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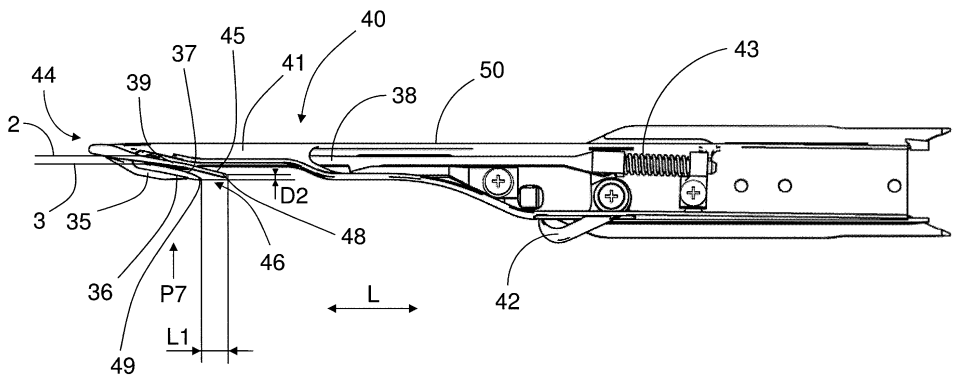
(54) Device and method for presenting weft threads to a gripper of a gripper weaving machine

(57) The invention realtes to a device for the presenting of weft threads to a gripper (10, 40) for a gripper weaving machine, wherein the device (1) comprises a plurality of presenting elements (11, 12, 13, 14, 15, 16) which are movable between a rest position and a presentation position and a support device (4) which in use is arranged between the presenting elements (11, 12, 13, 14, 15, 16) and a gripper (10, 40) to support a weft thread (2, 3) while the weft thread (2, 3) is taken up by the gripper (10, 40), wherein a first thread separator (7) is provided for weaving two weft threads (2, 3) at the same time, wherein the support device (4) comprises two support elements (5, 6) which are separated from each other by the first thread separator (7) and extend in use substantially in the direction of movement of the gripper (10, 40), and wherein each support element (5, 6) allows an associated weft thread (2, 3) to be supported in a position transverse to the direction of movement of the gripper (10, 40), which position is different from the position of the other weft thread (2, 3).

Fig. 7



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Description

[0001] The invention relates to a device for presenting of weft threads to a gripper for a gripper weaving machine, more particularly to a feed gripper for a gripper weaving machine, wherein the device comprises a plurality of presenting elements which are movable between a rest position and a presentation position and comprises a support device which can be arranged between the presenting elements and a gripper to support a weft thread while the weft thread is taken up by the gripper, to a gripper weaving machine, and to methods used therein.

[0002] A device of the aforementioned type is for example known from EP 0 161 014 A1 and is suitable for the presenting of a weft thread to a feed gripper. A device of the aforementioned type, which is suitable for the presenting of a weft thread to a receiving gripper, is for example known from WO 2005/047584.

[0003] The object of this aspect of the invention is to improve a device of the aforementioned type so as to make it more suitable for presenting at the same time two weft threads to a gripper and for weaving two weft threads at the same time.

[0004] This object is achieved in that the support device comprises two support elements which are separated from each other by a thread separator, wherein the support elements extend in use substantially in the direction of movement of the gripper and wherein each support element allows an associated weft thread to be supported in a position transverse to the direction of movement of the gripper, which position is different from the position of the other weft thread.

[0005] A device according to the invention allows two weft threads to be kept separate from each other, while they are presented in different positions to a gripper. Each support element allows a weft thread to be presented in a different position transversely with respect to the direction of movement of the gripper, meaning inter alia in a different height position with respect to the side edge of the gripper. The device according to the invention also allows two weft threads to be presented in a different position to a gripper, so that each weft thread can be presented in the region of a suitable guide of a gripper. The weft threads are separated by the device in the region of the gripper. The thread separator also allows in this case weft threads which are supported on a different support element to be located at a distance from each other in the longitudinal direction or direction of movement of the gripper. This allows both weft threads to be brought into a shed substantially parallel to each other and at a constant distance from each other. This means that, from the support device, both weft threads lie at a distance from each other that is sufficient to prevent the weft threads from being able to move one over the other. The invention allows two weft threads to be kept separate from each other during the insertion and to be beaten up parallel to each other, i.e. without said weft threads being laid over or around each other. In addition, weft threads chosen from different bobbins can be woven in pairs and can be woven in parallel to each other.

[0006] According to an embodiment of the device, the support elements are in use located at a different height with respect to the direction of movement of the gripper. Preferably, the support element which is arranged in use in proximity to the shed is located in a higher position than the support element which is arranged further away from the shed. This is advantageous for separating weft threads and for keeping them separate from one another during the insertion into a shed.

[0007] According to an embodiment of the device, the support elements are located in use at a different depth with respect to the direction of movement of the gripper. Preferably, the support element, which is arranged in proximity to the shed, is located further away from the beat-up line than the support element which is arranged remote from the shed. This is advantageous for separating weft threads and for keeping them separate from one another during the insertion into a shed.

[0008] According to a preferred embodiment, the gripper consists of a feed gripper. The support device is preferably formed from a curved plate at which the support elements and the thread separator are arranged.

[0009] The invention also relates to a gripper weaving machine for weaving two weft threads at the same time, the gripper weaving machine comprising a feed gripper, a receiving gripper, and a device for the presenting of weft threads to the feed gripper.

[0010] In one embodiment of the gripper weaving machine at the feed gripper there is arranged, in proximity to a side edge of the feed gripper that is positioned away from the thread clamp, a second thread separator which allows two weft threads, which are presented to the feed gripper at a different height, to be separated from each other while they are guided by the feed gripper to a stop.

[0011] Said feed gripper offers the advantage that above all the height of the presented weft thread, and less the shape or the position of the feed gripper, is important for determining on which side of the second thread separator a weft thread will be located. The two weft threads extend in this case through the feed gripper between the thread clamp and an associated stop on the side edge of the feed gripper that is positioned away from the thread clamp. A weft thread which is presented above the second thread separator will in this case be located above the second thread separator in the feed gripper and be guided to the one stop, while a weft thread which is presented below the second thread separator will be located below the second thread separator and will be guided to the other stop. The second thread separator also allows hereby both weft threads to be located at a distance from each other while they are clamped together by a thread clamp. This allows both weft threads to be taken up in the feed gripper substantially separately from each other and to be positioned at a distance from each other in the feed gripper while they are brought into a

shed. This means that, from the feed gripper, the two weft threads lie at a distance from each other that is sufficient to prevent the weft threads from lying one over the other. The feed gripper also allows both weft threads to be clamped together next to each other in the thread clamp. A feed gripper of this type, which a receiving gripper can penetrate during taking-over of weft threads, can be kept relatively slender. This then leads to the advantage that even during the simultaneous insertion of two weft threads, merely a relatively small shed is necessary. The invention allows two weft threads to be kept separate from each other during the insertion, and to be beaten up parallel to each other, i.e., without said weft threads being laid over or round each other. In addition, weft threads chosen from different bobbins can be woven in pairs and can be woven in parallel to each other.

[0012] According to one embodiment of the invention, the second thread separator is arranged substantially in the longitudinal direction of the feed gripper in the region of the side edge of the feed gripper. Hereby a guide, which guides a weft thread to a stop, is provided on each side of the second thread separator. Because of the second thread separator, the weft threads can move via a guide to an associated stop where they are guided during the insertion of the weft threads into the shed. Two grooves are formed by guides in proximity to the side edge of the feed gripper.

[0013] According to one embodiment of the invention, the two stops are arranged in the longitudinal direction of the feed gripper at a distance from each other. This allows the two weft threads to be kept separate from each other in the region of the feed gripper.

[0014] According to a preferred embodiment, the second thread separator is welded, soldered, adhesively bonded or attached in an approximate manner to the feed gripper. Thus, it is possible to select an appropriate material, for example steel, for the thread guide without the entire clamping hook having to be made of this material.

[0015] In one embodiment of the gripper weaving machine at the receiving gripper a third thread separator, which allows two weft threads to be separated from each other while they are clamped, is arranged in the region of the leading end of the receiving gripper.

[0016] Said receiving gripper offers the advantage of separating from each other two weft threads which both are clamped, the weft threads being separated in the region of the clamping hook which is located in the region of the leading end of the receiving gripper. In this case, the third thread separator also allows both weft threads to be located at a distance from each other while they are clamped. This allows both weft threads to be brought into a weaving shed substantially parallel to each other and at a constant distance from each other. This means that in and from the receiving gripper, the two weft threads lie at a distance from each other that is sufficient to prevent the weft threads from lying one over the other. The receiving gripper also allows both weft threads to be clamped next to each other between the clamping faces. This also allows the leading end to be embodied relatively narrow, while the two weft threads can still remain sufficiently separate from each other. This offers the advantage that the feed gripper, which the receiving gripper penetrates during taking-over of weft threads, can also be kept relatively slender. This then leads to the advantage that even during the simultaneous insertion of two weft threads, merely a relatively small shed is necessary. The invention allows two weft threads to be kept separate from each other during insertion and to be beaten up parallel to each other, i.e. without said weft threads being laid over or round each other. In addition, weft threads originating from different bobbins can as chosen be woven in pairs and can be woven in parallel to each other.

[0017] According to one embodiment of the invention, the third thread separator is arranged substantially in the center between the hook opening of the clamping hook. This means that the third thread separator is provided between the hook opening of the clamping hook and that the clamping hook is, as it were, subdivided into two parts. This offers the advantage that for both weft threads substantially the same amount of space is provided in order to move in the region of the clamping hook to the position where said weft thread is clamped.

