



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.11.2022 Bulletin 2022/44

(51) International Patent Classification (IPC):
B25B 5/16 (2006.01) **B25B 5/06** (2006.01)
B25B 5/12 (2006.01)

(21) Application number: **22000109.3**

(52) Cooperative Patent Classification (CPC):
B25B 5/122; B25B 5/166

(22) Date of filing: **22.04.2022**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **Conte, Umberto**
10092 BEINASCO (Torino) (IT)
• **Kolb, Stivy**
10092 BEINASCO (Torino) (IT)
• **Englert, Timo**
85045 INGOLSTADT (DE)
• **Kuch, Gerhard**
85045 INGOLSTADT (DE)
• **Micelli, Silvio**
85045 INGOLSTADT (DE)

(30) Priority: **26.04.2021 IT 202100010481**

(71) Applicants:
• **VEP Automation S.r.l.**
10092 Beinasco (Torino) (IT)
• **Audi AG**
85045 Ingolstadt (DE)

(74) Representative: **Cian, Paolo**
Saconney & Cian
Corso Vittorio Emanuele II, 14
10123 Torino (IT)

(54) **HOOK CENTERING AND HOLDING DEVICE FOR BACKLASH-FREE CENTERING AND HOLDING A MEMBER, PARTICULARLY A BODY MEMBER**

(57) A hook-shaped centering and holding device adapted for centering and holding a member (S), particularly a body member or a support member for supporting an equipment, provided with at least one centering hole (H), comprises a body (12) defining a bearing surface (66a) for the member (S), and a hooking member (16) movable between a resting position spaced from the bearing surface (66a) and at least one locking position close to the bearing surface (66a), and means for controlling the movement of the hooking member (16), including a control mechanism (14) operated by the movement of a rod (18). The outer surface of the centering pin (21) has at least one conical section (23d) that diverges towards the main body (12), which forms an backlash-free engagement zone for the hole (H). The centering pin (21) is slidable with respect to the body (12) and is biased by elastic thrust means (62) tending to move it away from the body (12) when the hole (H) is positioned at said backlash-free engagement zone.

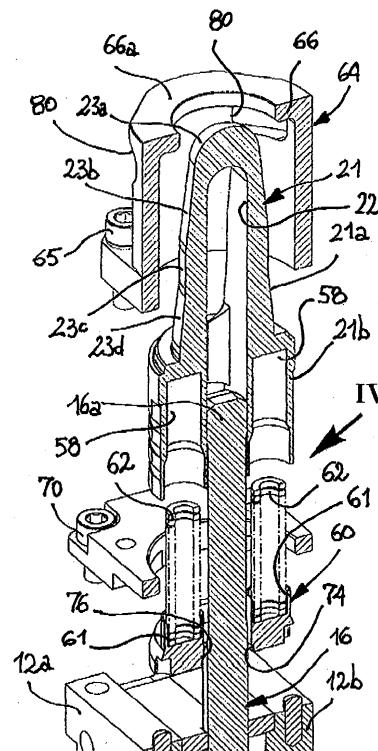


Fig. 3

Description

[0001] The present invention relates in general to centering and holding devices to be used in automatic processing lines to hold a piece, such as in particular a body member of a motor vehicle consisting of a sheet of metal or other material, or a support member for supporting an equipment, in order to lock said member in a pre-determined stationary position to allow workings such as welding, bending or other operations, to be executed.

[0002] A device of this type, known for example from EP-1 393 861-A1 or from EP-3 412 410-A1, allows a piece in the form of a sheet metal member to be held by a locking appendage of the relevant device, which consists of a hooking member movably mounted with respect to an axial cavity of a centering pin that extends from the same device and is intended to engage a corresponding centering hole formed in the member to be held.

[0003] More specifically, the invention relates to a device of the type defined in the preamble of the appended claim 1.

[0004] A device of the type defined above is known from EP-2 626 174-A1 and allows a laminar member such as a body piece, typically made by a sheet of metal or other material, to be locked by a movable hooking member. Such a member has a through centering hole intended to be engaged by a substantially cylindrical centering pin of the device. However, the size of the centering hole is critical in view of machining to be carried out on the member once the latter is locked by the hooking member. In fact, the size of the centering hole may be not very precise and different from that set by the design due to the machining tolerances which may cause the presence of backlash between the edge of the hole and the centering pin, with the consequence that the member may be locked in a position with respect to the device that does not correspond to the design specifications, so that machining to be carried out on it can be performed in a position incorrect and different from that set by the design, which could cause a rejection of this member.

[0005] The object of the invention is to provide a device of the type mentioned above which allows pieces such as elements of various thickness, for example body pieces or support members for supporting various equipment, to be centered and locked without any backlash and therefore with an improved accuracy, even if the size of one or more holes formed in the member at issue do not exactly correspond to that set by the design, as well as to allow members, for example body members, to be coupled together by welding or other known processes, with a greater precision by virtue of the elimination of the aforementioned backlashes. Another object of the invention is to provide a device whose structure has a bulkiness as small as possible, so that it can be used in equipment where the space for accommodating the device is relatively small, and/or to allow the device to be moved in space by an industrial robot, when this is foreseen.

[0006] These objects are achieved by a device having

the features mentioned in the attached claims.

[0007] In particular, according to the invention, the device comprises a centering pin the outer surface of which has at least one conical section which diverges towards the main body and has at least one area for the backlash-free engagement of said hole, the centering pin being mounted axially slidable with respect to the main body and being biased by elastic thrust means tending to move it away from the main body, whereby the member is locked by the hooking member in said locking position as a result of the operation of said control mechanism when the hole is arranged at said backlash-free engagement zone of said diverging conical section and the member rests on said bearing surface against the action of said elastic thrust means of the centering pin.

[0008] By virtue of these features, the device of the invention allows pieces such as body members or members for supporting equipment, to be centered and locked without any backlash, and therefore with a considerable precision, regardless of the machining tolerances of the hole of the member, and therefore the positioning of the member is always precise so that machining to be carried out on it are not affected by a possible inaccuracy of the size of this hole.

[0009] According to a preferred feature of the invention, said centering pin has a substantially fork shape defined by a pair of parallel branches delimiting, on opposite sides, a recess in which the hooking member is received, and said elastic thrust means consist of at least one helical spring, a first end of which engages a respective seat formed in a portion of the centering pin arranged laterally with respect to said recess, the second end of said spring engaging a corresponding seat formed in a plate interposed between the centering pin and the main body.

[0010] By virtue of these feature, the device of the invention has a simple and compact structure, which determines its ease of positioning and a reliable operation.

[0011] According to another preferred feature of the invention, said seat formed in the plate for the second end of each spring has a tubular portion that extends towards the centering pin and slidably engages a portion of the respective cylindrical seat formed in the centering pin, in order to make a telescopic casing of the respective spring.

[0012] This allows the aforesaid springs to be enclosed in a telescopic casing to protect them and keep them isolated from the outer environment.

