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(54) Device for widening an end portion of a pipe part

(57) A device for widening an end portion of a pipe part comprises a clamping member for clamping a pipe part to be widened on the outside, and a mandrel, directed towards the clamping member, for widening an end portion of a clamped pipe part. The clamping member and the mandrel are displaceable with respect to each other substantially in the axial direction of the mandrel. The device furthermore comprises a clamp-actuating mechanism for actuating the clamping member and a displacement mechanism for displacing the clamping member and the mandrel with respect to one another, which mechanisms are combined to form a single combined mechanism, and only one actuating member for actuating the combined mechanism. The combined mechanism is designed in such a manner that, when it is actuated in order to widen an end portion of a pipe part, the clamping member comes into action first, and then the mandrel and the clamping member move towards one another.

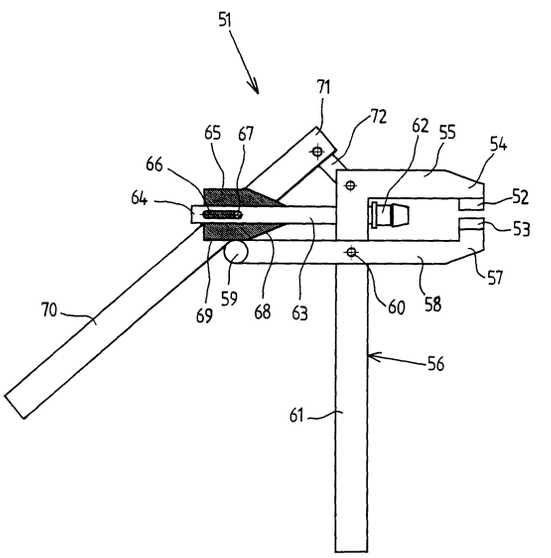

Fig. 3

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Description

[0001] The invention relates to a device for widening an end portion of a pipe part, comprising a clamping member for clamping a pipe part to be widened on the outside, and a mandrel directed towards the clamping member, for widening an end portion of a clamped pipe part, the clamping member and the mandrel being displaceable with respect to one another substantially in the axial direction of the mandrel, and furthermore comprising a clamped-actuating mechanism for actuating the clamping member, and a displacement mechanism for displacing the clamping member and the mandrel with respect to one another, and at least one actuating member for actuating the clamp-actuating mechanism and the displacement mechanism.

[0002] A device of this nature is known in practice.

[0003] In the known device, the clamping member is formed by the jaws of a special type of pincers with two levers, the first jaw being fixedly connected to one of the levers, and the second jaw being rotatably connected to the first jaw and being actuated, via a bar mechanism, by the other lever of the pincers. The mandrel is connected to a bar mechanism which is arranged on the first jaw and the lever which is fixedly connected thereto and is actuated by a third lever which is rotatably connected to the fixed bar of the pincers. The mandrel can be displaced by actuation of the third lever.

[0004] The drawback of the known device is that three levers have to be actuated in order for an end portion of a pipe part to be clamped securely in place and widened, which is awkward and requires a number of operations.

[0005] The object of the invention is to provide a device for widening an end portion of the pipe part, with which the end portion can be clamped in place and widened in a single operation.

[0006] This object is achieved, in a device of the type mentioned in the introduction, in that the clamp-actuating mechanism and the displacement mechanism are combined to form a single mechanism, and in that the device comprises only one actuating member for actuating the combined mechanism, the combined mechanism being designed in such a manner that, when it is actuated in order to widen an end portion of a pipe part, the clamping member becomes active first, and then the mandrel and the clamping member move towards one another.

[0007] Using the device according to the invention, an end portion of a pipe part can be clamped in place and widened in a single operation, and this is a considerable advantage in practice.

[0008] Preferred embodiments of the device according to the invention are given in the dependent claims.

[0009] The invention will be explained in more detail in the following description of two possible embodiments of the device according to the invention, with reference to the drawing, in which:

Fig. 1 diagrammatically depicts a first possible embodiment of the device according to the invention, and

Fig. 2 diagrammatically depicts a second possible embodiment of the device according to the invention,

Fig. 3 diagrammatically depicts a third possible embodiment of the device according to the invention,

Figs. 4 to 6 show three different positions of the embodiment shown in Fig. 3.

[0010] In Fig. 1, 1 denotes a first possible embodiment of the device according to the invention. This embodiment comprises a clamping member for clamping a pipe part to be widened. The clamping member is formed by two clamping jaws 2 and 3 which are located opposite to and at a distance from one another. The clamping jaws 2 and 3 will generally be in the form of a half shell in cross section, so that together they engage over substantially the entire circumference of the pipe part to be widened.

