper edges are retained by the retaining edge (24a) of the windows (24).

[0065] This second coupling part (20) is designed to be connected with a corresponding coupling part (not shown of the figures). This corresponding coupling part is described below but is not a part of the set of coupling parts according to this invention. The corresponding coupling part comprises an elongated body having an upper

cylindrical part and an inserting part terminating in an elastically deformable head. The head is formed by two flank parts having a respective end surface extending in a radial direction and converging symmetrically from the end surfaces towards a common top part, so that the flank parts and the top part together form an arrow-shaped head, and so that the flanks parts can be placed in a respective window opening of the second coupling part while the end surfaces of the flank parts are retained by a retaining edge (24a) of a respective window.

[0066] Through the passage (23) accessible from above, the elastically deformable head of the corresponding coupling part may be brought into the internal space (22). This passage (23) has such lateral dimensions that, when the head is so orientated that its flanks are situated above the windows (24), the head is elastically deformed in such a manner in the passage, so that its radial dimensions are reduced. The moment the flanks are brought beyond the passage (23), they end up in a respective window opening (24) and resume their original radial dimensions, so that the end surfaces of the flanks are retained by the retaining edges (24a) of the respective windows (24). In that manner, the head of the corresponding coupling part snap-fits into the internal space (22) of the second connecting means.

[0067] The second connecting means (20) has a springy lip (25) at the top, which is situated such that it is pushed down by the lower edge of the body of the corresponding coupling part when the coupling parts are coupled. The spring force exerted by this lip (25) pushes the connecting means away from one another in the disconnecting direction, because of which the end surfaces of the flanks are pushed against the retaining edges (24a) and because of which undesired axial movements of the connecting means with respect to one another are prevented. The cam (24c) prevents the two connecting means from being rotated around the longitudinal axis (B) with respect to one another.

[0068] In order to disengage the coupling parts, they must be pushed further towards one another in the coupling direction against the spring force of the springy lip (25), until the end surfaces of the flank parts of the head are brought beyond the cam (24c). Then the corresponding coupling part may be rotated around its longitudinal axis in the receiving part. In this position the head may be drawn freely and without any deformation along the passage (23) from the receiving space (22).

[0069] The adaptor (30) of the set of coupling parts according to this invention is an elongate unit having a longitudinal axis (C) and comprising two adjoining parts (31), (32) extending over a respective portion of the length of it (see figures 3 and 4). One part is an elongate inserting member (32) terminating in an elastically deformable head (39) at one end of the adaptor (30), and the other part is a receiving portion (31) comprising a cylindrical hollow portion delimited by a cylindrical side wall (40) defining an internal receiving space (41) which is accessible through a passage (42) extending along

the longitudinal axis (C) and debouching at the other end of the adaptor (30).

[0070] The elongate inserting member (32) of the adaptor (30) is designed to be received and retained in the internal space (22) of the second coupling part (20). The inserting member (32) is identical to the inserting part of the corresponding coupling part of the second set of interconnectable coupling parts.

[0071] This inserting member (32) has an upper cylindrical part (33) changing into a lower part (34) with smaller lateral dimensions than the upper part (33). In this lower part (34) an elongated opening (35) extending according to the longitudinal direction (C) has been provided. On both sides of the opening (35) a respective flank part (36), (37) has been formed on the lower part (34). These flank parts (36), (37) are projecting in opposite radial directions with respect to the walls of the lower part (34). The flank parts (36), (37) have a respective top surface (36a), (37a) extending in a direction practically across the longitudinal direction (C) of the inserting member.

[0072] These flank parts (36), (37) are narrowing in the direction of the extremity of the inserting member (32) and are merging into a common point (38) which forms the extremity of the inserting member (32), situated beyond the opening (35). The flank parts (36), (37) and the point (38) are made of elastically deformable material and together constitute a whole forming a head (39) having the form of an arrow.