[0013] According to yet another preferred feature of the invention, the device comprises shoulder means fast with the main body thereof to limit the movement of the centering pin away from said main body as a result of the action of said elastic thrust means.

[0014] According to a further preferred feature of the invention, the device comprises a sleeve fixed to the main body and surrounding a lower portion of greater diameter of the centering pin from which an upper portion of said pin having a smaller diameter extends, which sleeve has

a collar, at its end farthest from the main body, which defines an inner radial projection forming a shoulder for the axial movement of the lower portion of the centering pin caused by the action of said elastic thrust means.

[0015] Further characteristics and advantages of the invention will become more evident from the following detailed description, provided purely by way of non-limiting example and referred to the appended drawings in which:

Figure 1 is an overall perspective view of the centering and holding device of the invention in its resting condition, to which a member, for example a body member or a support member for supporting an equipment, can be associated, which is provided with a centering hole in view of the locking thereof by means of a movable hooking member of the device,

Figure 2 is an enlarged perspective view sectioned along a transverse plane, of a detail indicated by arrow II of Figure 1,

Figure 3 is an exploded and sectional perspective view of the elements shown in Figure 2,

Figure 4 is a perspective and exploded view showing some elements of the device of the invention indicated by arrow IV of Figure 3,

Figure 5 is a perspective view of the device sectioned along a longitudinal plane, in its configuration corresponding to the locking of a member,

Figures 6 and 7 are views similar to Figure 2 and to a part of Figure 5, respectively, of a modification of the device of the invention, and

Figures 8a, 8b and 8c are sectional side elevational views similar to each other, showing the main working steps of the device of the invention, which correspond to a resting configuration thereof in which a body member or a support member for supporting an equipment is spaced from it, to a step in which a centering pin thereof is inserted into a centering hole of the aforementioned member, and to a locking configuration of said member by means of the movable hooking member of the device, respectively.

[0016] With particular reference to Figures 1 to 5, a hook centering and holding device according to the invention, intended to center and hold without backlash a member S, for example a sheet body member made of metal or other material, or a support member for supporting an equipment, in order to perform a machining on it, is indicated 10 as a whole.

[0017] The member S (represented in Figures 8a to 8c) to be locked by means of the device 10 has at least one centering hole H to which reference will be made in greater detail below.

[0018] The device 10 comprises a main body 12 consisting of a pair of half-shells 12a and 12b which, in their coupled condition, delimit on opposite sides an inner cavity 13 (see Figure 5) of the body 12.

[0019] The cavity 13 encloses a control mechanism 14 for controlling the movement of a movable hooking member 16 having a general rod shape which comprises above, with reference to the figures, a first hook shaped end 16a and, below, a second end or foot portion 16b.

[0020] The hooking member 16, as a result of the operation of the control mechanism 14, is capable of assuming a resting position in which its hook end 16a is spaced from the member S associated with the device 10, or a locking position of the member S in which the hooked end 16a engages a portion of this member S to lock it in a stationary position with respect to the same device 10.

[0021] An axially slidable control rod 18 (see Figure 5) extends at least partially inside the cavity 13, which cooperates with the control mechanism 14 to control the movement of the hooking member 16, as will be explained in more detail below.

[0022] In the exemplary embodiment shown in the Figures, the control rod 18 has a lower end to which a piston 19 is fixed, which is slidably mounted in the chamber of a pressurized fluid cylinder 20 arranged in the lower part of the body 12, which preferably consists of a double-acting cylinder when the device 10 is operated pneumatically or hydraulically to control the movement of the rod 18. As an alternative, and according to a modification known per se and not shown in the figures, the movement of the rod 18 can be controlled by an electric actuator including an electric motor.

[0023] As a result of the axial sliding of the rod 18, the hooking member 16 can assume the above-mentioned resting or locking positions with respect to the main body 12, which respectively correspond to a completely raised position thereof spaced from the member S (shown in Figures 1, 2, 8a and 8b), and a completely lowered position thereof (shown in Figures 5 and 8c) in which its hooked end 16a interferes with an edge portion of the hole H of the member S and applies on it a thrust directed towards the body 12 of the device 10.

[0024] A centering pin 21 extends upwards from the upper part of the body 12, with reference to the Figures, which has a substantially fork shape defined by a pair of parallel branches thereof delimiting, on opposite sides, a recess 22 in which the movable hooking member 16 is received with a small lateral clearance. When the hooking member 16 is in its resting position, its hook end 16a is fully received within the recess 22, while when the hooking member 16 is in its locking position, a part of its hook end 16a projects outside the pin 21 to interfere with the edge of the hole H of the member S.

[0025] In particular, the pin 21 comprises an upper portion 21a of smaller diameter, at least part of which is intended to be inserted into the hole H of the member S when the latter is lowered from above towards the device 10, and a lower portion 21b of larger diameter.

[0026] The upper portion 21a comprises an upper end portion 23a, or head portion, arranged above the recess 22 and having a rounded shape, from which the two par-

allel branches thereof branch off, and a series of sections which, starting from the head portion 23a, consist of a first conical section 23b having an outer surface that slightly diverges towards the body 12, a section 23c having a cylindrical outer surface, and a second conical section 23d also having an outer surface that diverges towards the body 12.

[0027] The movement of the hooking member 16 is controlled by the aforesaid control mechanism 14 which substantially corresponds to that described in the European patent application EP-2 626 174-A1 which is considered incorporated herein by reference.

[0028] In particular, a connecting element 24 is connected to the upper end of the rod 18, on its side opposite to the piston 19, the upper portion of which is forkshaped so as to have two parallel branches spaced by an indentation 25. A roller 26 is accommodated in this indentation 25, which is rotatably mounted on a coaxial shaft 28 the axis of which is oriented perpendicularly to the rod 18, preferably with the interposition of a roller bearing. The opposite ends of the shaft 28 engage a pair of respective slots that extend transversely to the rod 18, which are formed in the two branches of the element 24.

[0029] Two identical connecting rods 30 are interposed between the roller 26 and each of the two parallel branches of the element 24 that delimit laterally the indentation 25, each of which has, at one of its ends, a first hole engaged by the shaft 28.

[0030] The other end of each connecting rod 30 has a second hole in which a pin 32 parallel to the shaft 28 is engaged, which also engages a hole 34 formed at one end of a first arm 36 of an L-shaped member 38. This L-shaped member 38 has a central portion articulated about a hinge pin 40, parallel to the pin 32 and having opposite ends fixed to the half-shells 12a and 12b, from which also a pair of arms 42 extend perpendicular to the arm 36. The arms 42 have respective end holes crossed by a pin 44, parallel to the pin 40, which also passes through a hole formed in an intermediate zone of the hooking member 16.

[0031] Moreover, another hole 46 is formed at the end of the foot portion 16b of the hooking member 16 furthest from the hook portion 16a, in which another pin 48 parallel to the pin 44 is engaged, the opposite ends of which, arranged laterally with respect to the hooking member 16, are provided with respective rolling bearings (only one of which is indicated 49 in Figure 5) which are slidably mounted in respective arched slots 50 formed in the two half-shells 12a and 12b, in order to guide the movement of the hooking member 16 so that the movement thereof is always parallel to itself.