[0018] According to a preferred embodiment of the invention, the third thread separator is attached in proximity to the leading end of the receiving gripper, more particularly in proximity to the upper edge of the leading end of the receiving gripper. In this case, the term " upper edge" refers to the edge which is positioned on top in use. The third thread separator can in this case be directed slightly downward in order to prevent it from undesirably taking along warp threads and to allow it to pass along a specific weft thread which is offered by a feed gripper. This offers the advantage that the third thread separator can be adapted according to the feed gripper in order to guide each time a weft thread along the third thread separator via the desired side.

[0019] According to a preferred embodiment, the third thread separator is attached to the receiving gripper for example hereby welded, soldered, adhesively bonded or the like. Thus it is possible to select an appropriate material, for example steel, for the third thread separator without the entire clamping hook having to be made of this material.

[0020] According to a preferred embodiment, the tip of the third thread separator ends in the longitudinal direction of the receiving gripper at a greater distance from the leading end of the receiving gripper than the tip of the clamping hook. This allows one of the weft threads on one side of the third thread separator to be taken up in the receiving gripper, while the other weft thread on the other side of the third thread separator can be taken up in the receiving gripper. As a result, both weft threads on different sides of the third thread separator can be moved between the two clamping faces to a clamped position.

[0021] The invention also relates to a method for pre-

senting of two weft threads to a gripper for a gripper weaving machine, more particularly to a feed gripper for a gripper weaving machine, wherein each support element supports an associated weft thread in a position transverse to the direction of movement of the gripper, which is different from the position of the other weft thread, in order to present the associated weft thread to the gripper in a different position with respect to the gripper. As a result, both weft threads can be presented on a different side of the thread separator and can be kept separate from each other. Hereby the two weft threads are presented in a different position to a gripper, so that each weft thread is presented in the region of a suitable guide of a gripper.

[0022] The invention also relates to a method for weaving two weft threads at the same time comprising the taking-up of the two weft threads with a feed gripper having a second thread separator, wherein the feed gripper takes up one weft thread above its thread separator while the feed gripper takes up the other weft thread below its thread separator. As a result, both weft threads can be moved on a different side of the second thread separator to a stop, more particularly can be moved to a stop via a guide.

[0023] The invention also relates to a method for weaving two weft threads at the same time comprising delivering of two weft threads to a receiving gripper having a third thread separator, more particularly delivering of two weft threads from a feed gripper to a receiving gripper, wherein the receiving gripper and the weft threads are located during the delivery in a position such that one weft thread is moved past the third thread separator while the other weft thread is not moved past the third thread separator. This allows one weft thread, which is offered by the feed gripper, to be located on one side of the third thread separator, while the other weft thread, which is offered by the feed gripper, is located on the other side of the third thread separator. As a result, both weft threads can be moved on different sides of the third thread separator between the clamping faces to a clamped position.

[0024] Further features and advantages of the invention will emerge from the following description of the embodiments illustrated in the drawings, in which:

figure 1 is a perspective view of a device according to the invention for the presenting of weft threads to a feed gripper, and of a feed gripper of a gripper weaving machine according to the invention;

figure 2 is a rear view, in the direction of arrow P2, of the support device in figure 1;

figure 3 is a top view, in the direction of arrow P3, of the support device in figure 1;

figure 4 is a schematic and simplified rear view, in the direction of arrow P2, of the feed gripper in figure 1;

figure 5 is a schematic, simplified and perspective view of a position while weft threads are taken over from the feed gripper by the receiving gripper;

figure 6 is a schematic and simplified front view, in the direction of arrow P7, of the receiving gripper in figure 7;

figure 7 is a top view of a receiving gripper of a gripper weaving machine according to the invention; figure 8 is a schematic, simplified and cross-sectional view of a feed gripper similar to the one of figure 5 with weft threads to be delivered to a receiving gripper;

figure 9 is a top view of a feed gripper and a receiving gripper according to a variant of figure 5; figure 10 is a top view of a feed gripper and a support device of a variant embodiment of figure 1 after the taking-up of weft threads;

figure 11 is a simplified sectional view along line XI-XI in figure 10 before the taking-up of weft threads, where the scale of the receiving gripper is exaggerated to clarify the invention;

figure 12 is a top view of a part of a feed gripper and a receiving gripper of the variant embodiment of figure 10 during the delivery of weft threads;

figure 13 is a view in the direction of arrow P13 of the receiving gripper of figure 12 at the moment of the delivery of weft threads; and

figure 14 is a top view of the receiving gripper of the variant embodiment of figure 10 after the delivery of weft threads.

[0025] The device 1 for the presenting of weft threads to a feed gripper 10 comprises a number of presenting elements 11 to 16 which are movable between a rest position and a presentation position. The presenting elements 11 and 15 are shown in the presentation position, while the presenting elements 12, 13, 14 and 16 are shown in the rest position. For the sake of clarity, just two weft threads 2 and 3 are shown, which in the exemplary embodiment are presented by associated presenting elements 11 and 15. Furthermore, the device 1 comprises a support device 4 for weft threads, which is arranged between the presenting elements and a feed gripper 10. The support device 4 comprises two support elements 5 and 6 and a thread separator 7 which separates the support elements 5 and 6 from each other. As may be seen, the support elements 5 and 6 extend in use substantially in the direction of movement B of the feed gripper 10. The support element 5 supports the weft thread 2 in a first position transverse to the direction of movement B of the feed gripper 10, while the support element 6 supports the weft thread 3 in a second position transverse to the direction of movement B. The support device 4 is fixedly attached to a fixedly arranged support beam 8 to which weft scissors 9 are also attached. The thread separator 7 prevents the weft thread 3 from being able to make contact with the support element 5 or the weft thread 2 from being able to make contact with the support element 6.

[0026] The support elements 5 and 6 are located, as shown in figures 1 and 2, in use in the height direction H

at a different height with respect to the direction of movement B of the feed gripper; more particularly there is a difference in height H1 between both. The support element 5, which is located closer to the shed 17, is in this case arranged higher than the support element 6 which is more remote from the shed 17. The support elements 5 and 6 are located, as is made clearer in figure 3, in use in the depth direction D at a different depth with respect to the direction of movement B of the feed gripper; more particularly there is a difference in depth D1 between the portion of the support element 5 in proximity to the transverse guide 19 and the portion of the support element 6 in proximity to the thread separator 7. The support element 5, which is arranged in proximity to the shed 17, is located in the direction of depth D further away from the beat-up line 20 than the support element 6 which is arranged removed from the shed 17. The support device 4 consists of a curved plate 18 wherein the support elements 5 and 6, the thread separator 7 and the transverse guide 19 are arranged. The plate 18 is curved in the region of the thread separator 7 and of the transverse guide 19. In the region of the transverse guide 19 and of the thread separator 7, wear-resistant elements can be arranged to limit the wear of the support device 4.

[0027] As is illustrated in figures 1, 4 and 5, the feed gripper 10 comprises a gripper housing 21 which comprises a plurality of guides for weft threads. A number of guides, such as guides 22 and 23, guide weft threads to a thread clamp 24, while other guides 25 and 26 guide weft threads to a stop 27 or 28. According to the embodiment, the feed gripper 10 also comprises a thread separator 29 which is provided with two guides 30 and 31 for guiding weft threads to a stop 27 or 28. The guides 30 and 31 are each arranged to a different side of the thread separator 29. The thread separator 29 is attached in proximity to a side edge 32 of the feed gripper 10 that is positioned away from the thread clamp 24. The thread separator 29 is in this case positioned in proximity to the side edge 32 of the feed gripper 10 that is positioned in proximity to the support device 4 during the taking-up of weft threads.

[0028] According to the invention, two weft threads 2 and 3, which are each supported by an associated support element 5 or 6 in a specific position transverse to the direction of motion B of the feed gripper 10, are first presented to the feed gripper 10. As the position of both weft threads 2 and 3 differs by the difference in height H1, the weft threads 2 and 3 will be located in a different position with respect to the feed gripper 10 while they are presented to the feed gripper 10 as the feed gripper 10 moves toward the shed 17. As a result of the shape and the dimensions of the support device 4 and the feed gripper 10 and as a result of their mutual arrangement, the highest positioned weft thread 2 will be guided between the guides 25 and 30 to the stop 27, while the lowest positioned weft thread 3 will be guided between the guides 26 and 31 to the stop 28. This means that, depending on the position of the weft thread 2 or 3 which is presented to a feed gripper 10, this weft thread 2 or 3 will be guided to a specific stop 27 or 28 by the thread separator 29. This allows two weft threads 2 and 3, which are presented at a different height to the feed gripper 10, to be separated from each other while they are guided by the feed gripper 10 to an associated stop 27 or 28. In figure 4, the weft threads 2, 3 are represented schematically as a dot; more particularly, the intersection of the weft threads with a plane in the region of the side edge 32 is represented.

[0029] As is illustrated in figures 4 and 5, the thread separator 29 is arranged, substantially in the longitudinal direction of the feed gripper 10, in the region of the side edge 32 of the feed gripper 10. This means that the thread separator 29 has a component which extends in the longitudinal direction of the feed gripper 10. In this case, the guides 25 and 30 form a groove 33 and the guides 26 and 31 form a groove 34 in the region of the side edge 32 of the feed gripper 10. The groove 33 ends at a stop 27 and the groove 34 at a stop 28, the stops 27 and 28 being arranged, in the longitudinal direction of the feed gripper 10, at a distance A1 from each other. The provision of the thread separator 29 in proximity to the side edge 32, and thus in proximity to the support device 4, offers the advantage that the weft threads 2, 3 are presented by the support device 4 precisely with respect to the feed gripper 10, meaning inter alia that their height position with respect to the side edge 32 of the feed gripper 10 is precisely defined.