[0073] The receiving portion (31) of the adaptor (30) is designed to receive and retain the elastic deformable coupling portion (14) of the first coupling part (10). The receiving portion (31) is identical to the receiving part of the associated female coupling part of the first set of interconnectable coupling parts, except for the fact that it does not comprise an uncoupling body. In an alternative embodiment of the set of coupling parts according to the invention, the receiving portion of the adaptor comprises an uncoupling body.

[0074] The receiving portion (31) comprises a cylindrical hollow portion delimited by a cylindrical side wall (40) defining an internal receiving space (41) which is accessible through a passage (42) extending along the longitudinal axis (C) and debouching at the other end of the adaptor (30).

[0075] The receiving space (41) is provided to receive and retain the head (14) of the first coupling part (10). This receiving space (41) is accessible via a substantially cylindrical passage (42) having an inlet opening (42a) at one end of the adaptor (30), a conically narrowing access part (42b) and an outlet opening (42c) debouching in the receiving space (41). The passage (42) extends along the longitudinal axis (C) of the receiving portion. The receiving space (41) is wider than the outlet opening (42c) of the passage (42) such that the top wall of the receiving space (41) forms an edge (41 a) around the outlet opening (42c) of the passage (42). This edge (41 a) serves as a retaining means for the head (14).

[0076] As mentioned above, the uncoupling body is

not provided in the receiving space (41). This results in a non-detachable connection of the first coupling part (10) and the adaptor (30). When the connection of the adaptor (30) and the second coupling part (20) is a detachable connection, the first (10) and second coupling parts (20) still can be connected and disconnected easily. In an alternative embodiment, both connections are detachable connections. In another embodiment, the connection of the first coupling part and the adaptor is detachable and the connection of the second coupling part and the adaptor is a non-detachable connection.

[0077] When the uncoupling body is omitted, the laterally protruding protuberances (14d) provided on one of the lateral parts (14a), (14b) of the first coupling part (10) have no function.

[0078] During coupling, the first coupling part (10) is introduced, head (14) first, into the passage (42) of the receiving portion (31) of the adaptor (30) via the inlet opening (42a) and the conically narrowing access part (42b). This causes the head (14) to deform elastically. The male coupling part (10) is pushed further into this passage (42) until the head (14) has reached the receiving space (41). In the receiving space, the head (14) assumes a larger transverse dimension.

[0079] In this state, the two coupling parts (10), (30) are coupled and if a load were to pull both coupling parts (10), (30) away from each other, this would result in the male coupling part (10) being displaced with respect to the adaptor (30) until the rear retaining surfaces (14e), (14f) of the head (14) knock against the edge (41a) which is situated around the outlet (42c) of the passage (42) and serves as a retaining surface. The head (14) of the first coupling part (10) is thus detained in the receiving space (41) of the adaptor (30), thus securing the coupling. Because the uncoupling body is omitted, the coupling parts (10), (30) cannot be detached manually.

[0080] In figure 5, the coupling parts (10), (20), (30) of a set of coupling parts according to the invention are represented in a coupled state. The first coupling part (10) comprises an elongate substantially cylindrical shaft (11) and an inserting portion (12). The inserting portion (12) is identical to the inserting portion (12) of the coupling part (10) shown in figure 1, but the shaft (11) has a slightly different design. Instead of the two portions having different diameters with a stepwise change of the diameter in the embodiment in figure 1, the shaft (11) of the embodiment of figure 5 has a uniform diameter in the middle and two end parts of which the diameter gradually decreases towards the ends of the shaft (11). The second coupling part (20) is identical the coupling part (20) shown in figure 2. The adaptor (30) is identical to the adaptor (30) shown in figures 3 and 4.

[0081] A Jacquard lifting cord (50) is attached to the free end of the shaft (11), while the other end of the shaft (11) adjoins the inserting member (12). The shaft (11) is moulded onto the cord (50) by means of an injection-moulding technique.

[0082] The inserting portion (12) of the first coupling

part (10) is retained in the receiving portion (31) of the adaptor (30), and the inserting member (32) of the adaptor (30) is retained in the receiving portion (21) of the second coupling part (20), in the way described above. The first (10) and the second coupling part (20) are connected with a Jacquard lifting (50) cord and a harness cord respectively in a Jacquard machine. Only the Jacquard lifting cord (50) is shown in figure 5.