[0032] The control mechanism 14 for controlling the movement of the hooking member 16, which in particular comprises the rod 18 and the respective connecting element 24, the connecting rods 30, the L-shaped member 38, as well as the respective pins of rotation, constitutes a toggle mechanism which allows the locking position of the hooking member 16 to be made irreversible against

any accidental movement of the member S.

[0033] Elastic compression means 52 are also associated with the body 12, which are adapted to cooperate with the control mechanism 14, in particular with the roller 26, which may consist of a spring assembly, for example of the Belleville washer type, or of a nitrogen gas charged spring. These elastic compression means 52 are enclosed in a cylindrical body fixed at a corresponding seat formed laterally in the body 12 and having its axis oriented transversely to the rod 18, and comprise a coaxial and slidable push bar 54 having a free end facing the inner cavity 13, which free end rests against the outer radial surface of the roller 26 in order to apply on it an elastic compression force directed towards the shaft 28 to cause a displacement of the latter along the slots of the parallel branches of the element 24. In this manner, the member 16 in its locking configuration can also perform a small vertical movement in order to allow elements S whose thickness is about ± 3 mm with respect to a nominal thickness, to be accepted and locked by the device 10, so as to allow the locking position of the hooking member 16 to be automatically adjusted depending on the thickness of the member S to be processed.

[0034] The body 12, below the elastic compression means 52, comprises a removable unit 53 including a pair of micro-switches of a type per se known, with the aim of detecting the reaching of the opposite end-of-stroke positions of the sliding of the rod 18, as a result of the detection of a check element (not shown) projecting from the rod 18.

[0035] Below the pin 21 there is a plate 60 whose lower surface rests on the top surface of the body 12, elastic means tending to move the pin 21 away from the plate 60, and therefore from the top of the body 12, being associated with the lower portion 21b of the pin 21 and with the plate 60. In particular, these elastic means comprise at least one spring 62, for example of the helical type, interposed between the pin 21 and the plate 60.

[0036] Preferably, and as shown in the Figures, a pair of respective cylindrical axial seats 58 are formed in the lower portion 21b of the pin 21, which are arranged on sides laterally opposite with respect to the recess 22, each of which receives a first end of a respective helical spring 62. The opposite end of each spring 62 is engaged in a corresponding seat formed in the plate 60, which is surrounded by a tubular portion 61 which extends from the plate 60 towards the pin 21 and which slidably engages a portion of the respective cylindrical seat 58. In this manner, each of the springs 62 is protected and kept isolated from the outer environment by a telescopic casing which prevents contact with any foreign bodies, so as to ensure the correct operation of the aforesaid elastic means.

[0037] Furthermore, means are associated with the pin 21 for preventing the separation of the lower portion 21b thereof with respect to the plate 60. For this purpose, the portion 21b is surrounded outwardly by a sleeve 64 having an inner diameter which substantially corresponds to

the outer diameter of the portion 21b, which sleeve is fixed by screws 65 on a support plate 68, in turn fixed to the top of the body 12 by means of other screws 70. The portion 21a of the pin 21 projects upwards from the sleeve 64, from the part opposite to the body 12.

[0038] A collar 66 is formed at the upper end of the sleeve 64, whose inner diameter is smaller than the outer diameter of the portion 21b. In this manner, the collar 66 forms a radial inner projection of the sleeve 64, which constitutes a shoulder for the axial movement of the portion 21b of the pin 21, in order to axially hold the portion 21b in a position generally close to the plate 60, in spite of the thrust exerted by the springs 62.

[0039] The upper surface of the collar 66, facing the head portion 23a of the pin 21, constitutes the resting and supporting surface for the member S, in view of its locking by means of the hooking member 16.

[0040] Since the overall height of the portion 21b of the pin 21 and of the plate 60 is less than the overall height of the support plate 68 and of the sleeve 64, except for the collar 66, the sleeve 64 defines inside it a space available for the movement of the pin 21 which, in any case, allows its axial movement with respect to the plate 60 as a result of the thrust applied by the springs 62, by virtue of which, in the absence of other stresses, the portion 21b of the pin 21 tends to abut against the shoulder constituted by the collar 66.

[0041] Between the plate 68 and the top surface of the body 12 there is a protective slab 72 slidably mounted transversely to the pin 21, which engages a corresponding guide groove formed in the upper face of the body 12. Above the slab 72 the plate 60 has a discharge groove 74 for the evacuation of possible foreign bodies.

[0042] Furthermore, the plate 60 has an elongated opening 76 (see Figures 4 and 8a to 8c) which extends parallel to a general plane of the body 12, having a length significantly greater than the overall dimensions of the hooking member 16 in that direction. A portion of the hooking member 16 is engaged with clearance in the opening 76, in order to allow a small movement of the hooking member 16 parallel to the aforesaid general plane, which occurs during operation of the device 10.

[0043] The protective slab 72 has a central opening 78 the shape of which corresponds to the cross section of the hooking member 16, for the engagement by the latter, so that the aforesaid movement of the hooking member 16 in the direction parallel to a general plane of the body 12 also causes a corresponding movement of the slab 72 which translates with respect to the plate 68 to keep the opening 76 of the plate 60 closed, in order to avoid the accidental penetration of foreign bodies into the cavity 13 through the recess 22 and the opening 76.

[0044] Any foreign bodies that could enter the device 10 through the recess 22 and insert into the small lateral clearance provided between the portion 21b of the pin 21 and the sleeve 64, are expelled as a result of the movement of the hooking member 16, through one or more windows 80 formed in the side wall of the sleeve 64.

[0045] Figures 6 and 7 show a modification of the device 10 in which the same reference numerals of the previous modification have been used to indicate parts equal or similar to it. This modification is conceived for the use of the device 10 in particularly heavy working conditions in which considerable amounts of foreign bodies may be present, there being the risk that they may in any case reach the inner cavity 13 of the body 12 through the small radial clearance provided between the lower portion 21b of the pin 21 and the inner lateral surface of the sleeve 64, which could jeopardize the operation of the device 10.

[0046] In this case, a radial groove 82 is formed on the inner lateral surface of the sleeve 64, just below the windows 80, in which a sealing gasket 84, for example of plastic or metal material, is inserted with the function of a scraper to remove any foreign bodies present between the pin 21 and the sleeve 64, which are then expelled through the windows 80 as a result of the movement of the pin 21 with respect to the sleeve 64.

[0047] In operation of the device 10 according to the modifications described above, and with particular reference also to Figures 8a, 8b and 8c, it is initially in its resting configuration shown in Figures 1, 2, 6, 8a. In this configuration, the rod 18 is in its most lowered and spaced position from the plate 68, the first arm 36 of the L-shaped member 38 is oriented transversely to the rod 18, the arms of the pair of arms 42 being arranged parallel to the rod 18, the rolling bearings 49 engage the upper end of the arched grooves 50, and the hooking member 16 is in its fully raised position with respect to the recess 22 of the pin 21, with its hooked end 16a entirely contained within this recess.