[0030] In this case, two weft threads 2 and 3 can be taken up by a feed gripper 10 so that one weft thread 2 comes to lie above the thread separator 29 and the other weft thread 3 comes to lie below the thread separator 29, so that both weft threads 2 and 3 are each guided on a different side of the thread separator 29 and to a different stop 27 or 28. The thread separator 29 can be attached to the feed gripper 10 in various ways, for example welded, soldered, adhesively bonded or in still another such manner.

[0031] As the weft threads 2 and 3 are each guided on a different side of the thread separator 29 and are guided respectively along the transverse guide 19 and the thread separator 7, the weft threads 2, 3 remain, during the further movement of the feed gripper 10 through the shed 17, separate from each other, substantially parallel to each other and cannot touch each other.

[0032] The receiving gripper 40 represented in figures 6 and 7 comprises a clamping hook 35 to which an insert 36, which forms a clamping face 37 of the clamping hook 35, is arranged. According to a variant, the clamping face can also be provided directly, i.e. without an insert on the clamping hook. The receiving gripper 40 also comprises a clamping element 38 which is provided with a clamping face 39. The clamping element 38 can be moved back and forth with respect to the gripper housing 41 by means of a drive lever 42 substantially in the longitudinal direction of the receiving gripper 40. In this case, a spring 43 presses the clamping element 38 toward the clamping

hook 35 so that the clamping faces 37 and 39 are pressed toward each other in order to allow a weft thread to be clamped between the clamping face 37 and the clamping face 39. According to the embodiment, a thread separator 45, which allows two weft threads 2 and 3 to be separated from each other while they are clamped between the clamping faces 37 and 39, is attached in proximity to the leading end 44 of the receiving gripper 40. The thread separator 45 is arranged substantially in the center between the hook opening 46 of the clamping hook 35. The thread separator 45 is attached in proximity to the leading end 44 of the receiving gripper 40.

[0033] In this case, the thread separator 45 is attached in proximity to the upper edge 47 of the leading end 44 of the receiving gripper 40. The thread separator 45 is directed slightly downward; more particularly, the tip 48 of the thread separator 45 that is positioned away from the leading end 44 is directed downward. The thread separator 45 can be welded to the receiving gripper 10. According to a variant, said thread separator can be soldered or adhesively bonded to the receiving gripper 40. Obviously, still other manners of fastening are also possible.

[0034] In order to promote the separating of the weft threads, the tip 48 of the thread separator 45 ends, in the longitudinal direction L of the receiving gripper 40, this is also the direction of movement of the receiving gripper 40, at a greater distance from the leading end 44 of the receiving gripper 40 than the tip 49 of the clamping hook 35, more particularly the tip 49 of the insert 36 of the clamping hook 35. In this case, the tips 48 and 49 are arranged, in the longitudinal direction, at a distance L1 from each other. The tip 48 of the thread separator 45 can also be positioned slightly more toward the side edge 50 of the receiving gripper 40 than the tip 49 of the clamping hook 35; more particularly, the tip 48 and the tip 49 end at a distance D2 from each other in a direction perpendicular to the direction of movement or longitudinal direction L of the receiving gripper 40. In this case, the side edge 50 is positioned, in use, substantially in the extension of the side edge 32 of the feed gripper 10 or directed, in the transverse direction, toward the support element 4.

[0035] The two weft threads 2, 3 are in this case delivered from the feed gripper 10 to a receiving gripper 40 by moving the feed gripper 10 and the receiving gripper 40 during the delivery into a mutual position as represented in figure 5. In this case, as the feed gripper 10 and the receiving gripper 40 move toward each other, the one weft thread 2 is moved past the thread separator 45 while the other weft thread 3 is not moved past the thread separator 45. This means that the weft thread 2 is moved past both the tip 48 and the tip 49, while the weft thread 49 is only moved past the tip 49. In the furthest mutual position of the feed gripper 10 and the receiving gripper 40, the weft threads 2, 3 are located roughly as schematically represented in figure 6. As the feed gripper 10 and the receiving gripper 40 move back apart from each other, the weft thread 3 arrives between the clamping face 37 and the thread separator 45, while the weft thread 2 arrives between the thread separator 45 and the clamping element 38. In this case, the taken-up weft threads 2 and 3 are then each located on a different side of the thread separator 45 and are separated by the thread separator 45. After the taking-up of the weft threads, the receiving gripper 40 moves to the right away from the feed gripper 10 and away from the support device 4 and the weft threads 2, 3 extend, as represented in figure 7, from the receiving gripper 40 to the support device 4.

[0036] In this case, the receiving gripper 40 and the weft threads 2 and 3 are located, during the delivery, in a position such that one weft thread 2 is moved past the thread separator 45, while the other weft thread 3 is not moved past the thread separator 45. According to another possibility of the aforementioned embodiment, the distances D2 and L1 are selected, as indicated in figure 7, in such a way that the weft threads 2 and 3 are each guided, irrespective of the mutual position in the longitudinal direction L of the feed gripper 10 and the receiving gripper 40 during the delivery, as a result of the positioning of the weft threads 2, 3 in the region of the feed gripper 10, on an appropriate side of the thread separator 45. The bringing of the feed gripper 10 and the receiving gripper 40 into a mutual position, wherein the weft threads 2 and 3 are located in the longitudinal direction L as represented in figure 6, offers the advantage that the two weft threads 2 and 3 can be delivered in an appropriate manner even if their separated position is substantially along the same longitudinal plane in the feed gripper 10.

[0037] In the feed gripper 10 represented in figure 8 the weft threads 2 and 3 extend between a respective stop 27 or 28 on the side edge 32 of the feed gripper 10 and the thread clamp 24. The thread clamp 24 can be made in a known manner and can comprise clamping elements 52, 53 and guide elements 54 for weft threads.

[0038] As is illustrated in figure 9 the clamping hook 35 of the receiving gripper 40 is arranged, during the delivery of weft threads 2 and 3, in proximity to and facing to the side edge 32 of the feed gripper 10 that comprises the thread separator 29 and the stops 27 and 28 for weft threads. In this way the side edge 50 of the receiving gripper 40 is positioned in transverse direction further away from the side egde 32 than the clamping hook 35. The thread separator 45 is arranged substantially in the center between the hook opening 46 of the receiving gripper 40. Hereby the thread separator 45 is directed to and is arranged in proximity to the side edge 32 during the delivery of weft threads 2 and 3. This arrangement offers the advantage that the tip 48 of the thread separator 45 can enter between the two weft threads 2 and 3 at a position where the two weft threads 2 and 3 are arranged at a greater distance from each other, in other words at a position further away from the thread clamp 24.

[0039] The feed gripper 10 represented in figures 10 to 12 comprises a gripper housing 21 which comprises

at a side edge 32 a thread separator 29 with two guides 30, 31 for weft threads 2, 3 that guide a weft thread 2, 3 to a respective stop 27, 28. The feed gripper 10 further comprises a thread clamp 24 positioned away from the side edge 32. The gripper housing 21 is substantially U-shaped and comprises a bottom plate connecting the side edge 32 with a side edge near the thread clamp 24. At the housing 21 a thread guide element 55 is provided that is movable between an open and a closed position and together with the thread clamp 24. The thread guide element 55 is substantially L-shaped and comprises a top edge 56 and a side edge 57 that are arrangeable to guide warp threads during the insertion of weft threads. The weft threads can extend between the thread clamp 24 and the stops 27, 28. The thread clamp 24 can be made in a known manner, for example as explained in DE 1710292 or CH 510151. During taking-up, the weft thread 3 arrives in proximity of the guide 31 before the weft thread 2 arrives in proximity of the guide 30. During the taking-up of weft threads 2 and 3, as shown in figures 10 and 11 the side edge 32 with the thread separator 29 is positioned in proximity to a support device 4 that presents two weft threads 2, 3 in a different position to the feed gripper 10. The support device 4 is part of a device for presenting weft threads that also comprises a plurality of presenting elements for presenting weft threads in a way similar as shown in figure 1 and is arranged in use between the presenting elements 11, 15 and the feed gripper 10. The support device 4 comprises a plate 18 with two support elements 5, 6 that are separated from each other by a thread separator 7 and support a respective weft thread 2, 3 in a different position. As shown the difference in position is in a direction transverse to the direction of movement of the feed gripper 10, in particular there is a difference in height and a difference in depth between the two positions. In particular the difference in heigth or level allows to take up one weft thread 2 above the thread separator 29 and the other weft thread 3 below the thread separator 29, in order to guide each of the two weft threads 2, 3 on a different side of the thread separator 29 to a stop 27, 28. Once the two weft threads are near the stops 27, 28 the thread clamp 24 and the thread guide element 55 can close such that the two weft threads are clamped by the thread clamp 24 and are substantially enclosed by the thread guide element 55, as shown in dash-dot-lines in figure 11. The difference in depth is in particular advantageous to guide weft threads separated during their further insertion into the weaving shed. In figure 10 also a weaving reed 51 is shown. In figure 12 the feed gripper 10 is arranged in the proximity to the receiving gripper 40 in order to feed the weft threads 2 and 3 in a different position to the receiving gripper 40. For sake of clarity, the thread guide element 55 is not shown in figure 12.

