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(54) **DEVICE FOR HANDLING MECHANICAL COMPONENTS, PARTICULARLY FOR EXTRACTING OR INSERTING VEHICLE COMPONENTS IN THEIR SEAT**

(57) A device (1) for handling mechanical components, particularly for extracting or inserting vehicle components in their seats, comprising a main body (2), a piston (8) which is accommodated in the annular chamber (4) and is movable by translation along the work direction (D) between an inactive position, in which it is closer to the bottom (5) of the annular chamber (4), and an active position, in which it is spaced from it and protrudes partially from the chamber through its open end (6). The device (1) further has hydraulic sealing means (9, 10) that are interposed between the piston (8) and the walls of the annular chamber (4). The sliding of the piston (8) along the work direction (D) away from the

bottom (5) of the annular chamber (4) is actuated by the delivery of pressurized working fluid through the connection port (7) and there are spring means (11, 12) for the return of the piston (8) to the inactive position. The device (1) further comprises an internally threaded bushing (21) that is integral with the piston (8) in the stroke from the inactive position to the active position, which is associated with the main body (2) so that it can translate freely along the work direction (D) at the hole (3) and can be associated with an externally threaded extraction/insertion bar (102), in the inactive position the bushing (21) not protruding from the main body (2) along the work direction (D).

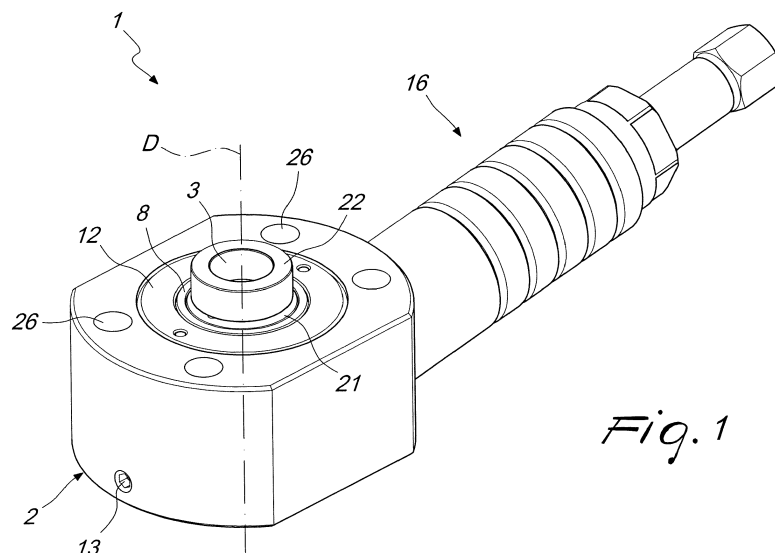


Fig. 1

Description

[0001] The present invention relates to a device for handling mechanical components, particularly for extracting or inserting vehicle components in their seat.

[0002] In the field of car workshop equipment, devices for handling mechanical components, known as "cylinders", are known and are widely used to extract vehicle components that are secured in their seat or to insert said components by forcing in the corresponding seat.

[0003] These devices, for example, are used to extract injectors that are locked in the head of the engine or to insert or extract wheel hubs, bearings or silent blocks in/from the corresponding seats.

[0004] These cylinders are constituted essentially by a main body, which is provided with a through hole along a work direction and with an annular chamber that is co-axial to said hole and has an open side and a bottom that is closed by said body, and by an annular piston, which is accommodated in said chamber and can move along the work direction between an inactive position and an active position. In the inactive position the piston is arranged so that a first face abuts against the bottom of the annular chamber and a second face, arranged opposite the first face, is substantially coplanar with the top of the main body. In the active position, the piston is arranged along the annular chamber so that the second face protrudes from the main body. Moreover, there are means for supplying a pressurized working fluid between the bottom of the annular chamber and the piston in order to actuate its movement along the work direction between the inactive position and the active position and there is a return spring for repositioning the piston in the active position in the absence of delivery of working fluid.

[0005] To extract injectors from the engine head, for example, these cylinders are used in association with a conventional bridge-like extraction apparatus with threaded extraction bar. The extraction bar is screwed to the injector and the cylinder is arranged on the cross-member of the extraction bridge, with the open side of the annular chamber directed upwardly and so that the extraction bar passes through the corresponding hole. A nut is screwed along the upper end of the extraction bar that protrudes above the main body until it abuts against the piston, which in the inactive position faces the open side of the annular chamber. By means of the delivery of pressurized working fluid into the annular chamber, the translation of the extraction bar for an extent equal to the stroke imparted to the piston is actuated. If a translation extent that is greater than the stroke of the piston is necessary in order to complete extraction, it is necessary to reposition the nut along the extraction bar and repeat the operation.