[0048] A piece to be subjected to a machining, such as a member S, for example a sheet of metal or other material, is approached to the device 10 from above, with the center of its centering hole H aligned with the general axis of the centering pin 21. The member S is then brought closer to the body 12, until the head end 23a of the pin 21 is engaged in the hole H.

[0049] After passing the head portion 23a, the hole H reaches the first conical section 23b which mainly performs a guiding function of its centering with respect to the pin 21, and continues its descent until it reaches the cylindrical section 23c of the pin 21. Then, the hole H reaches the second conical section 23d to engage an area thereof without any backlash, the dimensions of which correspond exactly to the width of the hole H. In this configuration, the position of the member S self-settles with respect to the pin 21, eliminating any backlash between the edge of its hole H and the respective area of the conical portion 23d. In particular, the side wall of the second conical section 23d of the pin 21 has an inclination such as to allow members S to be locked by the device 10 which are provided with a hole H the diameter of which has a tolerance usually comprised between 0.5 and 10 mm as a function of the axial extension of the centering pin 21 and, in particular, of its conical section 23d.

[0050] After the member S has stopped at an area of the conical section 23d the diameter of which corresponds to that of the hole H, the same member S is subjected to a further movement towards the body 12, as a result of its own weight or of a downward thrust applied thereon, until reaching a stationary position resting on the upper surface 66a of the collar 66 (see Figure 8b).

[0051] During this further movement of the member S, the lower portion 21b of the pin 21 moves towards the body 12 inside the sleeve 64 against the thrust action exerted by the elastic means consisting of the springs 62. Therefore, these springs, whose elastic force is usually comprised in the range between 10 and 30.000 N, depending on the application, undergo a compression which causes a displacement of the lower portion 21b of the pin 21 inside the sleeve 64 towards the plate 60.

[0052] In this configuration, the operation of the control mechanism 14 causes the hooking member 16 to move until it reaches its locking position of the member S.

[0053] In particular, the rod 18 undergoes an upward movement as a consequence of the sliding of the piston 19 in the cylinder 20, or of the operation of the respective electric motor, until it reaches its upper axial end of stroke position, the roller 26, dragged from the connecting element 24, reaches a position in which the push bar 54 of the elastic means 52 contacts its radial surface, and the L-shaped member 38, after having performed a swung about the pin 40, reaches the position shown in Figure 5 where the rolling bearings 49 engage the lower ends of the arched grooves 50. In this configuration, the hooking member 16 is in its fully lowered position in which its hook end 16a protrudes outside the recess 22 to interfere with an edge portion of the hole H, and to apply a thrust on it in the direction of the surface 66a (see Figure 8c), so as to keep the member S locked without any backlash with respect to the body 12.

[0054] Even elements S having a thickness of ± 3 mm with respect to a nominal thickness, can be locked by means of the device 10 of the invention, by virtue of the presence of the elastic compression means 52 which cooperate with the control mechanism 14 and by virtue of the fact that the ends of the shaft 28 are free to slide along the slots of the parallel branches of the element 24, as described in EP-2 626 174-A1.

[0055] In particular, in the locking configuration of the hooking member 16, the bar 54 applies a thrust on the outer surface of the roller 26 and, through the latter, on the shaft 28 which slides along the slots of the parallel branches of the element 24 to axially bias the connecting rods 30 towards the hooking member 16, so as to allow the hooking member 16 to lock indifferently elements S of different thickness, maintaining a high clamping force of the member S and with an irreversible locking effect of the movement of the hooking member 16, due to the toggle mechanism.

[0056] The presence of the sealing gasket 84 inserted in the radial groove 82 of the sleeve 64 with the function of a scraper, when it is provided, allows foreign bodies

penetrated between the pin 21 and the sleeve 64 to be removed, which are expelled from the device 10 through the windows 80, in the case of use of the device 10 in environments contaminated by the presence of considerable amounts of such foreign bodies.

Claims

1. Hook centering and holding device for centering and holding a member (S), particularly a body member or a member for supporting an equipment, provided with at least one centering hole (H), comprising a main body (12) which defines a bearing surface (66a) for said member (S), a hooking member (16) movably mounted in the main body (12) between a resting position spaced from said bearing surface (66a) and at least one locking position close to said bearing surface (66a) in which one end (16a) of the hooking member (16) interferes with an edge of the hole (H) to lock said member (S) with respect to the main body (12), and control means for controlling the movement of the hooking member (16) which include a control mechanism (14) operated by the movement of a rod (18) axially slidable with respect to the main body (12),

characterized in that it comprises a centering pin (21) the outer surface of which has at least one conical section (23d) which diverges towards the main body (12) and has at least one area for the backlash-free engagement of said hole (H), the centering pin (21) being mounted axially slidable with respect to the main body (12) and being biased by elastic thrust means (62) tending to move it away from the main body (12), whereby the member (S) is locked by the hooking member (16) in said locking position as a result of the operation of said control mechanism (14) when the hole (H) is arranged at said backlash-free engagement zone of said diverging conical section (23d) and the member (S) rests on said bearing surface (66a) against the action of said elastic thrust means (62) of the centering pin (21).

2. Device according to claim 1, **characterized in that** said centering pin (21) has a substantially fork shape defined by a pair of parallel branches delimiting, on opposite sides, a recess (22) in which the hooking member (16) is received, and **in that** said elastic thrust means consist of at least one helical spring (62), a first end of which engages a respective seat (58) formed in a portion of the centering pin (21) arranged laterally with respect to said recess (22), the second end of said spring (62) engaging a corresponding seat formed in a plate (60) interposed between the centering pin (21) and the main body (12).
3. Device according to claim 1, **characterized in that** said seat formed in the plate (60) for the second end

of each spring (62) has a tubular portion (61) that extends towards the centering pin (21) and slidably engages a portion of the respective cylindrical seat (58) formed in the centering pin (21), in order to make a telescopic casing of the respective spring (62).