Claims

1. Set of coupling parts for detachably connecting elements of a warp yarn positioning system on a weaving loom **characterized in that** it comprises a first coupling part (10) comprising first connection means (12) and a second coupling part (20) comprising second connection means (21) which are not connectable with said first connection means (12), and **in that** it further comprises an adaptor (30) comprising

- third connection means (31) designed to connect with the first connection means (12) so as to connect the adapter (30) to said first coupling part (10), said first (12) and third connection means (31) forming a first pair of cooperatable connection means, and

- fourth connection means (32) designed to connect with the second connection means (21), so as to connect the adapter (30) to said second coupling part (20), said second (21) and fourth connection means (32) forming a second pair of cooperatable connection means,

- and **in that** at least one of said pairs of cooperatable connection means (12, 31), (21, 32) is designed to realize a detachable connection.

2. Set of coupling parts according to claim 1 **characterized in that** in at least one pair of cooperatable connection means (12, 31), (21, 32), one connection means comprises an inserting portion (12), (32) and the other connection means comprises a receiving portion (31), (21) designed to receive and retain said inserting portion.
3. Set of coupling parts according to claim 2 **characterized in that** in at least one pair of cooperatable connection means (12, 31), (21, 32), one connection means comprises an elastically deformable coupling portion (14), (39) and the other connection means comprises a receiving portion (31), (21) designed to receive and retain said elastically deformable coupling portion (14), (39).
4. Set of coupling parts according to any one of claims 1 to 3 **characterized in that** the adaptor (30) comprises third connection means (31) comprising a receiving portion designed to receive and retain an

elastically deformable coupling portion (14) of the first connection means (12) of the first coupling part (10), and fourth connection means (32) comprising an elastically deformable coupling portion (39) designed to be received and retained in a receiving portion (21) of the second connection means (21) of the second coupling part (20).

5. Set of coupling parts according to claim 3 or 4 **characterized in that** in at least one pair of cooperatable connection means (12, 31), (21, 32), the receiving portion comprises a receiving space (41), (22) and a passage (42), (23) through which the elastically deformable coupling portion (14), (39) in a radially compressed state is moveable to said receiving space (41), (22), the elastically deformable coupling portion in this receiving space (41), (22) having the possibility to adopt a larger radial dimension than in said compressed state such that it is retained in the receiving space.
6. Set of coupling parts according to any one of claims 3 to 5 **characterized in that** in at least one pair of cooperatable connection means (12, 31), (21, 32), the receiving portion (31), (21) and the elastically deformable coupling portion (14), (39) are designed such that the elastically deformable coupling portion (14), (39) received in the receiving portion may be rotated about its longitudinal axis (A), (C) in order to be brought from a coupling position in which it is retained in the receiving portion (31), (21) into a disengaging position in which it is not retained in the receiving portion, and vice-versa.
7. Set of coupling parts according to claims 5 and 6 **characterized in that** the passage (23), (42) is designed to let pass the elastically deformable coupling portion (14), (39) in a substantially non-deformed state when the coupling portion is rotated into said disengaging position.
8. Set of coupling parts according to claim 6 or 7 **characterized in that** said elastically deformable coupling portion (14), (39) comprises at least one radially projecting bumper edge (14e, 14f), (36a, 37a), **in that** said receiving portion (31), (21) comprises at least one retaining edge (24a), (41a) provided for retaining at least one bumper edge of the elastically deformable coupling portion situated in the receiving space (22), (41) in order to prevent disconnection of the connection means, and **in that** the elastically deformable coupling portion and the receiving portion are carried out such that the elastically deformable coupling portion in the receiving space may be brought from a coupling position in which at least one bumper edge is retained by a retaining edge into a disengaging position in which not any bumper edge is retained by a retaining edge so that said discon-

nection is no longer prevented.