[0040] The receiving gripper 40 represented in figures 12 to 14 comprises a clamping hook 35 provided with a clamping face 37 and a clamping element 38 provided with a clamping face 39 to clamp weft threads 2 and 3 between the clamping faces 37 and 39. The clamping element 38 can be made in a known manner, for example as explained in DE 1710292. In the region of the leading end 44 of the clamping hook 35, the receiving gripper 40 comprises a thread separator 45 that is arranged to separate two weft threads 2, 3 while they are delivered by the feed gripper 10 and clamped by the receiving gripper 40. The tip 48 of the thread separator 45 ends, in the longitudinal direction of the receiving gripper 40, at a greater distance from the leading end 44 of the receiving gripper 40 than the tip 49 of the clamping hook 35. As represented in figures 12 and 14 the thread separator 45 and the clamping hook 35 are arranged in the direction perpendicular to the moving direction or the longitudinal direction of the receiving gripper at a distance away from each other, in other words with a difference in depth with respect to each other, such that both weft threads are also separated in the transverse direction from each other near the receiving gripper 40. The opening and closing of the thread clamps of the feed gripper 10 and the receiving gripper 40 can be controlled as explained in CH 510151 or EP 266286. As shown in figure 12, the weft thread 2 can first be taken along with the thread separator 45, then the weft thread 3 can be taken along with the clamping hook 35 and then the clamping faces 37 and 39 can clamp both weft threads 2, 3 while the thread clamp 24 releases the weft threads 2, 3 and the receiving gripper 40 is already moving to the opposite side of the shed. The feed gripper 10 and the receiving gripper 40 can be moved in a known way into the weaving shed by flexible gripper bands or rigid gripper rods.

[0041] It will be clear that concepts such as "above", "below", "height", "depth", "left", "right" and the like are not meant in absolute terms, but rather are meant more to clarify the illustrated embodiments. It is clear that the entire device can be brought into a different relative position. The direction of movement of the feed gripper 10 and of the receiving gripper 40 also coincides, in the illustrated embodiments, with the longitudinal direction of the feed gripper 10 and of the receiving gripper 40.

[0042] As a result of the fact that the two weft threads 2, 3 are, during the insertion thereof, kept separate from each other, it is possible to keep the weft threads 2, 3 mutually in position, allowing these weft threads, during the joint beating-up of both weft threads 2, 3, to be beaten up and to be woven in parallel to each other. What matters in accordance with the invention is that the weft threads 2, 3 not only are kept separate in the region of the device 1 for presenting and in the region of the feed gripper 10, but also be kept separate and substantially parallel in the region of the receiving gripper 40. The keeping separate in the region of the receiving gripper 40 is important above all for the beating-up of both weft threads 2, 3 and more particularly for the weaving-in, in parallel, of both weft threads 2, 3. The term "weaving-in in parallel" refers to the fact that the two weft threads 2, 3 also remain parallel to each other and do not twist over each other in the fabric.

[0043] It will be clear that two other weft threads can

also be brought together in a similar manner into the shed, wherein for example one weft thread is presented by one of the presenting elements 11, 12 or 13 and the other weft thread is presented by one of the presenting elements 14, 15 or 16. Hereby two weft threads can in each case be as chosen brought into the shed via a selected presenting element. As a result, the invention is not limited to the insertion of one of the two weft threads from a specific thread supply, such as is for example the case in EP 633336.

[0044] Although in the illustrated embodiments in each case two weft threads are inserted, it is of course also possible to insert, using a device, a feed gripper and a receiving gripper according to the invention, merely one single weft thread. Obviously, the joint insertion of, for example, three or more weft threads using a device, a feed gripper and a receiving gripper according to the invention is not ruled out. In this case, two groups of weft threads can be inserted separately from each other and can be woven in parallel to one another.

[0045] It will also be clear that the invention is not limited to the use of six presenting elements 11 to 16, but that use may be made of any number of presenting elements, for example four, eight or twelve presenting elements. If weaving is carried out using just two weft threads, the presenting elements can be replaced by a fixedly arranged thread eye. Likewise, one group of presenting elements 11, 12 and 13 can be used, while the other group of presenting elements 14, 15 and 16 can be replaced by a fixedly arranged thread eye. Other combinations of presenting elements and thread eyes are of course also possible.

[0046] The feed gripper 10 and the receiving gripper 40 can be attached in a known manner to the leading end of a gripper band or gripper rod with which they can be moved into and out of a shed 17. The gripper housings 21, 41 can be made of metal, for example light metal.

[0047] Although in the illustrated embodiments two weft threads 2 and 3 are inserted by means of a feed gripper 10 and a receiving gripper 40, it is also possible, in accordance with a variant, to insert a weft thread over the entire weaving width using just a feed gripper or using just a receiving gripper. If the weft threads are inserted using just a feed gripper, then the feed gripper takes up a weft thread as represented in figure 1 and brings it to the opposite side of the shed. A fixedly arranged clamping hook, which is embodied in a similar manner to the leading end of the receiving gripper, can in this case be arranged to the opposite side of the shed. If weft threads are inserted using just a receiving gripper, then the receiving gripper takes up a presented weft thread, which has been presented as in figure 1, and brings it to the opposite side of the shed. In this case, the receiving gripper 40 can be brought into a position with respect to the weft threads 2, 3 in the region of the support device 4 which is similar to that represented in figure 6. Gripper weaving machines which utilize a feed gripper and a receiving gripper are the most widespread.

[0048] The illustrated exemplary embodiments serve merely to clarify the invention. Variants are readily possible, in particular in relation to the shape of the guides and the positions of the weft threads. Also possible are combinations of the illustrated embodiments which come under the extent of protection of the claims. In the case of such variants and combinations of the illustrated embodiments, the weft threads 2 and 3 are also guided in such a way that they remain separate from each other and allow both weft threads 2, 3 to be jointly beaten up and to be woven in parallel to each other. The combination of the application of a thread separator 7, a thread separator 29 and a thread separator 45 allows the weft threads 2 and 3 to be kept permanently separate from each other during their joint insertion and to be beaten up parallel to each other after their insertion, so that a fabric with parallel weft threads is obtained, wherein weft threads 2 and 3 are inserted together.

Claims

1. A device for the presenting of weft threads to a gripper (10, 40) for a gripper weaving machine, more particularly to a feed gripper (10) for a gripper weaving machine, wherein the device (1) comprises a plurality of presenting elements (11, 12, 13, 14, 15, 16) which are movable between a rest position and a presentation position and comprises a support device (4) which in use is arranged between the presenting elements (11, 12, 13, 14, 15, 16) and a gripper (10, 40) to support a weft thread (2, 3) while the weft thread (2, 3) is taken up by the gripper (10, 40), **characterized in that** a first thread separator (7) is provided for weaving two weft threads (2, 3) at the same time, wherein the support device (4) comprises two support elements (5, 6) which are separated from each other by the first thread separator (7), wherein the support elements (5, 6) extend in use substantially in the direction of movement of the gripper (10, 40) and wherein each support element (5, 6) allows an associated weft thread (2, 3) to be supported in a position transverse to the direction of movement of the gripper (10, 40), which position is different from the position of the other weft thread (2, 3).

2. Device according to claim 1, **characterized in that** the support elements (5, 6) are located in use at a different height with respect to the direction of movement of the gripper (10, 40).

3. Device according to claim 2, **characterized in that** the support element (5) which in use is close to a shed is located in a higher position than the support element (6) which is remote from the shed (17).

4. Device according to any one of claims 1 to 3, **char-**

acterized in that the support elements (5, 6) are located in use at a different depth with respect to the direction of movement of the gripper (10, 40).

5. Device according to any one of claims 2 to 4, **characterized in that** the support element (5), which is close to the shed (17), is located further away from the beat-up line (20) than the support element (6), which is remote from the shed (17).

6. Device according to any one of claims 2 to 5, **characterized in that** the support device (5, 6) comprises a curved plate (18) at which the support elements (5, 6) and the first thread separator (7) are arranged.

7. Gripper weaving machine for weaving two weft threads (2, 3) at the same time, the gripper weaving machine comprising a feed gripper (10), a receiving gripper (40), and a device for the presenting of weft threads to the feed gripper (10) in accordance with any of claims 1 to 6.

8. Gripper weaving machine according to claim 7, **characterized in that** the feed gripper (10) comprises a gripper housing (21) having guides for weft threads, wherein the guides guide weft threads (2, 3) to a stop (27, 28) and to a thread clamp (24), wherein a second thread separator (29) is provided, the second thread separator (29) being arranged in a side edge (32) of the feed gripper (10) that is positioned away from the thread clamp (24) and that is positioned in the proximity to the support device (4) for presenting weft threads (2, 3) to the feed gripper (10) during the taking-up of weft threads (2, 3), allowing two weft threads (2, 3), which are presented to the feed gripper (10) at a different height by the support device (4), to be separated from each other while they are guided to a stop (27, 28).

9. Gripper weaving machine according to claim 8, **characterized in that** the second thread separator (29) extends substantially in the longitudinal direction of the feed gripper (10) in the region of the side edge (32) of the feed gripper (10).

10. Gripper weaving machine according to claim 7, **characterized in that** the receiving gripper (10) comprises a clamping hook (35) provided with a clamping face (37) and a clamping element (38) provided with a clamping face (39) to clamp a weft thread (2, 3) between the clamping face (37) of the clamping hook (35) and the clamping face (39) of the clamping element (38), wherein a third thread separator (45) is provided, the third thread separator (45) being arranged in the region of the leading end (44) of the receiving gripper (40) and allowing two weft threads (2, 3) to be separated from each other while they are clamped, and wherein the tip (48) of the third thread separator (45) ends, in the longitudinal direction of the receiving gripper (40), at a greater distance from the leading end (44) of the receiving gripper (40) than the tip (49) of the clamping hook (35).

11. Gripper weaving machine according to claim 10, **characterized in that** the third thread separator (45) is arranged substantially in the center between the hook opening (46) of the clamping hook (35).

12. Gripper weaving machine according to claim 10 or 11, **characterized in that** the clamping hook (35) is facing to a side edge (32) of the feed gripper (10) that comprises the second thread separator (29) and stops (27, 28) during the delivery of weft threads (2, 3).

13. A method for the presenting of two weft threads to a gripper (10, 40) for a gripper weaving machine with a device according to any one of claims 1 to 6, more particularly for the presenting of two weft threads to a feed gripper (10) for a gripper weaving machine, wherein each support element (5, 6) supports an associated weft thread (2, 3) in a position transverse to the direction of movement of the gripper (10, 40), which is different from the position of the other weft thread (2, 3), in order to present the associated weft thread (2, 3) to the gripper (10, 40) in a different position with respect to the gripper (10, 40).