5

4. Device according to claim 2 or 3, **characterized in that** said plate (60) has an elongated opening (76) in which a portion of the hooking member (16) is engaged with clearance. 10
5. Device according to any one of claims 2 to 4, **characterized in that** it comprises a protective slab (72) slidably mounted with respect to the main body (12) to prevent foreign bodies from penetrating inside a cavity (13) of the main body (12), which protective slab (72) has a narrow central opening (78) whose shape corresponds to a cross section of the hooking member (16), to allow the engagement and the transverse sliding of the latter. 15
20
6. Device according to any one of claims 1 to 5, **characterized in that** it comprises shoulder means (66) fast with the main body (12) to limit the movement of the centering pin (21) away from said main body (12) as a result of the action of said elastic thrust means (62). 25
7. Device according to claim 6, **characterized in that** it comprises a sleeve (64) fixed to the main body (12) and surrounding a lower portion (21b) of greater diameter of the centering pin (21), from which an upper portion (21a) of said pin (21) having a smaller diameter extends, which sleeve (64) has a collar (66) at its end farthest from the main body (12), which defines an inner radial projection forming a shoulder for the axial movement of the lower portion (21b) of the centering pin (21) caused by the action of said elastic thrust means (62). 30
35
40
8. Device according to claim 7, **characterized in that** said sleeve (64) has at least one window (80) for expelling foreign bodies that have penetrated between its inner wall and the outer wall of the lower portion (21b) of the centering pin (21). 45
9. Device according to claim 8, **characterized in that** said sleeve (64) is fixed on a plate (68) which is in turn fixed on a top wall of the main body (12). 50
10. Device according to claim 8 or 9, **characterized in that** a radial groove (82) is formed in the inner wall of said sleeve (64), in which a sealing gasket (84) is inserted, having the function of a scraper to remove possible foreign bodies penetrated between the sleeve (64) and the centering pin (21). 55