[0011] The clamping jaws 2 and 3 are each mounted at the end of an elongate bar 4 or 5, respectively. Approximately at their centre, the bars 4 and 5 are rotatably connected, at rotation points (pivot points) 6 and 7, to a common, bar-like first support 8, which is at right angles to the bars 4 and 5.

[0012] At the opposite end from the clamping jaws 2 and 3, the bars 4 and 5 are provided with surfaces 9 and 10 which are located opposite one another and slope towards one another in the direction of the clamping jaws 2 and 3. These inclined surfaces 9 and 10 merge into surfaces 11 and 12 which run parallel to the longitudinal direction of the bars 4 and 5. As the inclined surfaces 9 and 10 move away from one another, the clamping jaws 2 and 3 move towards one another.

[0013] Between the bars 4 and 5, there is a mandrel 13 for widening an end portion of a pipe part (not shown) which has been clamped securely in place by the clamping jaws 2 and 3. The mandrel 13 is directed towards the clamping jaws 2 and 3 and can be displaced towards and away from the clamping jaws 2 and 3 in the axial direction. The mandrel 13 is mounted fixedly on an axial bar 14 which, in turn, is connected to a bar-like second support 15 which is substantially parallel to the first support 8. Guide elements, in the form of rollers 16 and 17, are mounted on the second support 15, which rollers are able to interact with the inclined surfaces 9 and 10 and their adjoining surfaces 11 and 12.

[0014] The bar-like supports 8 and 15 can be moved towards and away from one another by means of an actuating member, which is arranged between the supports 8 and 15, in the form of a scissor mechanism. The scissor mechanism comprises two levers 20 and 21 which are rotatably connected to one another at a rotation point 19. The ends of the levers 20 and 21 are rotatably connected, at the rotation points 22 and 23, to the supports 8 and 15. Furthermore, the levers are pro-

vided with projections 24 and 25 which are arranged at the same distance from the rotation point 19 as the rotation points 22 and 23, but on the other side of the rotation point 19. The projections 24 and 25 act as a supporting means for the free ends of the supports 15 and 8. This ensures that the supports 15 and 18 remain parallel to one another when the scissor mechanism is actuated.

[0015] The free ends of the levers 20 and 21 are provided with handles 26 and 27, by means of which the levers can easily be gripped.

[0016] When widening an end portion of a pipe part using the device shown in Fig. 1, the procedure is as follows.

[0017] The pipe part to be widened is placed between the clamping jaws 2 and 3. Then, the levers 20 and 21 are moved manually towards one another, with the result that the supports 8 and 15 are moved towards one another. In the process, the rollers 16 and 17 roll along the inclined surfaces 9 and 10, with the result that the clamping jaws 2 and 3 move towards one another and clamp the pipe part which has been placed between them securely in place. When the transition between the surfaces 9 and 10 and the surfaces 11 and 12 has been reached, the clamping force remains constant. Because of the supports 8 and 15 being moved towards one another, the mandrel 13 is displaced in the direction of the clamping jaws 2 and 3 and thus in the direction of the end portion, which is to be widened, of the pipe part which has been clamped securely in place. As the levers 20 and 21 are moved further towards one another, during which process the rollers 16 and 17 roll along the surfaces 11 and 12, the mandrel 13 penetrates into the end portion of the pipe part which has been clamped securely in place and widens this end portion.

[0018] In order to remove the mandrel 13 from the widened end portion of the pipe part, the levers 20 and 21 are moved apart, with the result that the supports 8 and 15 are also moved apart. During this movement, firstly the mandrel 13 is pulled out of the widened end portion of the pipe part and then, as the rollers 16 and 17 roll along the inclined surfaces 9 and 10, the clamping jaws move apart slightly. The pipe part can then be removed from the device.

[0019] In Fig. 2, 31 denotes a second possible embodiment of the device according to the invention. This embodiment comprises a clamping member which is formed by two clamping jaws 32 and 33 which are located opposite to and at a distance from one another. In the embodiment shown in Fig. 2, the clamping jaws 32 and 33 are of elongate design, although this is not necessary. The clamping jaws 32 and 33 are likewise generally in the shape of a half shell in cross section.

[0020] The clamping jaws 32 and 33 are rotatably connected, at rotation points 34 and 35, to an end section of a first lever 36. As the clamping jaws 32 and 33 rotate with respect to the lever 36, from the position shown in Fig. 2, during which movement the clamping jaws 32 and 33 remain parallel to one another, the distance between the clamping jaws 32 and 33 will decrease.