9. Set of coupling parts according to claim 8 **characterized in that** in at least one pair of cooperatable connection means (21, 32), the elastically deformable coupling portion (39) comprises two radially projecting flanks (36, 37) with respective end faces (36a), (37a) forming two radially projecting bumper edges, and the receiving space (22) is delimited by a side wall (29) in which two windows (24) are provided, such that a respective flank (36), (37) of the elastically deformable coupling portion (39) may be situated in each window (24) and an edge (24a) of each window (24) acts as a retaining edge for said bumper edges (36a), (37a) of the elastically deformable coupling portion (39).
10. Set of coupling parts according to any one of claims 3 to 9 **characterized in that** in at least one pair of cooperatable connection means (12, 31), (21, 32), the receiving portion (31), (21) is designed to retain the elastically deformable coupling portion (14), (39) in a substantially non-deformed state.
11. Set of coupling parts according to claim 5 and any one of claims 6 to 10 **characterized in that** in at least one pair of cooperatable connection means (12, 31), the receiving portion (31) comprises, beyond said passage (42), an axially displaceable uncoupling body comprising an opening into which the coupling portion (14) can be introduced when it is in the receiving space (41), and **in that** said opening is designed to deform the coupling portion (14) introduced in the opening in such a manner that it can be withdrawn from the receiving space (41) via the passage (42) in order to disconnect the connection means (12), (31).
12. Set of coupling parts according to any of the preceding claims **characterized in that** one pair of cooperatable connection means (12, 31) is designed to realize a non-detachable connection.
13. Set of coupling parts according to any of claims 2 to 11 **characterized in that** the adaptor (30) comprises an elongate body having two opposing ends, said body terminating in an elongate inserting member (32) with an elastically deformable head (39) at one end, and terminating in a hollow portion (31) delimited by a side wall (40) defining a receiving space (41) and a passage (42) at the other end, the inserting member (32) and the hollow portion (31) forming said inserting portion and said receiving portion respectively.
14. Set of coupling parts according to any of the preceding claims **characterized in that** the first coupling part (10) and the second coupling part (20) are con-

nected to one or more respective cords of the warp yarn positioning system.

15. Warp yarn positioning system comprising a number of motion-inducing devices and means for transmitting motion from each motion-inducing device to a respective number of warp yarns during a weaving process on a weaving loom, said means for transmitting motion comprising

- a first element connected to a first coupling part (10) comprising first connection means (12), and
- a second element connected to a second coupling part (20) comprising second connection means (21) which are not connectable with said first connection means (12),

characterized in that the means for transmitting motion further comprise

- an adaptor (30) comprising third connection means (31) connected with the first connection means (12), and fourth connection means (32) connected with the second connection means (21), so that the adaptor (30) is connected to said first coupling part (10) and to said second coupling part (20),

and **in that** at least one of the connections is a detachable connection.

16. Warp yarn positioning system according to claim 15 **characterized in that** at least one of the connections is realized by an elastically deformable coupling portion (14), (39) of one connection means which is received and retained in a receiving portion (31), (21) of the other connection means.
17. Warp yarn positioning system according to claim 15 or 16 **characterized in that** the adaptor (30) comprises third connection means (31) comprising a receiving portion in which an elastically deformable coupling portion (14) of the first connection means (12) of the first coupling part (10) is received and retained, and fourth connection means (32) comprising an elastically deformable coupling portion (39) which is received and retained in a receiving portion (21) of the second connection means (21) of the second coupling part (20).
18. Warp yarn positioning system according to any one of claims 15 to 17 **characterized in that** at least one of the connections is realized by an elastically deformable coupling portion (14), (39) of one connection means (12), (32) which is received and retained in a receiving space (41), (22) of the other connection means, said receiving space (41), (22) being accessible through a passage (42), (23) having a radial

dimension which is smaller than the radial dimension of the elastically deformable coupling portion (14), (39) in the receiving space, such that the elastically deformable coupling portion is retained in the receiving space (41), (22).