14. Method according to claim 13, **characterized in that** two weft threads (2, 3) are presented in a different position to a gripper (10, 40), so that each weft thread (2, 3) is presented in the region of a suitable guide of a gripper (10, 40).

15. A method for weaving two weft threads at the same time comprising the method of claim 13 or 14 and further comprising taking-up of the two weft threads with a feed gripper (10) provided with a second thread separator (29), wherein the feed gripper (10) takes up one weft thread (2) above the second thread separator (29) while the feed gripper (10) takes up the other weft thread (3) below the thread separator (29), in order to guide the two weft threads (2, 3) on a different side of the thread separator (29) to a stop (27, 28).

16. The method for weaving two weft threads at the same time according to claim 15, further comprising delivering of the two weft threads from the feed gripper (10) to a receiving gripper (40) provided with a third thread separator (45), wherein the receiving gripper (40) and the weft threads (2, 3) are located during the delivery in a position such that one weft thread (2) is moved past the third thread separator (45) while the other weft thread (3) is not moved past the third thread separator (45).

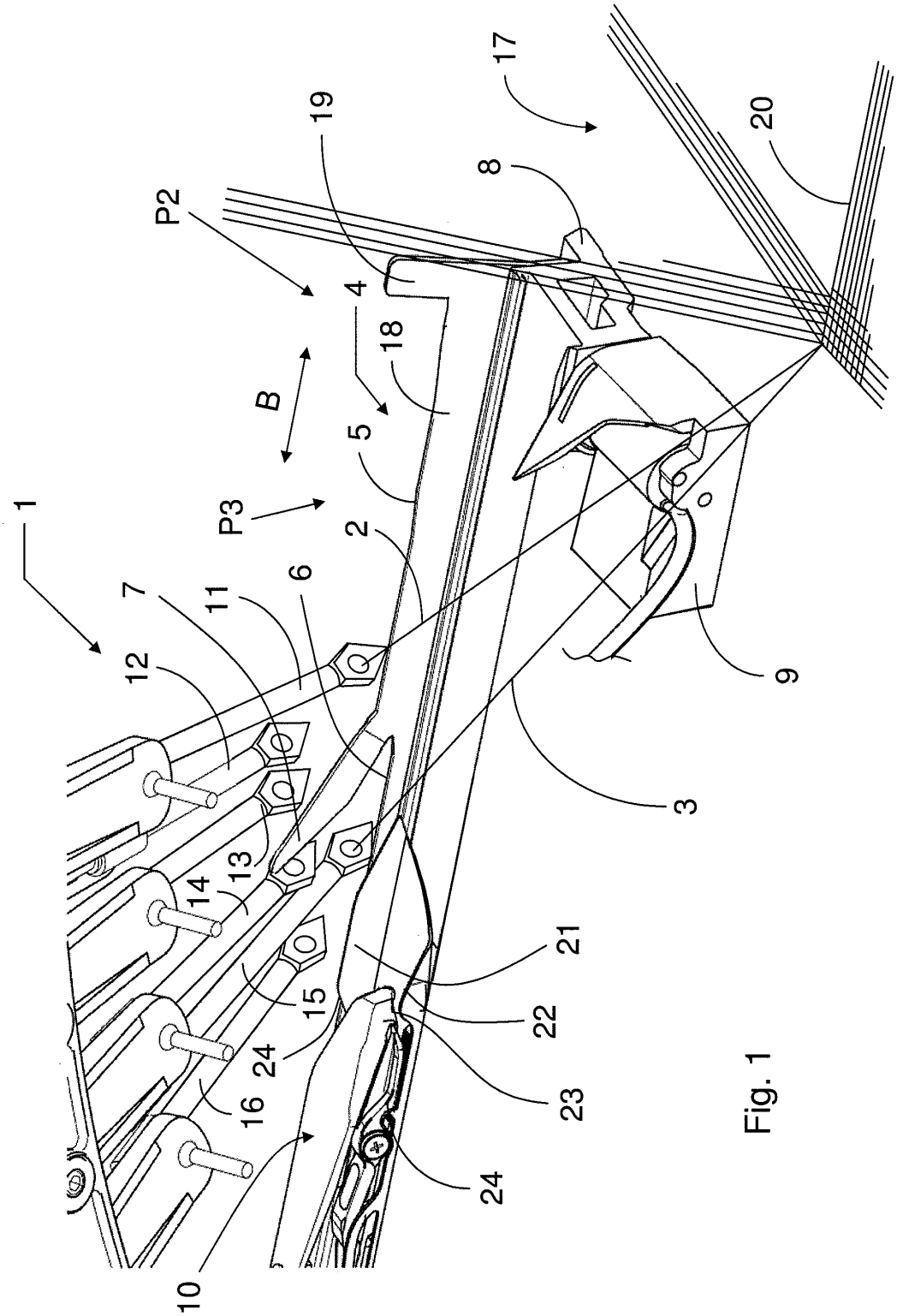


Fig. 1

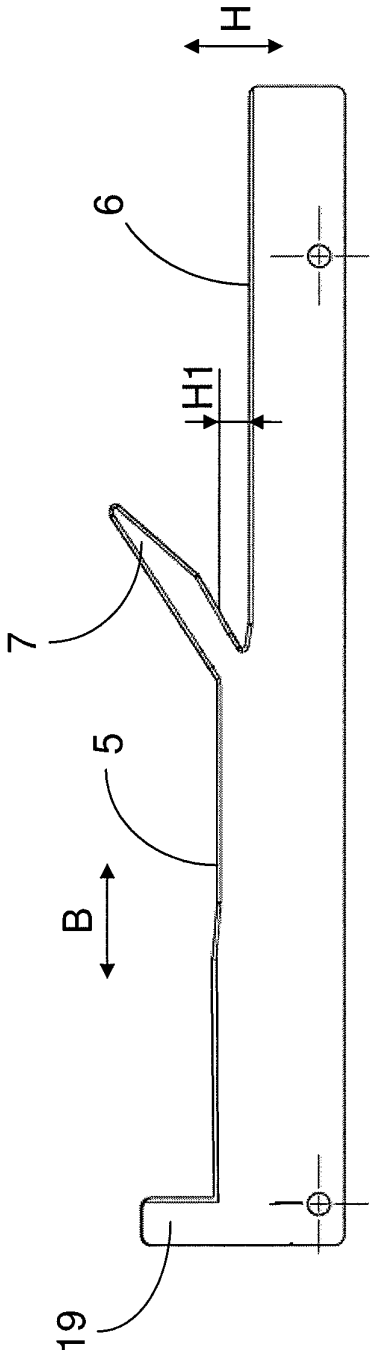


Fig. 2