[0021] A mandrel 37 which is directed towards the clamping member formed by the clamping jaws 32 and 33 is mounted on a second lever 38. The second lever 38 is provided with a transverse arm 39. The clamping jaw 33 is connected to this transverse arm 39 by means of a four-bar mechanism 40, in which one of the bars is formed by the clamping jaw 33 and the opposite bar is formed by the transverse arm 39. Between the two other bars 41 and 42, there is a spring 33 which presses the bars 41 and 42 apart, with the result that, without external load on the four-bar mechanism 40, the distance between the bars 41 and 42 is maximal and the four-bar mechanism 40 adopts the position depicted in Fig. 2.

[0022] When using the device shown in Fig. 2 for widening an end portion of a pipe part, the procedure is as follows.

[0023] Firstly, a pipe part (not shown), the end portion of which is to be widened, is placed between the clamping jaws 32 and 33. Then, the levers 36 and 38 are moved towards one another. Since the spring 43 tends to hold the four-bar mechanism 40 in the position shown in Fig. 2, the lever 36 begins to rotate, at the rotation point 35, with respect to the clamping jaw 33. This reduces the distance between the clamping jaws 32 and 33, and the pipe part which has been placed between the clamping jaws 32 and 33 is clamped securely in place by the clamping jaws 32 and 33. When a certain clamping force has been reached, the clamping jaws 32 and 33, with the pipe part clamped securely between them, move towards the mandrel 37, counter to the action of the spring 43. As the levers 36 and 38 move further towards one another, the mandrel 37 penetrates into the end portion, which is to be widened, of the pipe part and widens this end portion. In order to be able to follow the sideways movement of the clamping jaws 32 and 33 which results from the movement of the four-bar mechanism 40, the mandrel 37 can be displaced along the lever 38.

[0024] In order to remove the pipe part from the mandrel 37, the levers 36 and 38 are moved apart. In the process, firstly the clamping jaws 32 and 33 move apart and loose their clamping action, and then the four-bar mechanism 40 moves into the position shown in Fig. 2 under the influence of the spring 43. As the levers 36 and 38 move further apart, the clamping jaws 32 and 33 move back towards one another and again clamp the pipe part securely in place. As the levers 36 and 38 move still further apart, the widened end portion of the pipe part which has been clamped securely in place by the clamping jaws 32 and 33 is pulled off the mandrel 37.

[0025] On the inner side, which comes into contact with the pipe, the clamping blocks 2 and 3 and 32 and 33 may be provided with rubber in order to improve the clamping action. However, the clamping jaws may also be designed as metal shells which are provided on the

inner side with teeth or other means for roughening the surface.

[0026] In Fig. 3, 51 denotes a third possible embodiment of the device according to the invention. This embodiment comprises a clamping member which is formed by two clamping jaws 52 and 53 which are located opposite to and at a distance from one another. The clamping jaws 52 and 53, like the clamping jaws of the embodiments shown in Figs. 1 and 2, will generally be in the form of a half shell in cross section.

[0027] The clamping jaw 52 is mounted at the free end 54 of the horizontal limb 55 of a L-shaped first lever 56. The clamping jaw 53 is mounted at the free end 57 of a clamping-jaw bar 58 which, between the free end 57 and the other free end 59, is rotatably connected, at a rotation point 60, to the vertical limb 61 of the L-shaped first lever 56. As a result, the clamping jaws 52 and 53 can be moved towards and away from one another. Between the horizontal limb 55 of the L-shaped first lever 56 and the clamping-jaw bar 58, there is a mandrel 62 for widening an end portion of a pipe part (not shown in Fig. 3) which has been clamped securely in place between the clamping jaws 52 and 53. The mandrel 62 is directed towards the clamping jaws 52 and 53 and can be displaced towards and away from the clamping jaws 52 and 53 in the axial direction. To this end, the mandrel 62 is mounted fixedly on the end of a mandrel bar 63 which is supported by the vertical limb 61 of the L-shaped first lever 56 and can be displaced in the axial direction with respect to this limb.

[0028] That end portion 64 of the mandrel bar 63 which is located at a distance from the mandrel 62 is provided with a block 65 which can be displaced over a limited distance with respect to the mandrel bar 63. This distance is determined by the length of a slot 66 which is arranged in the end portion 64 of the mandrel bar 63 and through which a pin 67, which is connected to the block 65, extends.

[0029] The block 65 is provided with an inclined surface 68 and an adjoining surface 69 which runs parallel to the mandrel bar 63. Both surfaces 68 and 69 are able to interact with the free end 59 of the mandrel bar 58.

[0030] The block 65 can be displaced by means of an actuating member in the form of a second lever 70 which, at one end 71, is rotatably connected, via a connection piece 72, to the L-shaped first lever 56, specifically at the location of the transition between the limb 55 and the limb 61. Since the connection piece 72 is rotatably connected to both the lever 70 and the lever 56, the free end 71 of the lever 70 can also be displaced with respect to the lever 56. The second lever 70, at a distance from the free end 71, is rotatably connected to the block 65.