19. Warp yarn positioning system according to any one of claims 16 to 18 **characterized in that** the elastically deformable coupling portion (14), (39) and the receiving portion (31), (21) of at least one of the connections are designed such that the elastically deformable coupling portion (14), (39) received in the receiving portion may be rotated about its longitudinal axis (A), (C) in order to be brought from a coupling position in which it is retained in the receiving portion (31), (21) into a disengaging position in which it is not retained in the receiving portion, and vice-versa.

20. Warp yarn positioning system according to claims 18 and 19 **characterized in that** the passage (42), (23) is designed to let pass the elastically deformable coupling portion (14), (39) in a substantially non-deformed state when the coupling portion is rotated into said disengaging position.

21. Warp yarn positioning system according to claim 19 or 20 **characterized in that** said coupling portion (14), (39) comprises at least one radially projecting bumper edge (14e, 14f), (36a, 37a), **in that** said receiving portion (31), (21) comprises at least one retaining edge (24a), (41a) provided for retaining at least one bumper edge of the elastically deformable coupling portion situated in the receiving space (22), (41) in order to prevent disconnection of the connection means, and **in that** the elastically deformable coupling portion and the receiving portion are carried out such that the coupling means in the receiving space may be brought from a coupling position in which at least one bumper edge is retained by a retaining edge into a disengaging position in which not any bumper edge is retained by a retaining edge so that said disconnection is no longer prevented.

22. Warp yarn positioning system according to claim 21 **characterized in that**, in at least one of the connections, the elastically deformable coupling portion (39) comprises two radially projecting flanks (36, 37) with respective end faces (36a), (37a), forming two radially projecting bumper edges and the receiving space (22) is delimited by a side wall (29) in which two windows (24) are provided, and **in that** each flank (36), (37) of the elastically deformable coupling portion (39) is situated in a respective window (24) such that an edge (24a) of the window acts as a retaining edge for the bumper edge.

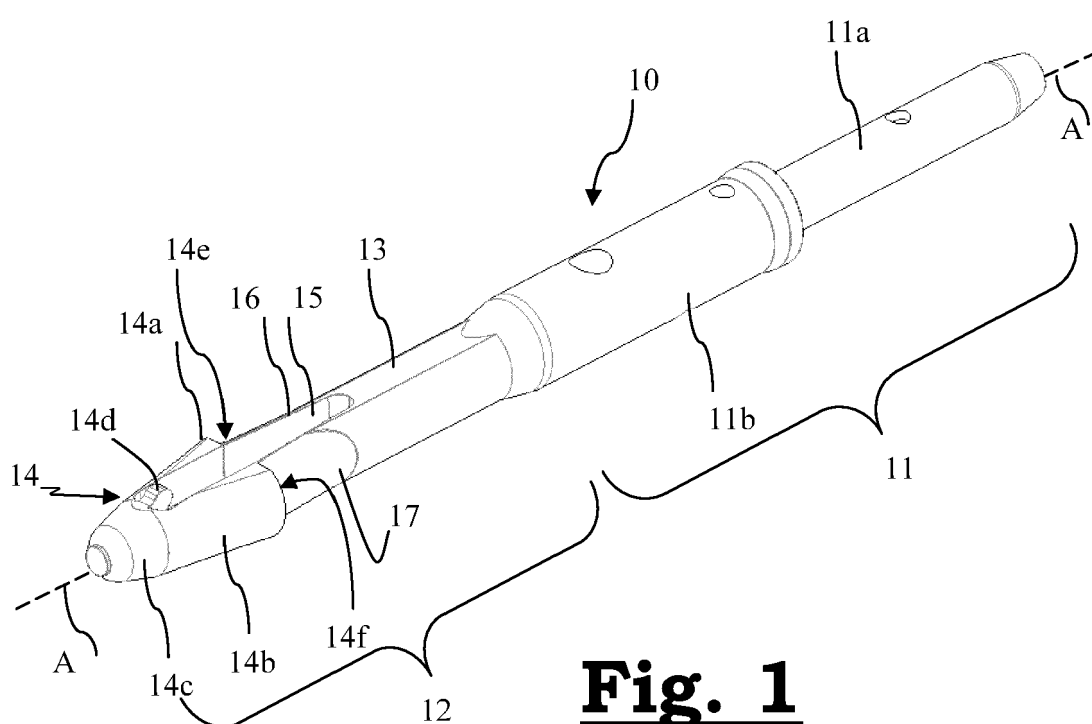
23. Warp yarn positioning system according to any one of claims 16 to 22 **characterized in that** the receiving

portion (31), (21) of at least one of the connections retains the elastically deformable coupling portion (14), (39) in a substantially non-deformed state.