[0006] These cylinders of the known type are not devoid of drawbacks, which include the fact that during use it is necessary to keep the extraction bar protruding from the main body in an axial direction, so as to be able to arrange along said bar additional elements for abutment

against the piston, such as threaded nuts or the like.

[0007] This fact increases the axial space occupation of the device during use, limiting its possibilities of use if the spaces available for cylinder insertion are limited.

[0008] Moreover, the use of loose components, such as nuts or the like, which can escape from the operators' hands, falling or even getting lost, makes operations inconvenient.

[0009] The aim of the present invention is to eliminate the drawbacks noted above of the background art, by providing a device for handling mechanical components, particularly for extracting or inserting vehicle components in their seat, that is compact along the work direction, so that it can be used also in situations that have reduced accessible spaces.

[0010] Within this aim, an object of the present invention is to not require the use of additional elements, such as nuts or the like, for the translational actuation of the extraction or insertion bar.

[0011] Another object of the present invention is to be integrable in extraction/insertion apparatuses, so as to be flexible and versatile in use.

[0012] Another object of the present invention is to have a structure that is simple, relatively easy to provide in practice, safe in use and effective in operation as well as relatively low in cost.

[0013] This aim, as well as these and other objects that will become better apparent hereinafter, are all achieved by the present device for handling mechanical components, particularly for extracting or inserting vehicle components in their seats, comprising a main body provided with a through hole extended along a work direction, with an annular chamber that is extended externally to said hole along an axis that is substantially parallel to said work direction and has a closed bottom and an open end that is arranged opposite said bottom and at least one port for connection to means for supplying a pressurized working fluid within said annular chamber arranged proximate to its bottom, a piston which is accommodated in said annular chamber and is movable by translation along said work direction between an inactive position, in which it is closer to the bottom of said annular chamber, and an active position, in which it is spaced from it and protrudes partially from said chamber through its open end, and hydraulic sealing means that are interposed between said piston and the walls of said annular chamber, the sliding of the piston along the work direction away from the bottom of the annular chamber being actuated by the delivery of pressurized working fluid through the connection port and spring means being provided for the return of the piston to the inactive position, characterized in that it comprises an internally threaded bushing that is integral with said piston in the stroke from the inactive position to the active position, which is associated with said body so that it can translate freely along the work direction at said hole and can be associated with an externally threaded extraction/insertion bar, in the inactive position the bushing not protruding from the main body

along the work direction.

[0014] Further characteristics and advantages of the present invention will become better apparent from the detailed description of two preferred but not exclusive embodiments of a device for handling mechanical components, particularly for extracting or inserting vehicle components in their seats, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a first embodiment of a device for handling mechanical components according to the invention;

Figure 2 is an exploded perspective view of the device of Figure 1;

Figure 3 is a top plan view of the device of Figure 1;

Figure 4 is a sectional view, taken along the line IV-IV of Figure 3;

Figure 5 is a top plan view of a second embodiment of the device according to the invention;

Figure 6 is a sectional view, taken along the line VI-VI of Figure 5;

Figure 7 is a front elevation view of an apparatus that comprises the device of Figure 1;

Figure 8 is a sectional view, taken along the line VIII-VIII of Figure 7.

[0015] With particular reference to the figures, the numeral 1 generally designates a device for handling mechanical components, particularly for extracting or inserting vehicle components in their seat.

[0016] The device 1 comprises a main body 2 provided with a through hole 3 that is extended along a work direction D, of an annular chamber 4 that lies externally to said hole along an axis that is substantially parallel to the work direction D and has a closed bottom 5 and an open end 6, arranged opposite said bottom along said axis, and a port 7 for connection to means for supplying a pressurized work fluid, such as hydraulic oil, inside said chamber, which is arranged proximate to the corresponding bottom 5.

[0017] Preferably, the annular chamber 4 and the hole 3 are coaxial.

[0018] The device 1 comprises further a piston 8 that has a tubular shape, is accommodated in the annular chamber 4 and can move by translation along the work direction D between an inactive position, in which it is closer to the bottom 5, and an active position, in which it is spaced from said bottom and protrudes partially from the annular chamber 4 through its open end 6.

[0019] The device is provided further with hydraulic sealing means that are interposed between the piston 8 and the walls of the annular chamber 4 and consist of two sealing rings 9 and 10, which are associated with the opposite faces of the piston 8 at corresponding seats and are adapted to abut against the walls of the annular chamber 4 in the sliding of said piston.

[0020] The sliding of the piston 8 along the work direction D away from the bottom 5 for transition from the

inactive position to the active position is actuated by means of the delivery of pressurized working fluid through the connection port 7 inside the annular chamber 4, between the corresponding bottom 5 and said piston.