[0031] The way in which the device illustrated in Fig. 3 operates when widening an end portion of a pipe part is explained in more detail with reference to Fig. 4-6, which show three positions of the device.

[0032] Fig. 4 shows the starting position. The device is arranged over an end portion 81, which is to be widened, of a pipe part 82, the mandrel 62 being placed against the end of the pipe part 82, and the vertical limb 61 of the L-shaped lever 56 and the lever 70 being as far apart from one another as possible. The clamping jaws 52 and 53 are likewise as far apart as possible.

[0033] In order to widen the end portion 81 of the pipe part 82, the lever 70 is moved towards the limb 61, the limb 61 remaining in the same position. The movement of the lever 70 will cause the block 65 to move along the mandrel bar 63 towards the mandrel 62. In the process, the inclined surface 68 of the block 65 moves along the free end 59 of the lever bar 58, which as a result rotates. As a result, the clamping jaw 53 moves towards the clamping jaw 52. When the free end 59 of the clamping-jaw bar 58 moves into the vicinity of the transition between the inclined surface 68 and the parallel surface 69, the clamping jaw 53 comes into contact with the pipe part 82. As the lever 70 is moved further, the pipe part 82 is clamped securely in place between the clamping jaws 52 and 53, and the free end 59 of the clamping-jaw bar 58 comes to bear against the parallel surface 69. This position is shown in Fig. 5. During the movement of the lever 70, the mandrel bar 63 has remained in place, and the pin 67, which is connected to the block 65, has moved from one end of the slot 66 in the mandrel bar 63 to the other end of this slot. Since the end 71 of the lever 70 is pivotably connected, via the connection piece 72, to the lever 61, the connecting point between the lever 70 and the block 65 is able, despite the rotary movement of the lever 70, to execute a rectilinear movement.

[0034] As the lever 70 moves further towards the limb 61, the mandrel bar 63 is advanced by the pin 67, and the mandrel 62 is moved to the right, as seen in the drawing, and is pressed into the end portion 81, which is to be widened, of the pipe part 82, as shown in Fig. 7. As a result, the end portion 81 is widened. During this movement, the end portion 59 of the clamping-jaw bar 58 continues to bear against the parallel surface 69, with the result that the pipe part 82 remains clamped securely in place between the clamping jaws 52 and 53.

[0035] In order to pull the mandrel back out of the widened end portion 81, the lever 70 is moved away from the limb 61 again, the pin 67, after it has moved through the slot 66, again pulling the mandrel bar 63 with it.

[0036] The embodiment shown in Fig. 3 is particularly suitable for use at locations where the end portion 82 which is to be widened is difficult to reach or where this end portion 82 is located directly at a wall.

[0037] Within the scope of the invention, the embodiments of the device according to the invention which are shown in Figs. 1 to 3 may also be designed differently.

[0038] In the embodiment shown in Fig. 1, it is not necessary for the clamping-jaw supports 4 and 5 to be designed as bars. They may also be of different form. Furthermore, there are other possibilities for moving the

supports 8 and 15 towards and away from one another, for example by means of a hydraulic or pneumatic cylinder which is arranged between the supports 8 and 15.

[0039] In the embodiment shown in Fig. 2, the clamping jaw 33 may also be designed in such a manner that it can be displaced along a guide which is attached to the arm 39, a spring, which tends to move the mandrel 37 and the clamping jaws 32 and 33 away from one another, being arranged between the clamping jaw 33 and the arm 38. The mandrel 37 may then be mounted fixedly on the lever 38.

[0040] Also, in the embodiment shown in Fig. 3, a hydraulic or pneumatic cylinder may be used instead of the lever 70 to displace the block 65, in order to actuate the device. The various components may also have different forms from those shown.

[0041] The device according to the invention is intended in particular for widening the end portion of plastic pipe parts. However, the device is also suitable for widening an end portion of pipe parts made from other materials which can be deformed with relatively little force.

Claims

1. Device for widening an end portion of a pipe part, comprising a clamping member for clamping a pipe part to be widened on the outside, and a mandrel, directed towards the clamping member, for widening an end portion of a clamped pipe part, the clamping member and the mandrel being displaceable with respect to one another substantially in the axial direction of the mandrel, and furthermore comprising a clamp-actuating mechanism for actuating the clamping member, and a displacement mechanism for displacing the clamping member and the mandrel with respect to one another, and at least one actuating member for actuating the clamp-actuating mechanism and the displacement mechanism, characterized in that the clamp-actuating mechanism and the displacement mechanism are combined to form a single mechanism, and in that the device comprises only one actuating member for actuating the combined mechanism, the combined mechanism being designed in such a manner that, when it is actuated in order to widen an end portion of a pipe part, the clamping member becomes active first, and then the mandrel and the clamping member move towards one another.