24. Warp yarn positioning system according to any of claims 17 to 22 **characterized in that** at least one of the connections is realized by an elastically deformable coupling portion (14) of one connection means (12) which is received and retained in the receiving space (41) of a receiving portion (31) of the other connection means, said receiving space (41) being accessible through a passage (42) having a radial dimension which is smaller than the radial dimension of the deformable coupling portion (14) in the receiving space, such that the coupling portion is retained in the receiving space (41), said other connection means comprising, beyond said passage (42), an axially displaceable uncoupling body comprising an opening into which the coupling portion (14) can be introduced, said opening being designed to deform the coupling portion introduced in the opening in such a manner that it can be withdrawn from the receiving space (41) via the passage (42) in order to disconnect the connection means.
25. Warp yarn positioning system according to any of claims 15 to 24 **characterized in that** one of the connections is a non-detachable connection.
26. Warp yarn positioning system according to any of claims 16 to 25 **characterized in that** the adaptor (30) comprises a body having two opposing ends, said body terminating in an elongate inserting member (32) with an elastically deformable head (39) at one end, and terminating in a hollow portion (31) delimited by a side wall (40) defining a receiving space (41) and a passage (42) at the other end, the inserting member (32) and the hollow portion (31) forming said inserting portion and said receiving portion respectively.
27. Warp yarn positioning system according to any of claims 15 to 26 **characterized in that** the first coupling part (10) and the second coupling part (20) are connected to one or more respective cords of the warp yarn positioning system.
28. Warp yarn positioning system according to any of claims 15 to 27 **characterized in that** it is a jacquard machine.
29. An adaptor for detachably coupling two non-interconnectable elements of a warp yarn positioning system on a weaving loom, comprising third (31) and fourth connection means (32) designed to realize a first connection with first connection means (12) of one element and a second connection with second connection means (21) of the other element respec-

tively, at least one of the two connections being a detachable connection.

30. An adaptor according to claim 29 **characterized in that** the third connection means (31) comprises retaining means (41a) for retaining a coupling head (14) and **in that** the fourth connection means comprises an elastically deformable coupling head (39).
31. An adaptor according to claim 29 or 30 **characterized in that** said two non-interconnectable elements are connected to respective coupling parts (10), (20) belonging to different sets of coupling parts for connecting elements of a warp yarn positioning system on a weaving loom.
32. An adaptor according to any one of claims 29 to 31 **characterized in that** it is an adaptor of a set of coupling parts according to any one of claims 1 to 14.
33. An adaptor according to any one of claims 29 to 32 **characterized in that** it is an adaptor for a warp yarn positioning system according to any one of claims 15 to 28.