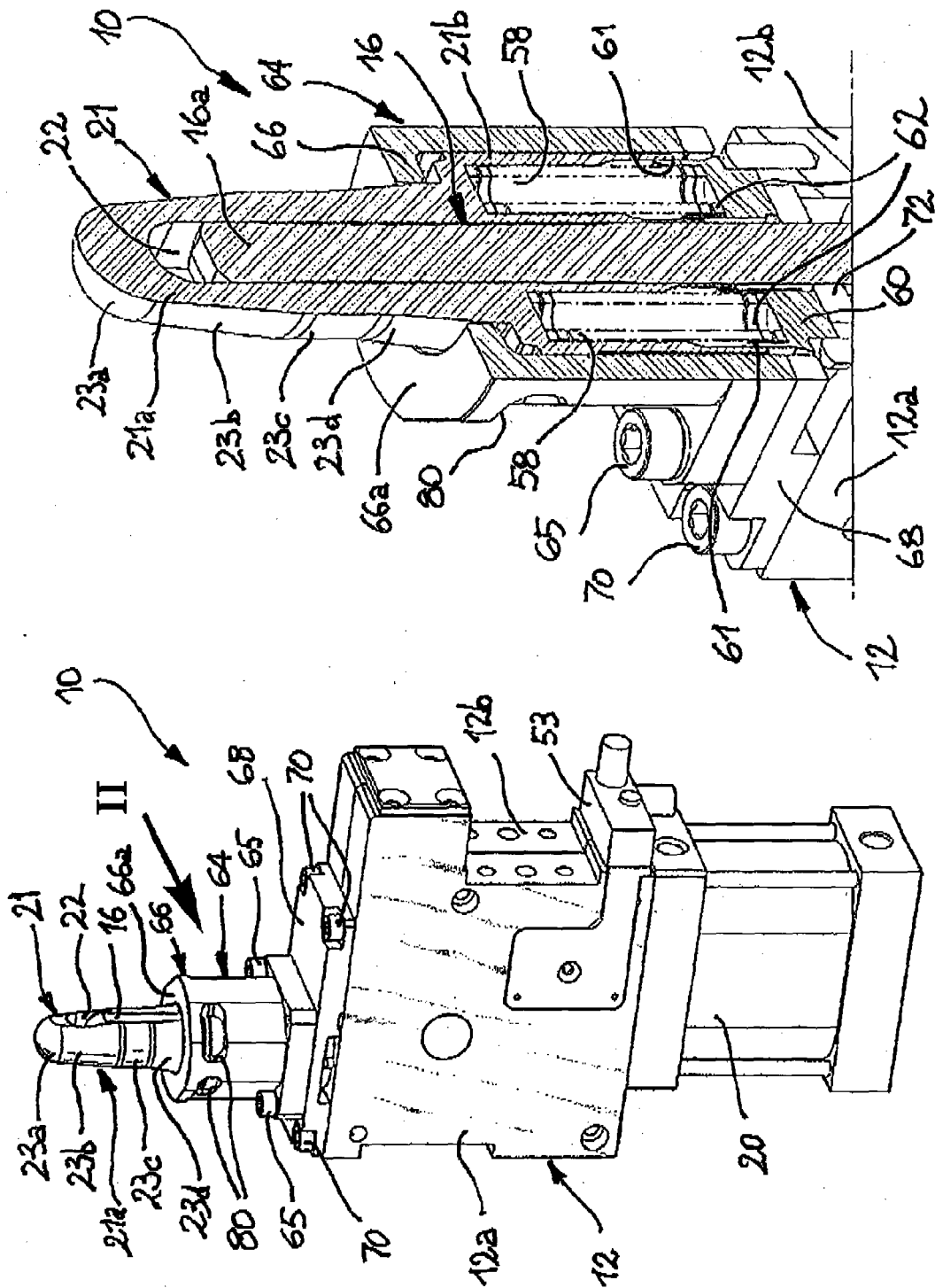


Fig. 2

Fig. 1

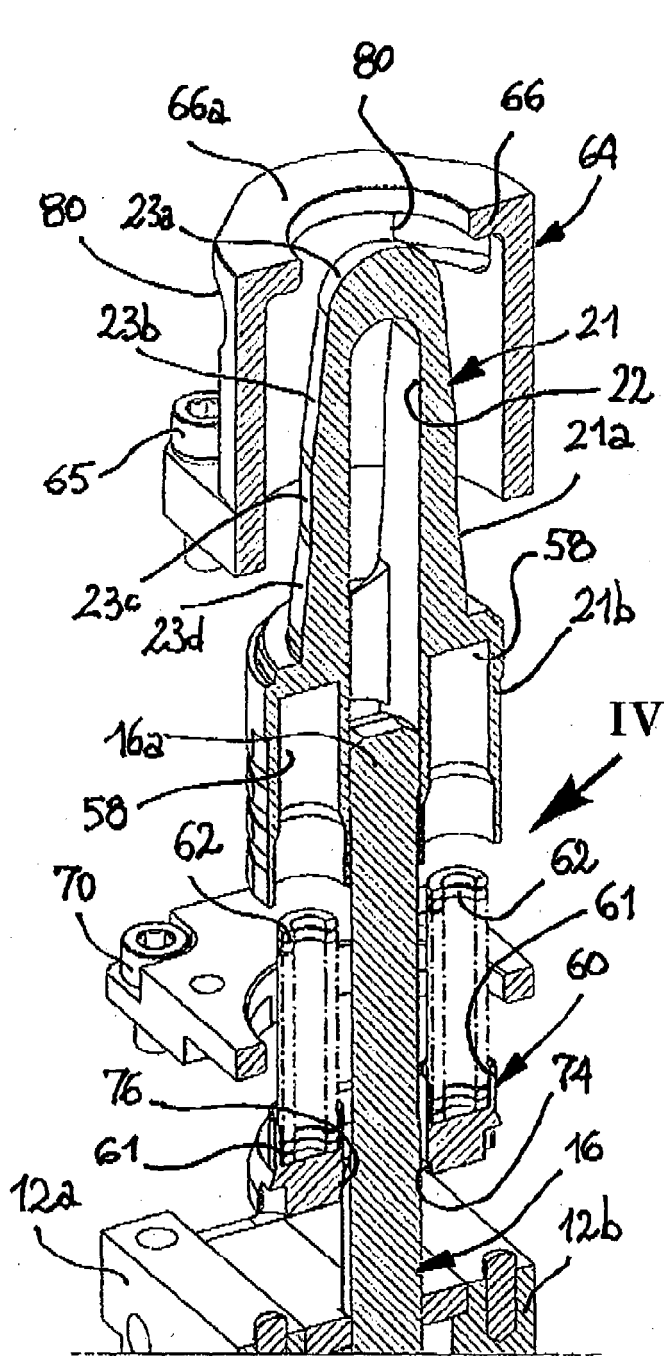


Fig. 3

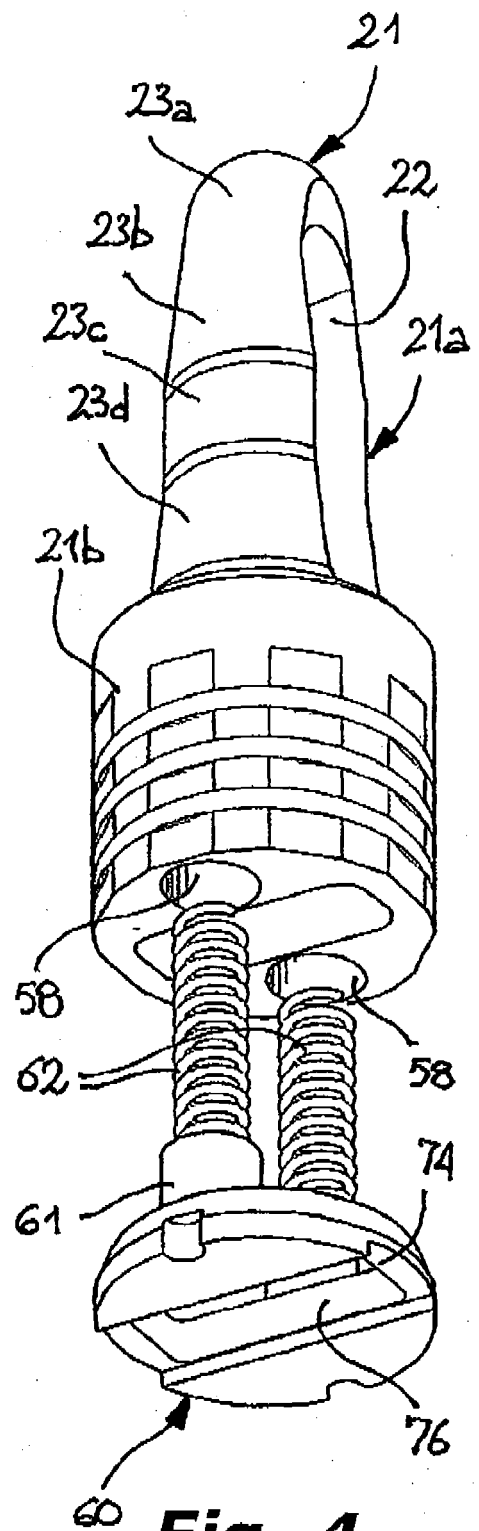


Fig. 4

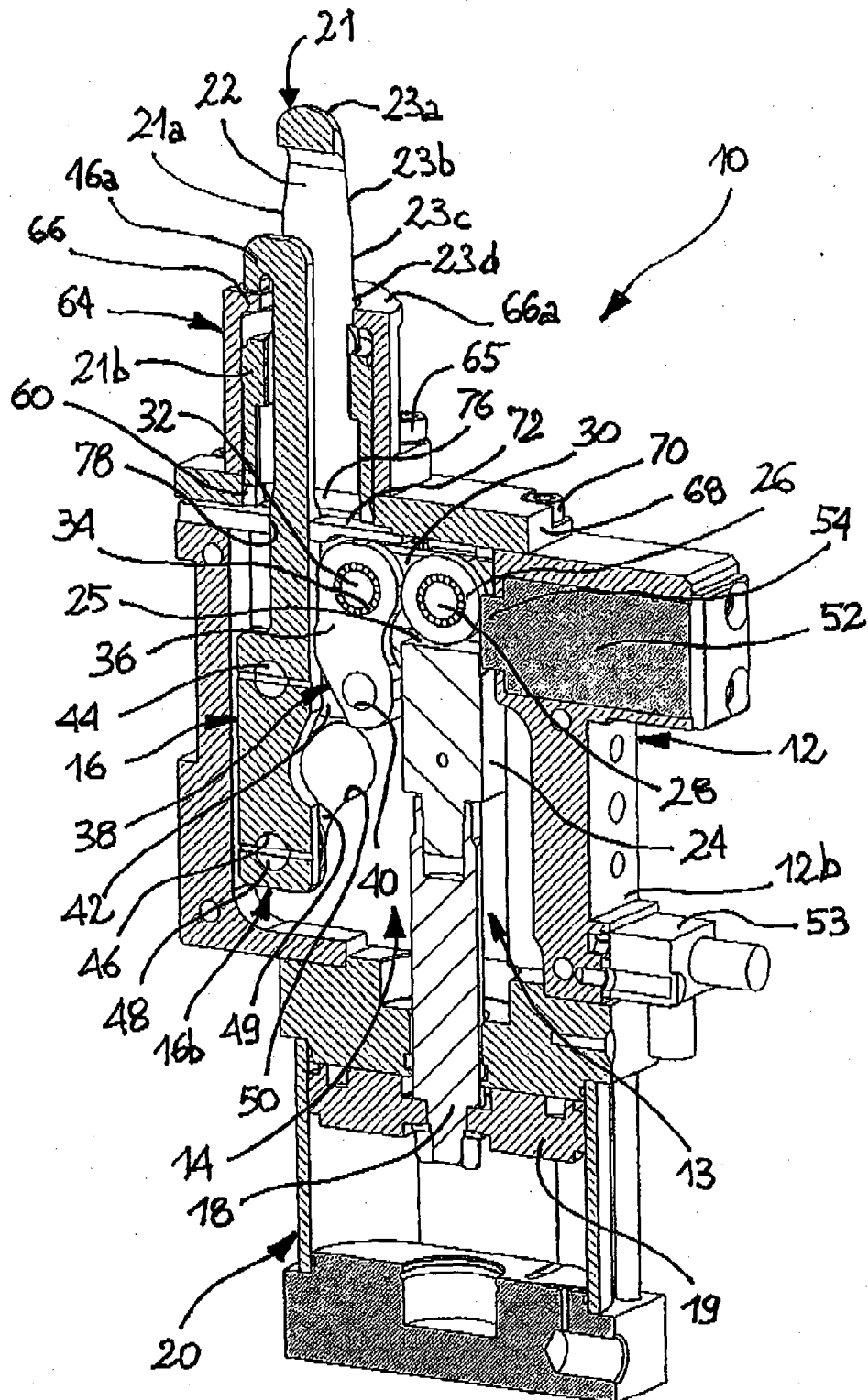
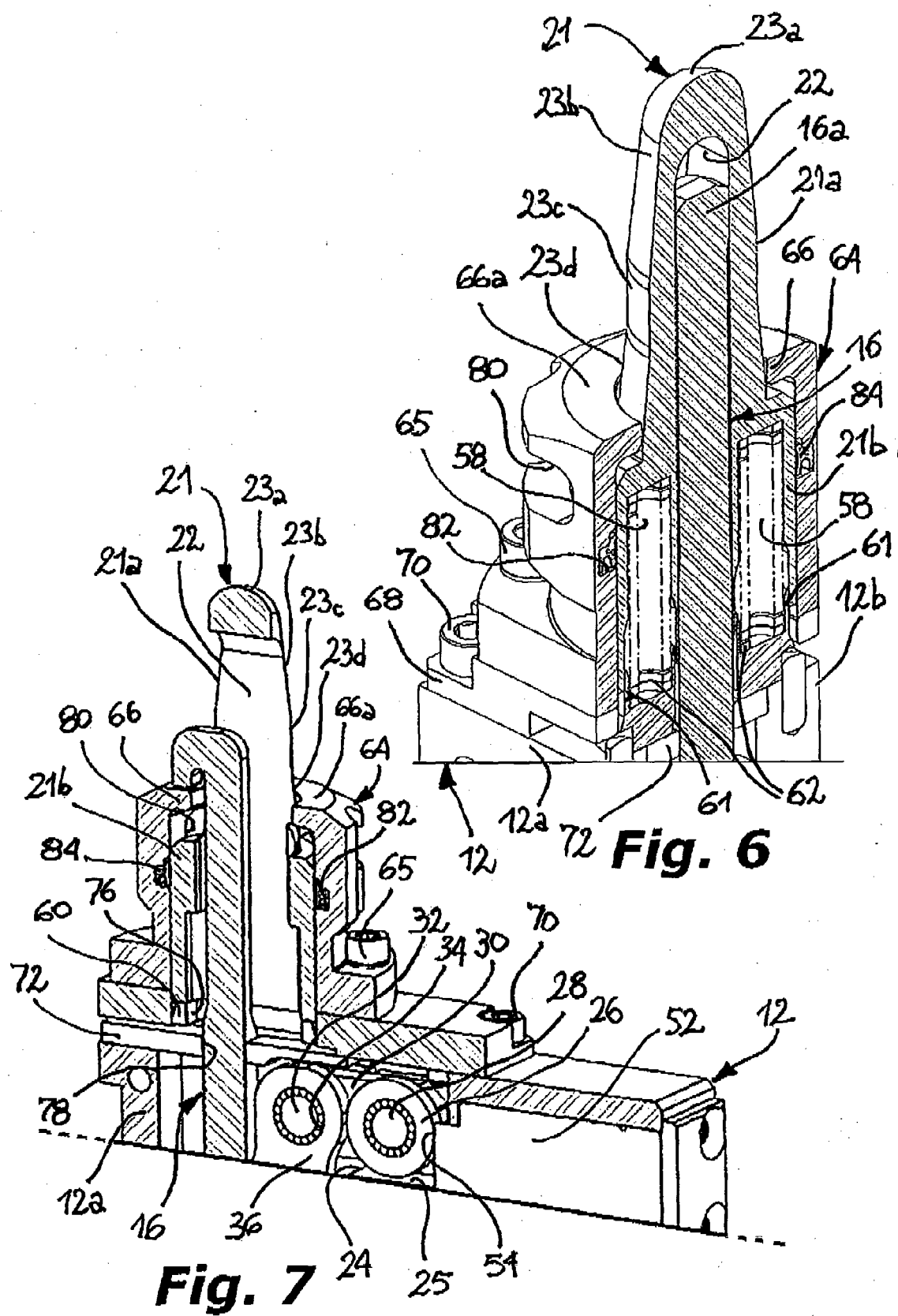
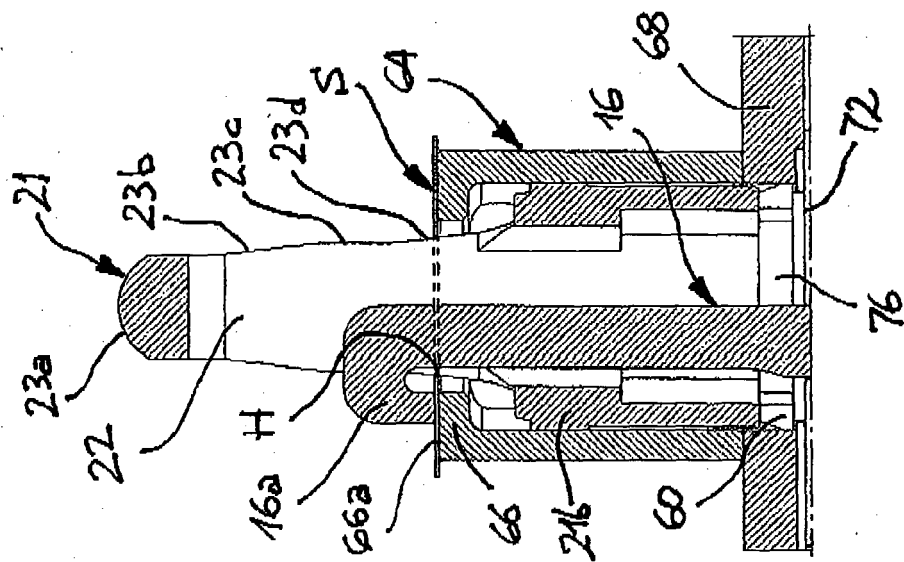
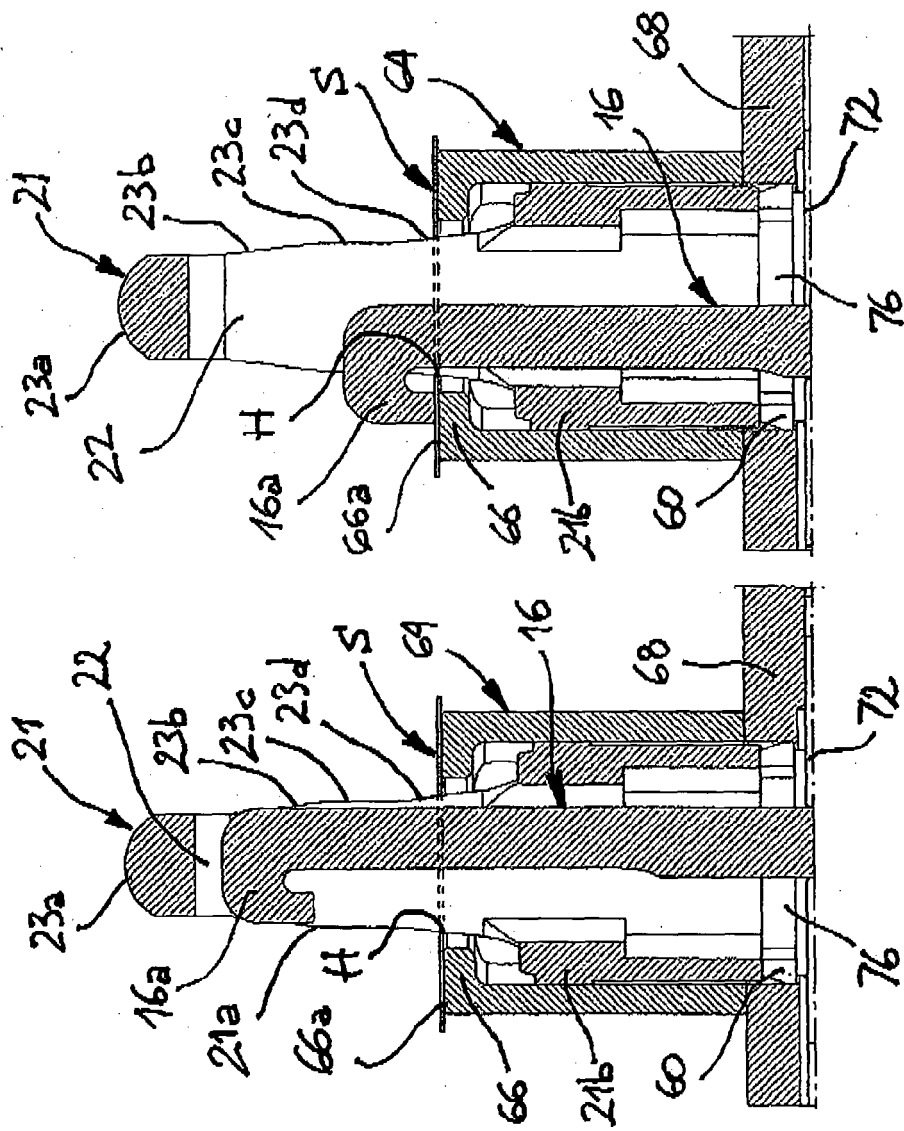
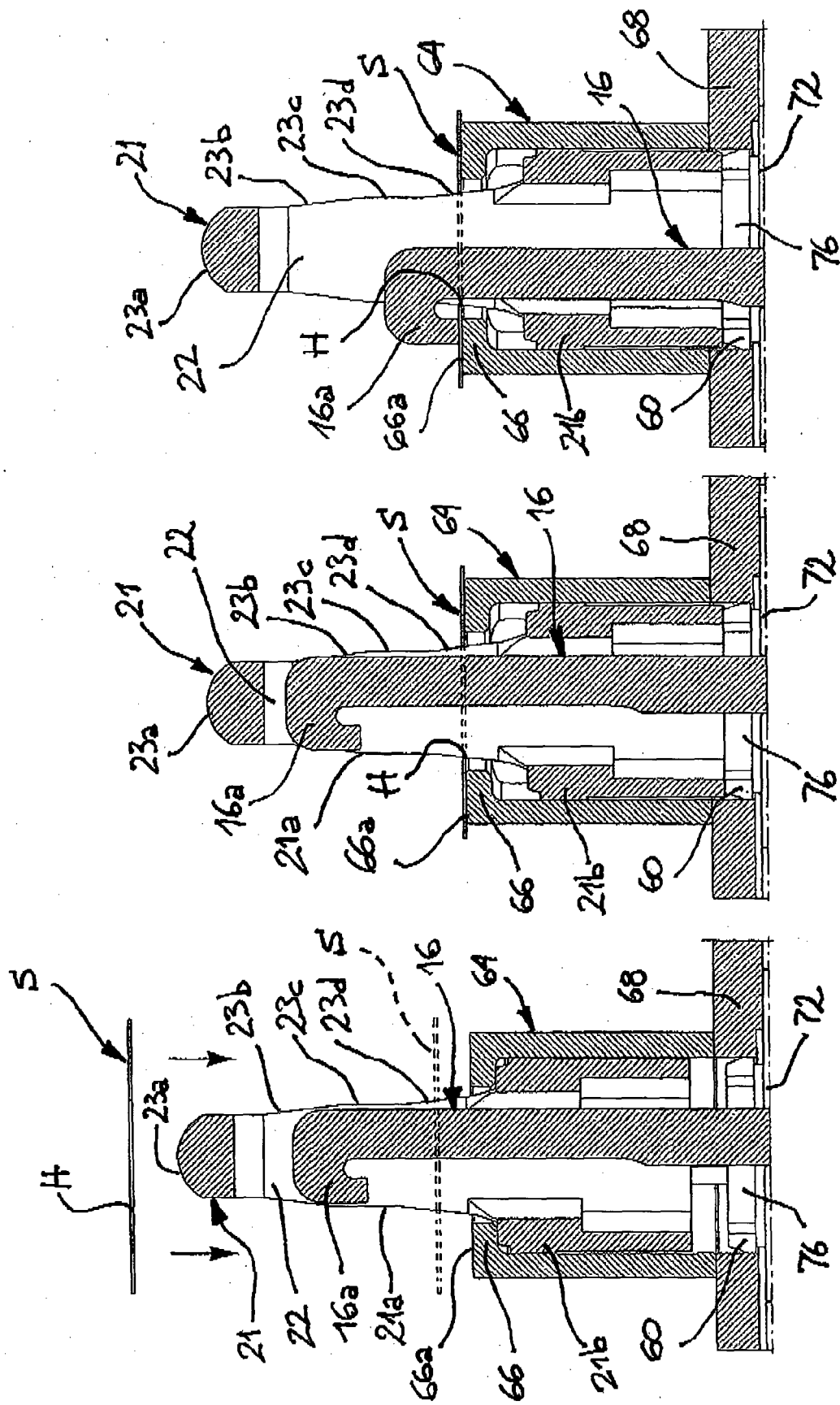


Fig. 5







EUROPEAN SEARCH REPORT

Application Number

EP 22 00 0109

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, D	EP 2 626 174 A1 (VEP AUTOMATION SRL [IT]) 14 August 2013 (2013-08-14) * abstract; figure 1 * -----	1-10	INV. B25B5/16 B25B5/06 B25B5/12
A	JP 2001 300830 A (NISSAN SHATAI CO) 30 October 2001 (2001-10-30) * paragraphs [0017], [0022]; figures 1-5 *	1-10	
A	JP 2008 142803 A (TAIYO TEKKO KK) 26 June 2008 (2008-06-26) * abstract; figures 1-19 * -----	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			B25B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		30 August 2022	Janssens, Gerd
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 00 0109

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

30-08-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2626174 A1	14-08-2013	NONE	
JP 2001300830 A	30-10-2001	JP 3699632 B2	28-09-2005
		JP 2001300830 A	30-10-2001
JP 2008142803 A	26-06-2008	JP 4695057 B2	08-06-2011
		JP 2008142803 A	26-06-2008

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1393861 A1 [0002]
- EP 3412410 A1 [0002]
- EP 2626174 A1 [0004] [0027] [0054]