2. Device according to claim 1, characterized in that the clamping member is formed by two clamping jaws (2, 3) which are located opposite to and at a distance from one another and are each mounted on a clamping-jaw holder (4, 5), the two clamping-jaw holders (4, 5) are rotatably connected, at rotation points (6, 7), to a common first support (8), in such a manner that the clamping jaws (2, 3) can be moved towards and away from one another, the clamping-jaw holders (4, 5) are provided with surfaces (9, 10) which are located opposite one another and slope towards one another in the direction of the clamping jaws (2, 3), and are arranged in such a manner with respect to the rotation point (6, 7) of the clamping-jaw holders (4, 5) that, when the inclined surfaces (9, 10) move away from one another, the clamping jaws (2, 3) move towards one another, the mandrel (13) is arranged between the two clamping-jaw holders (4, 5) and can be displaced in the axial direction towards and away from the clamping jaws (2, 3), the mandrel (13) is connected to a second support (15) on which guide elements (16, 17) are mounted, which are able to interact with the inclined surfaces (9, 10) of the clamping-jaw holders (4, 5), and the actuating member is active between the first support (8) and the second support (15), in order to move the supports (8, 15) towards and away from one another.

3. Device according to claim 2, characterized in that the actuating member comprises a scissor mechanism (19-24).

4. Device according to claim 3, characterized in that the scissor mechanism (19-24) comprises two levers (20, 21).

5. Device according to claim 1, characterized in that the clamping member is formed by two clamping jaws (32, 33) which are located opposite to and at a distance from one another and are each rotatably connected, at rotation points (34, 35), to an end portion of a first lever (36), the mandrel (37) is mounted on a second lever (38), one (33) of the two clamping jaws (32, 33) is connected to the second lever (38) in such a manner that it can move in the axial direction of the mandrel (37), and the device is provided with a resilient element (43) which tends to move the mandrel (37) and the clamping jaws (32, 33) away from one another.

6. Device according to claim 5, characterized in that the clamping jaw (33) which is connected movably to the second lever (38) is connected to this lever (38) by means of a four-bar mechanism (40), one of the bars being formed by the clamping jaw (33) in question, the opposite bar being formed by a transverse arm (39) which is at right angles to the second lever (38) and is connected thereto, and the resilient element (43) is arranged between the other two, mutually opposite, bars (41, 42) of the four-bar mechanism.

7. Device according to claim 1, characterized in that the clamping member is formed by two clamping jaws (52, 53) which are located opposite to and at

a distance from one another and are each mounted on a clamping-jaw holder (55, 58), the first clamping-jaw holder (55) is fixedly connected to a support (61), and the second clamping-jaw holder (58) is connected rotatably, at a rotation point (60), to the support (61), in such a manner that the clamping jaws (52, 53) can be moved towards and away from one another, the mandrel (62) is arranged between the two clamping-jaw holders (55, 58) and can be displaced towards and away from the clamping jaws (52, 53) in the axial direction, the mandrel (62) is arranged at one end of a mandrel bar (63), which is supported by the support (61), can be displaced in the axial direction with respect to the support, and is provided, on that side of the support (61) which is remote from the mandrel (62), with a block (65) which can be displaced over a limited distance with respect to the mandrel bar (63), the block (65) being provided with an inclined surface (68) and an adjacent surface (69) which runs substantially parallel to the mandrel bar (63), which two surfaces (68, 69) are able to interact with the rotatable second clamping-jaw holder (58), in such a manner that as the block (65) moves towards the clamping jaws (52, 53), the clamping jaws (52, 53) are moved towards one another, and the actuating member (70) acts between the support (61) and the block (65) in order to move the block (65) towards and away from the support (61).

8. Device according to claim 7, characterized in that the support is formed by a first lever (56).

9. Device according to claim 8, characterized in that the first lever (56) is L-shaped, the first clamping-jaw holder being formed by the horizontal limb (55) and the support being formed by the vertical limb (61) of the L-shaped lever (56) .

10. Device according to one of claims 7-9, characterized in that the actuating member comprises a second lever (70) which is rotatably connected to the support (61) and the block (65).

11. Device according to claim 10, characterized in that the second lever (70), at one free end (71) thereof, is rotatably connected, via a connection piece (72), to the support (61), the connection piece (72) being rotatably connected both to the second lever (70) and to the support (71).