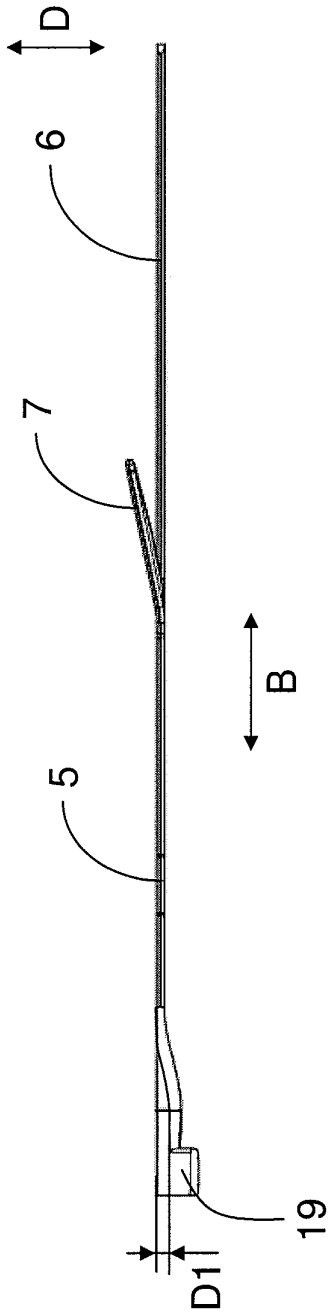


Fig. 3

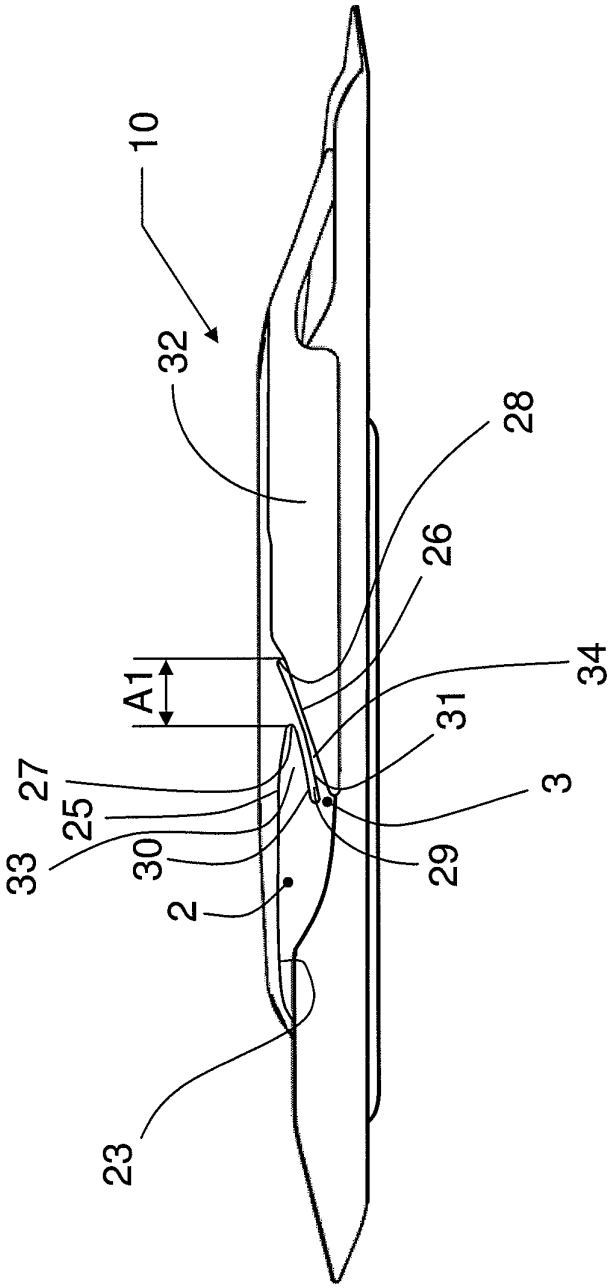


Fig. 4

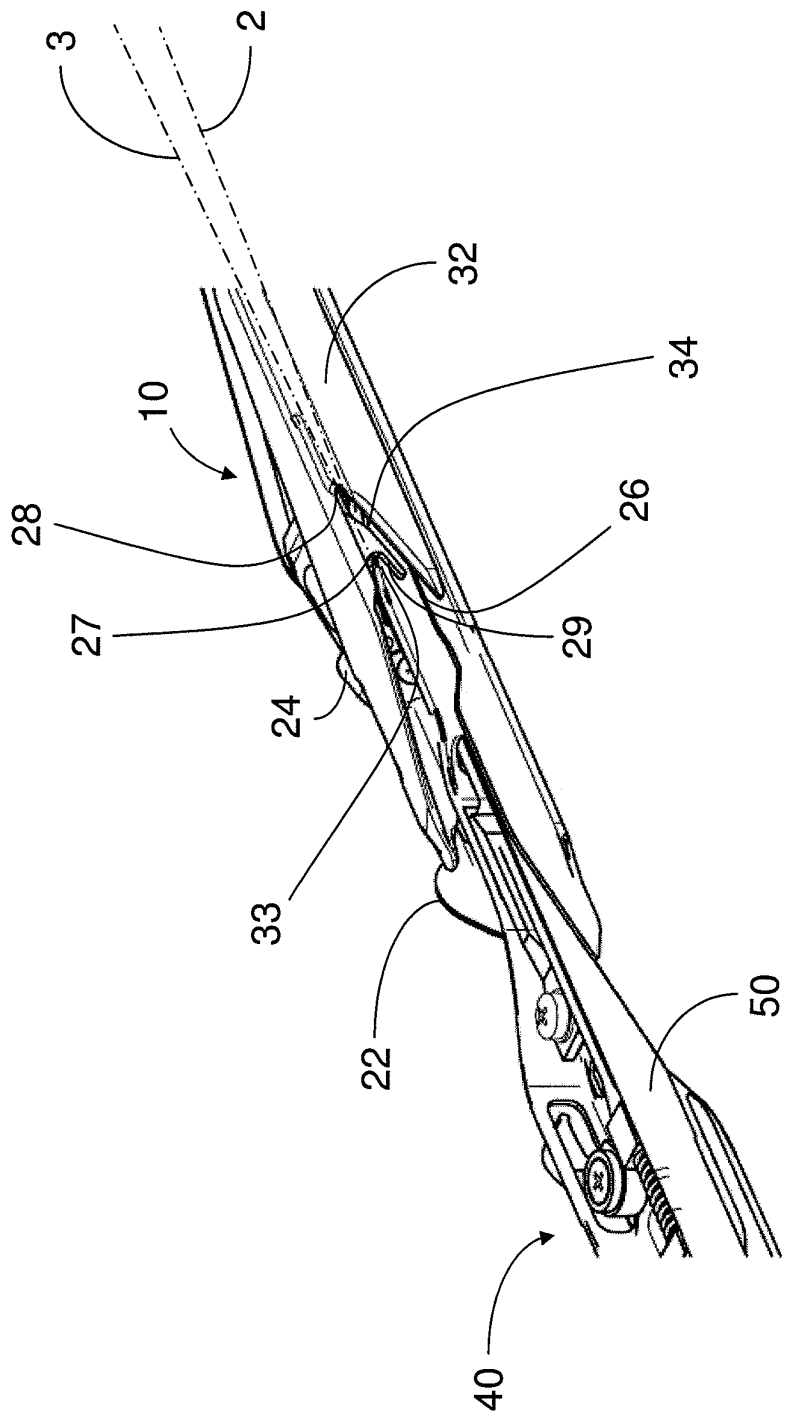


Fig. 5

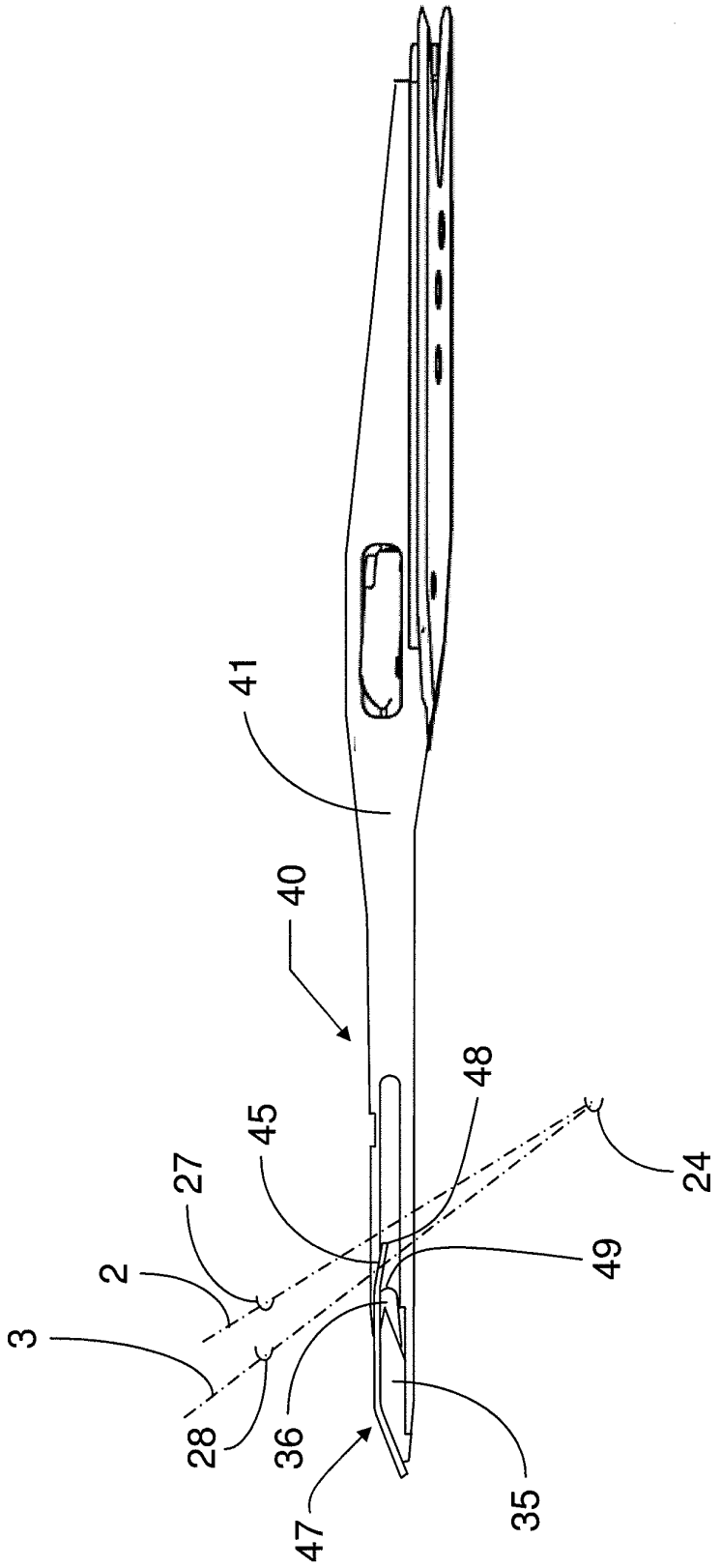


Fig. 6

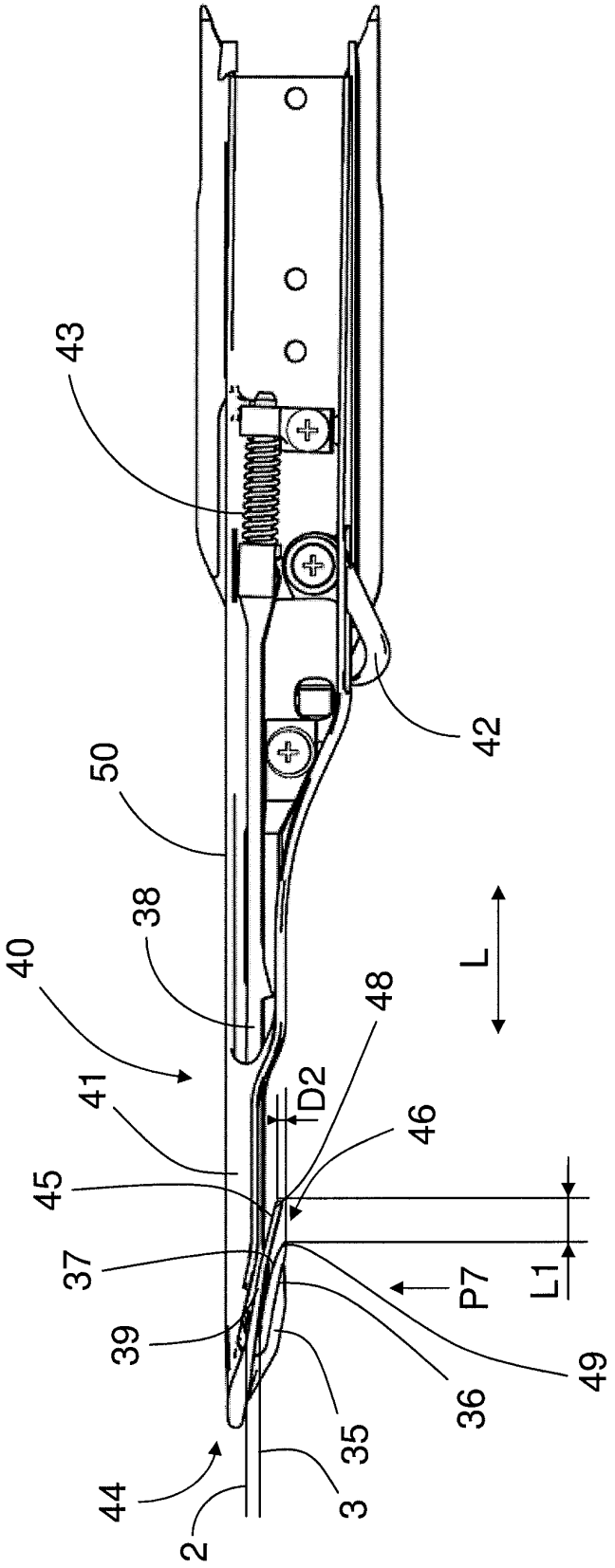


Fig. 7

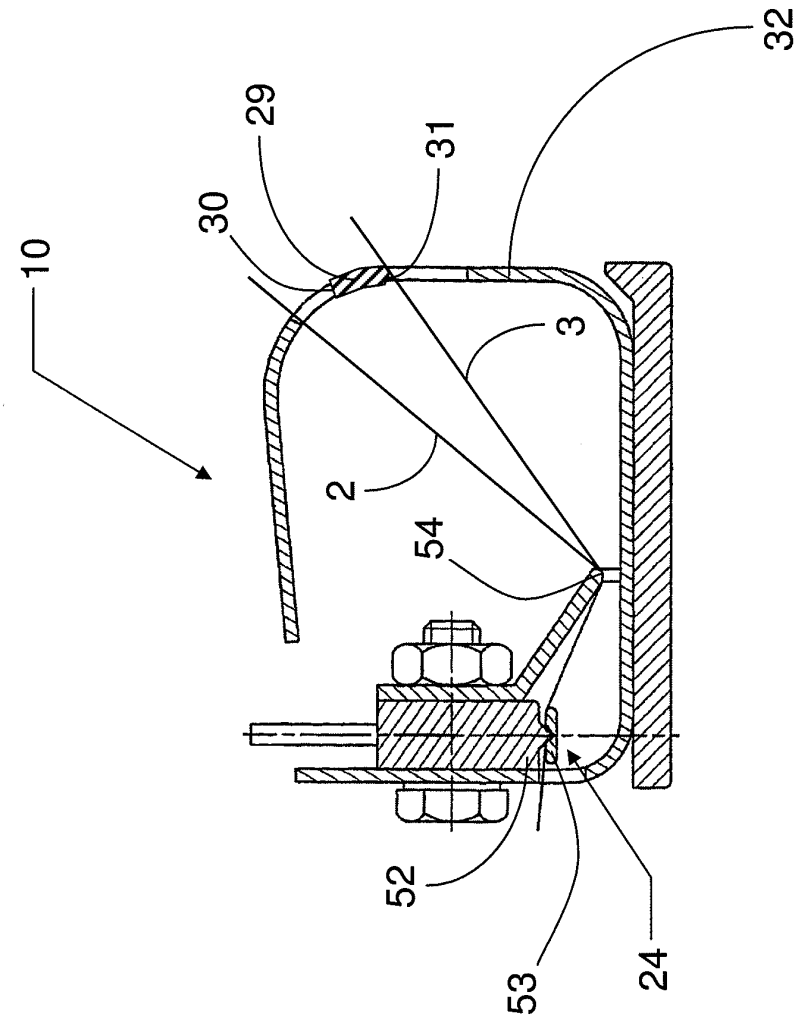


Fig. 8

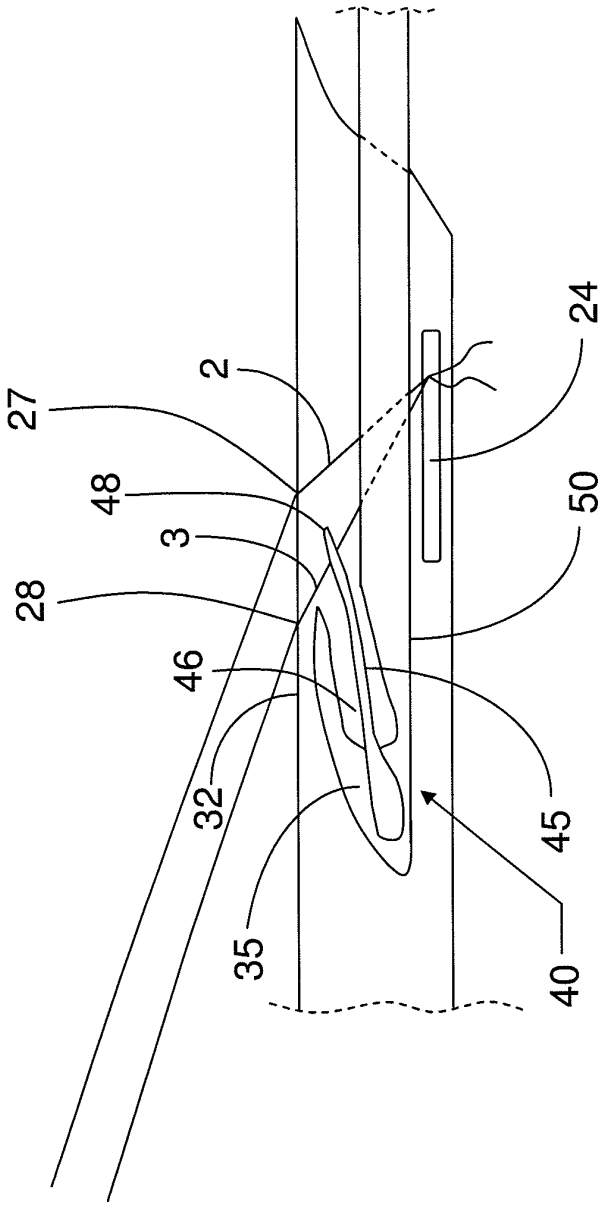


Fig. 9

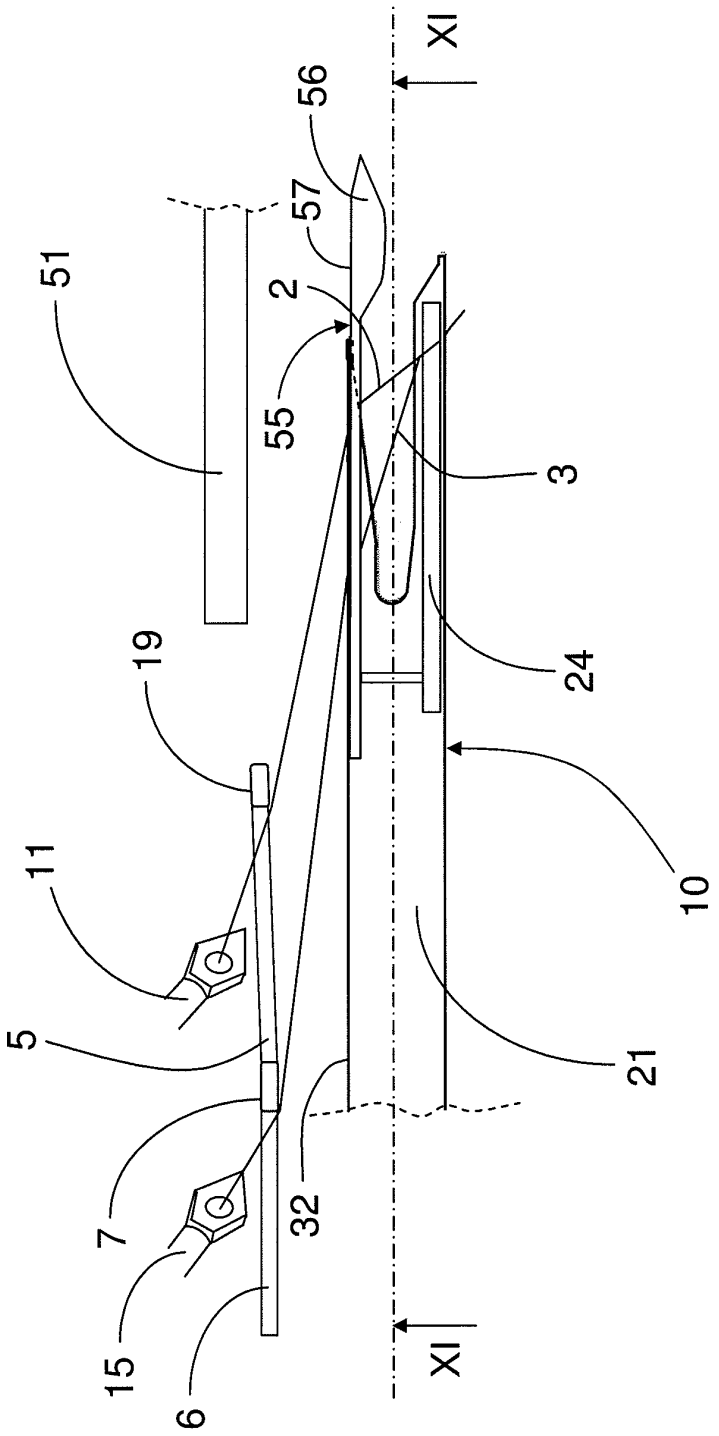


Fig. 10

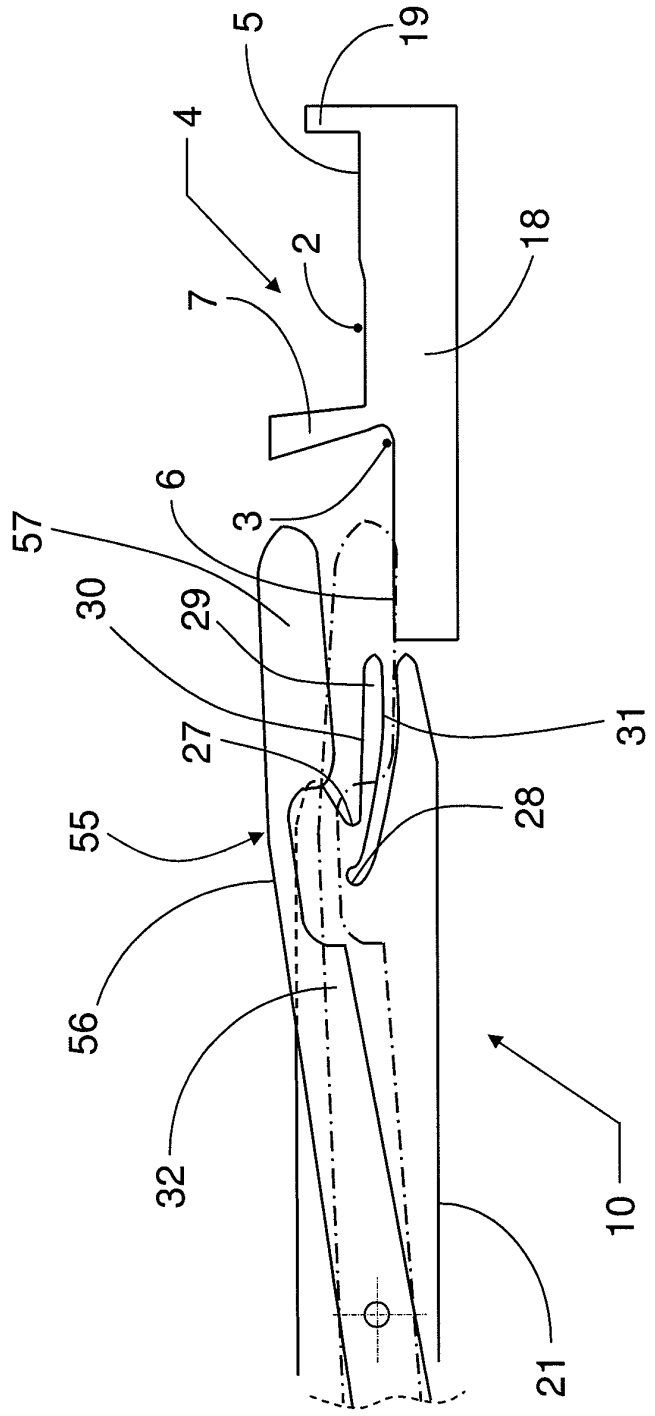
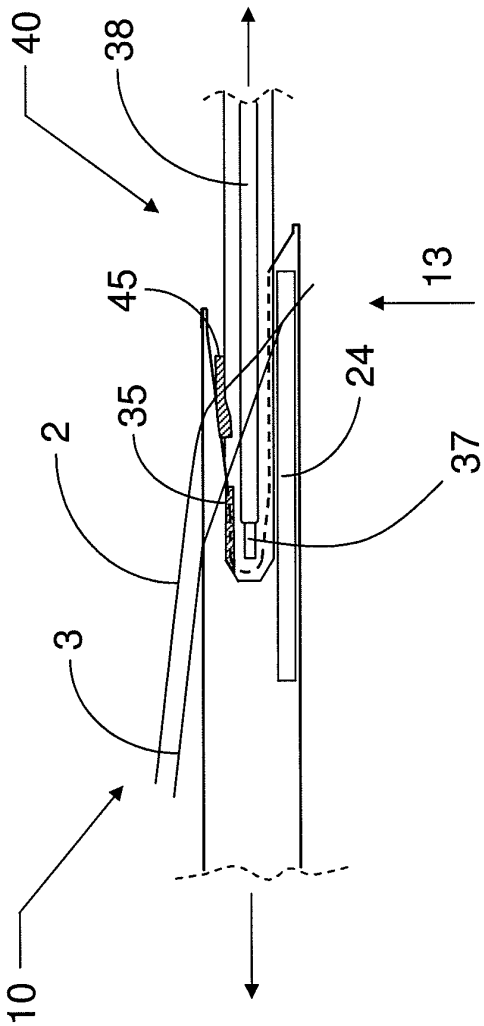


Fig. 11

Fig. 12



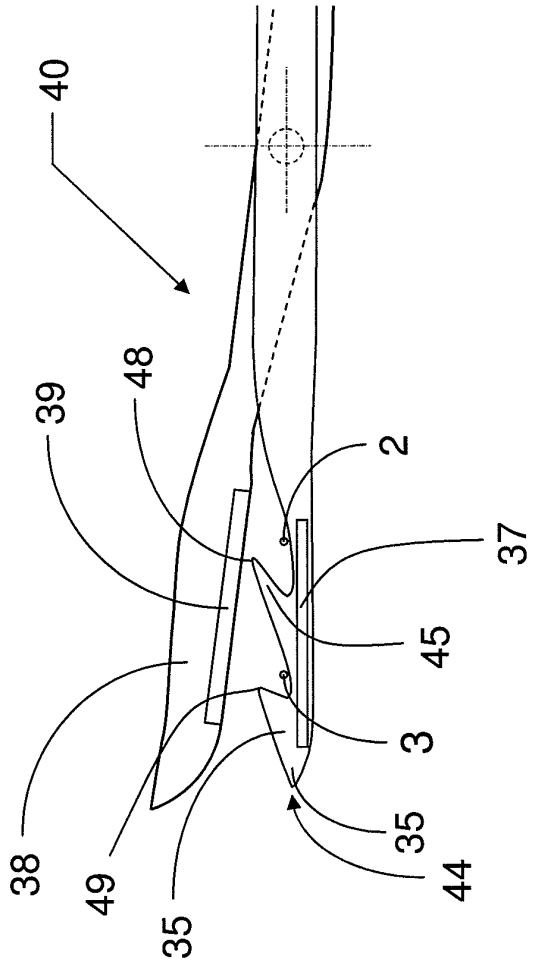


Fig. 13

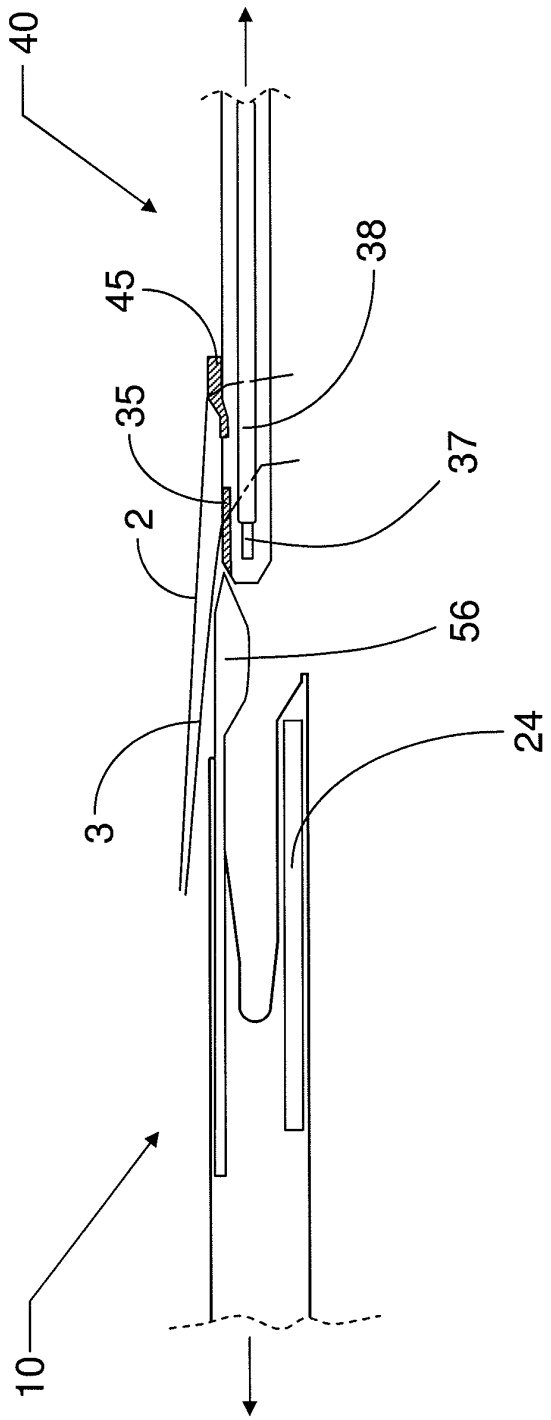


Fig. 14

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EUROPEAN SEARCH REPORT

Application Number
EP 13 15 5075

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 00/29651 A (SULZER TESSILE S R L [IT]; CORAIN LUCIANO [IT]; BORTOLI GIULIO [IT]; C) 25 May 2000 (2000-05-25) * abstract * * page 8, line 6 - page 17, line 2; figures 1-8 *	1-16	INV. D03D47/23 D03D47/38
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			TECHNICAL FIELDS SEARCHED (IPC)
			D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 March 2013	Louter, Petrus

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 13 15 5075

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21-03-2013

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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