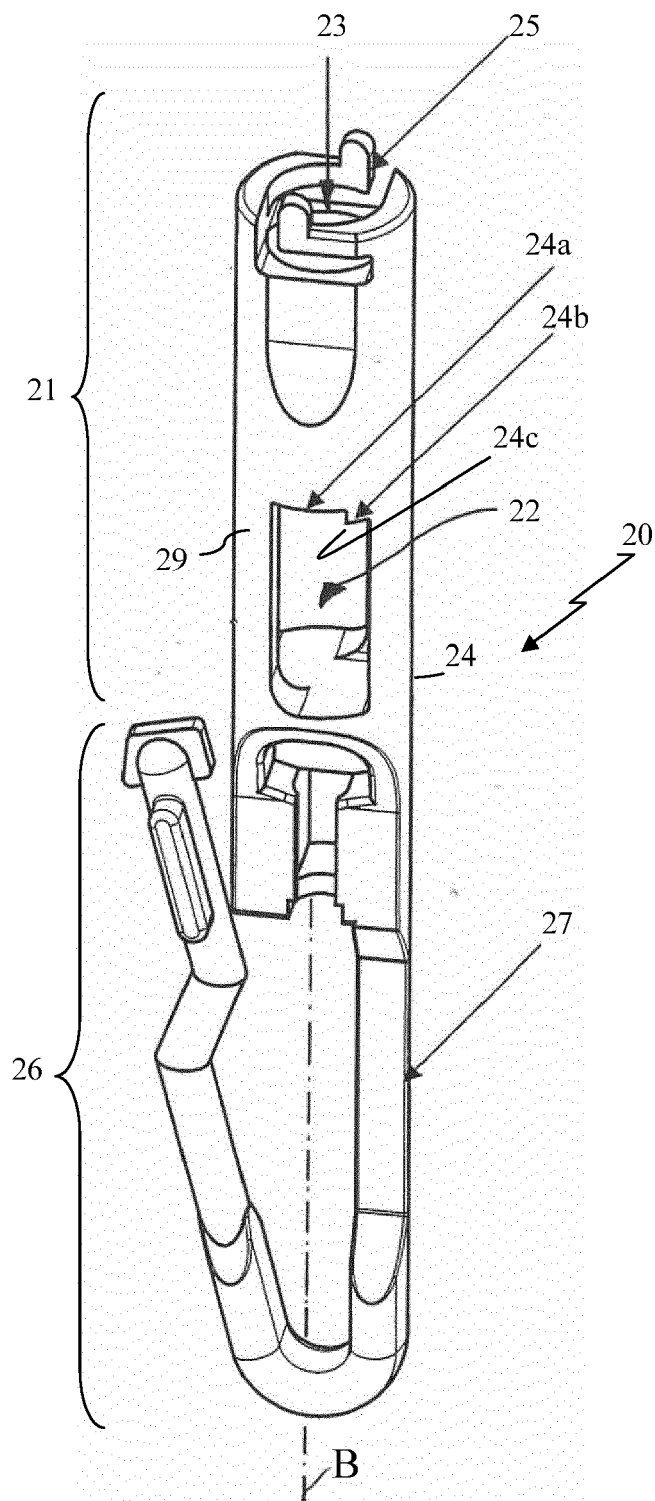


Fig. 2

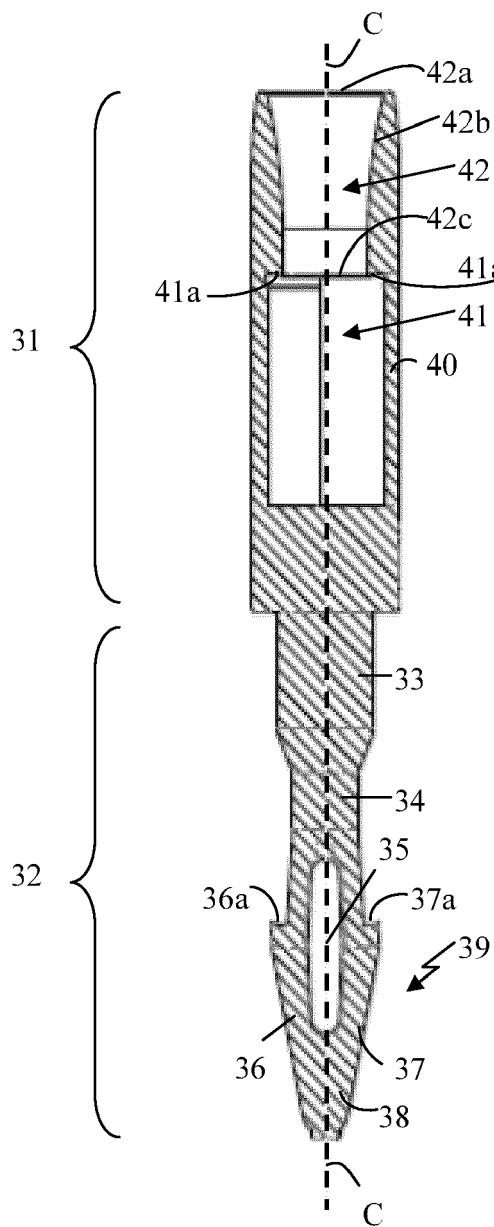


Fig. 4

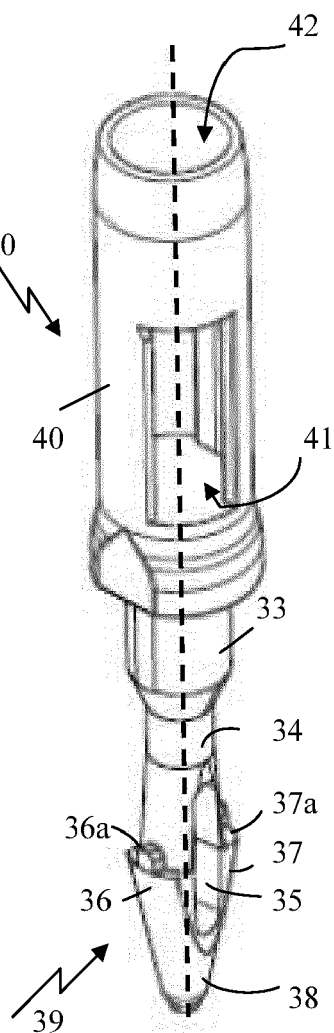
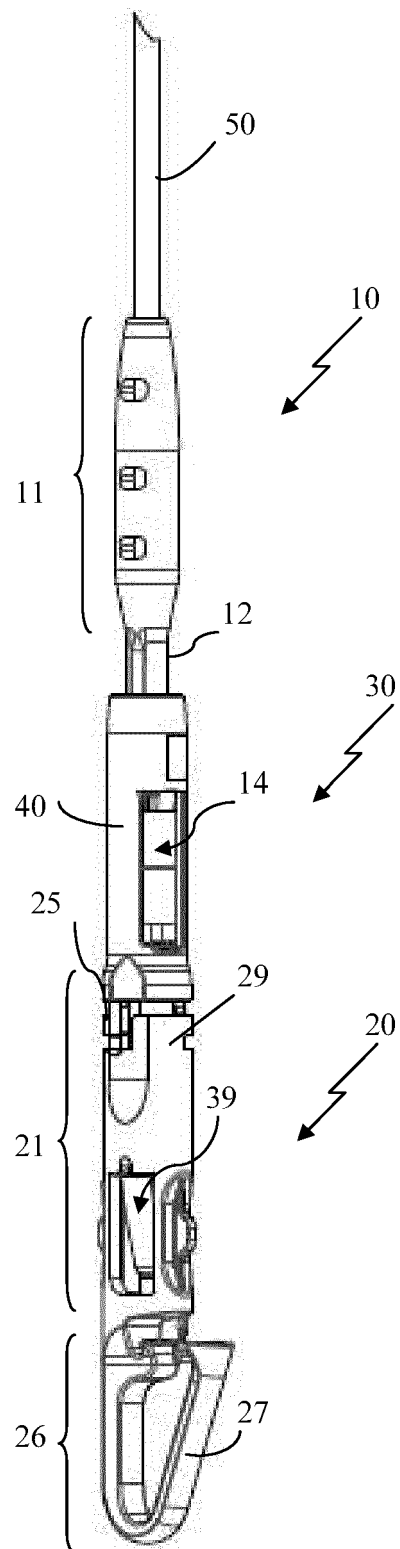


Fig. 3

Fig. 5



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1361302 B1 [0008] [0009] [0061]
- WO 2013128275 A9 [0008] [0010] [0015] [0051]
- EP 0788562 B1 [0012] [0015]
- WO 9927170 A [0013]