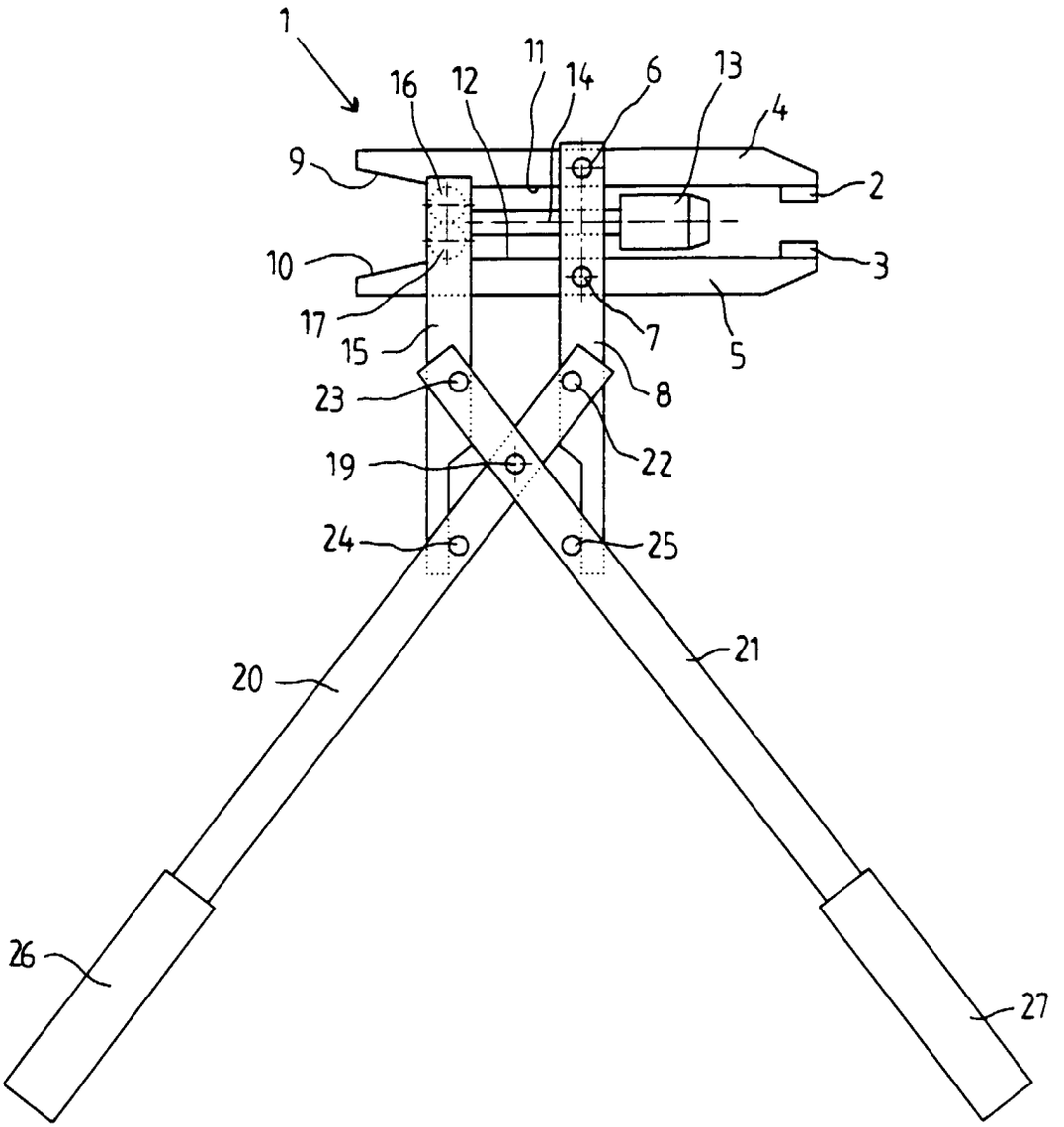

Fig. 1

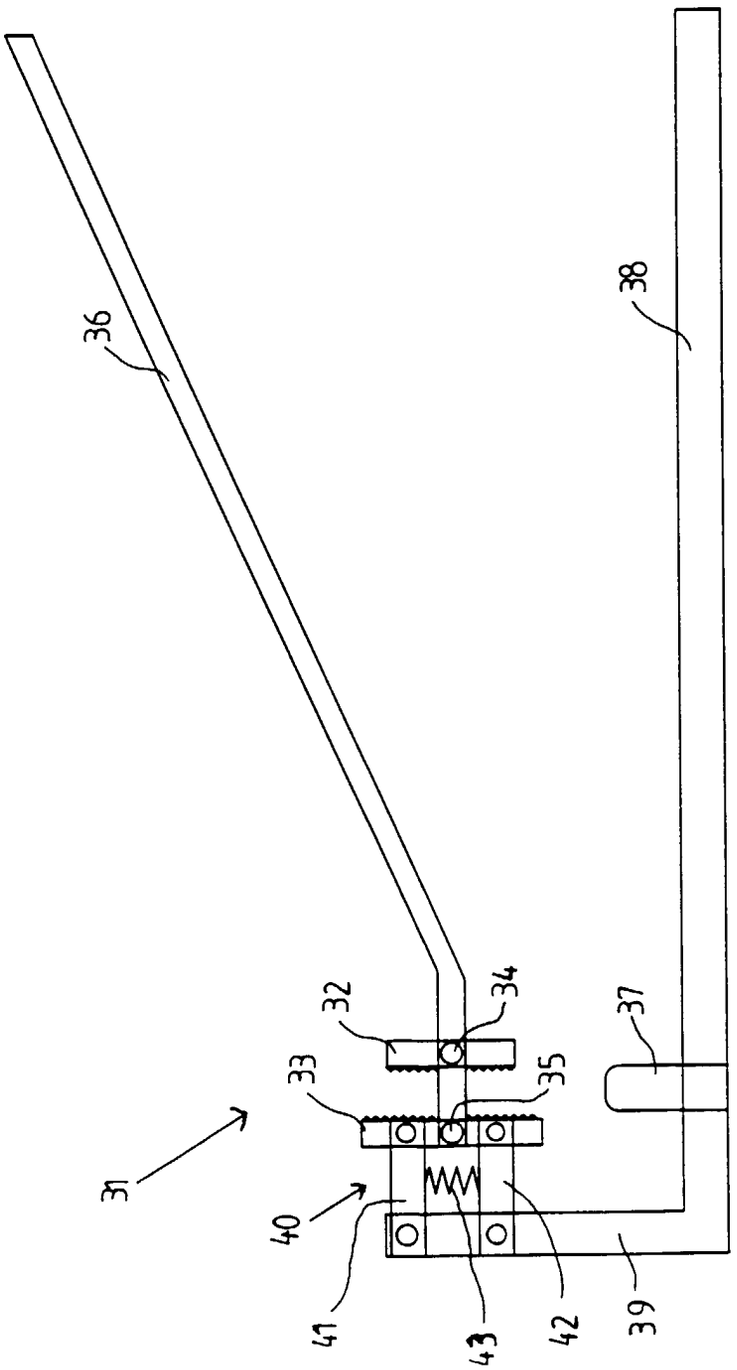

Fig. 2

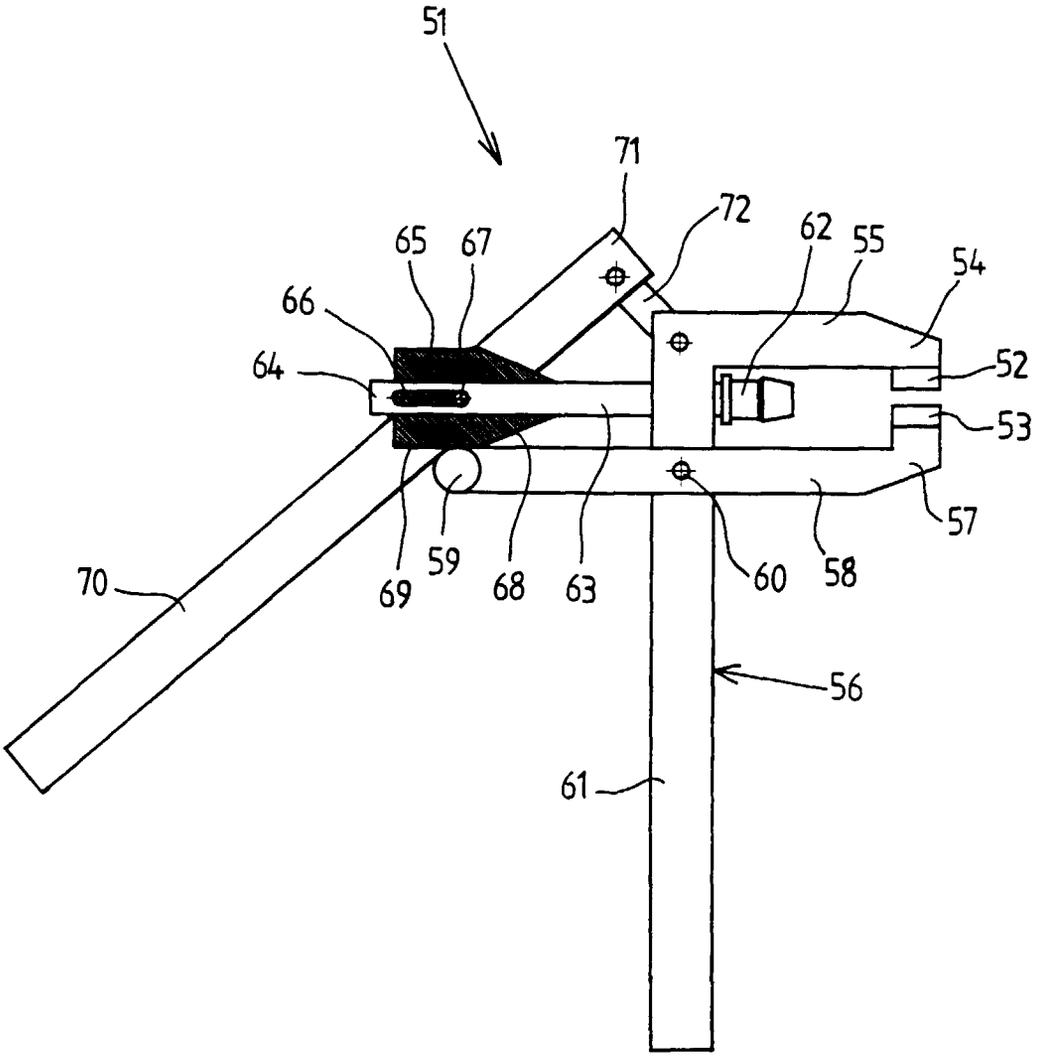

Fig. 3

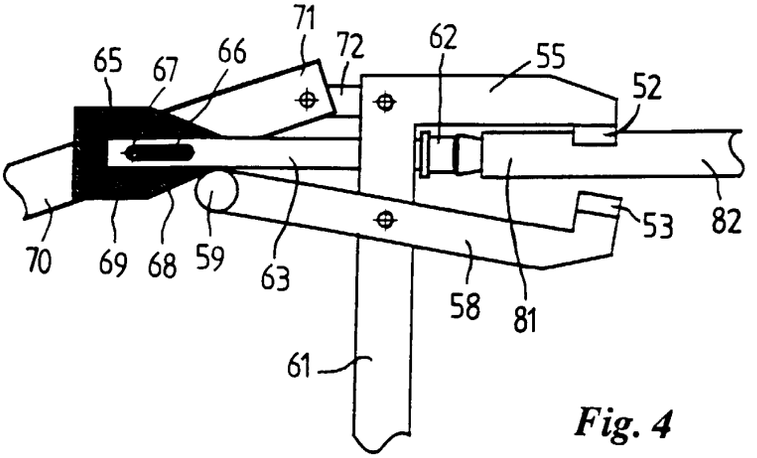

Fig. 4

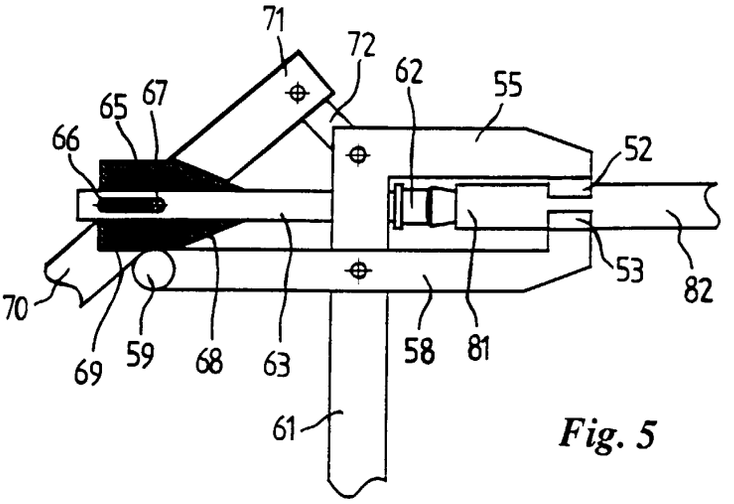

Fig. 5

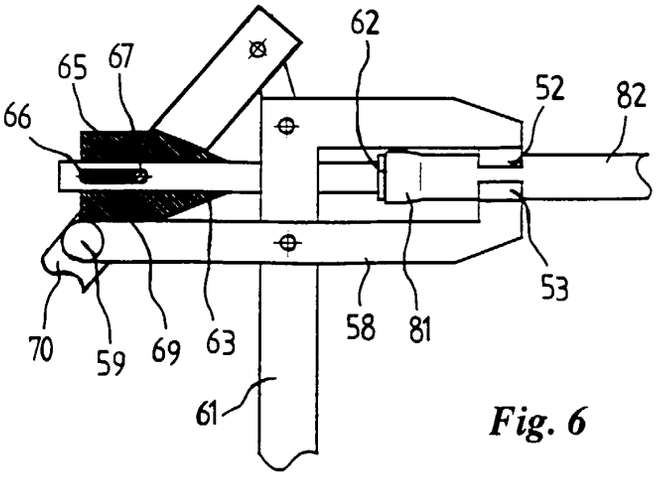

Fig. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 20 2696

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)
B21D B25B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15 October 1999	Peeters, L

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