[0021] The return of the piston 8 to the inactive position in the absence of delivery of pressurized working fluid is actuated by spring means, which comprise a helical and elastic compression spring 11, which is accommodated along the annular chamber 4 between a shoulder that is defined on said piston and an abutment ring 12 that is screwed to the main body 2 at the open end 6 of said chamber.

[0022] During the return of the piston 8 to the inactive position, the pressurized working fluid that is present in the annular chamber 4 flows through the connection port 7 toward the supply means.

[0023] The main body 2 is provided further with a vent hole 13, which is closed by a closure and is connected to the annular chamber 4 proximate to the corresponding bottom 5 for the evacuation of any air bubbles.

[0024] Advantageously, in order to contain the space occupation along the work direction D of the main body 2 for an equal useful stroke of the piston 8, the connection port 7 has a first portion 14 for connection to the supply means, which is open toward the outside of the main body 2, and a second portion 15 for connection to the annular chamber 4, which has a smaller transverse cross-section than the first portion 14 and leads out at the bottom 5 of said chamber.

[0025] According to a first so-called "mechadraulic" embodiment (Figures 1-4), the supply means consist of a manually actuated pump 16 that is associated directly with the connection port 7.

[0026] In the embodiment shown, the pump 16 is of the type of a conventional screw pump, which is not described in detail since it is of a type that is known to the person skilled in the art.

[0027] In a second so-called "hydraulic" embodiment (Figures 5 and 6), the device 1 is intended to be connected to external supply means, of the type of a conventional electric pump, and there is a removable closure 17 for closing the connection port 7.

[0028] According to the invention, the device 1 has an internally threaded bushing 21 that is integral with the piston 8 in the stroke from the inactive position to the active position and is associated with the main body 2 so that it can translate freely along the work direction D at the hole 3 and can be associated with an externally threaded extraction/insertion bar. In the inactive position of the piston 8, the bushing 21 is completely contained within the hole 3 and does not protrude from the space occupation of the main body 2 along the work direction D.

[0029] In greater detail, the bushing 21 has an annular protrusion 24 that protrudes radially and the piston 8 has a corresponding annular seat 25 against which said protrusion abuts to entrain the bushing 21 in the stroke from the inactive position to the active position.

[0030] Preferably, the bushing 21 is coaxial to the work

direction D and has a longitudinal extension along the work direction that is at most equal to that of the hole 3.

[0031] The main body 2 is constituted by an outer jacket 18, by an inner skirt 19 and by a bottom wall 20 which are mutually blended and define respectively the outer wall, the inner wall and the bottom 5 of the annular chamber 4.

[0032] In the embodiments shown, the skirt 19 and the bottom wall 20 are provided in one piece.

[0033] Conveniently, the skirt 19 has a longitudinal extension along the work direction D that is shorter than the jacket 18, so as to allow the connection between the piston 8 and the bushing 21 at the open end 6 of the annular chamber 4.

[0034] In this manner it is possible to screw directly the extraction/insertion bar to the bushing 21 without requiring the use of additional components and without creating additional space occupations in an axial direction, since the bar can be screwed until it is arranged flush with said bushing.

[0035] In order to facilitate the screwing of the bushing 21 along the extraction/insertion bar there can be an actuation ring 22, which can be associated temporarily with said bushing by means of centering pins 23 and can then be removed during extraction/insertion of the component from/in the corresponding seat so as to not create additional space occupations in an axial direction.

[0036] Advantageously, the device 1 can be used in combination with conventional apparatuses for the extraction/insertion of components from/in the corresponding seats or can be used individually.

[0037] The main body 2 is provided with holes 26 on both mutually opposite faces along the work direction D; only the upper holes for fixing during use to an adequate abutment surface are visible in the figures.

[0038] In use for the extraction of components, such as for example injectors locked in the corresponding seats on the head of engines, the extraction bar is screwed to the injector to be removed and then the device 1, without the bushing 21, is arranged so as to rest against an adapted abutment surface by inserting the extraction bar along the hole 3.

[0039] The bushing 21 is screwed along the extraction bar until it is arranged with the corresponding protrusion 24 in abutment against the corresponding seat 25 provided on the piston 8. To complete screwing, it is possible to use the ring 22, which must then be removed.

[0040] By actuating the stroke of the piston 8 from the inactive position to the active position, extraction of the component is achieved.

[0041] If the useful stroke of the piston 8 is not sufficient to extract the component completely, the bushing 21 is screwed by an additional extent until the corresponding protrusion 24 is returned in abutment against the seat 25 with the aid of the ring 22 and the stroke of the piston 8 is actuated again.

[0042] It should be noted that the extraction bar can be arranged flush with the bushing 21 so as to not pro-

trude above the main body 2 during the execution of the intervention.

[0043] In a preferred solution, the device 1 is incorporated within a conventional bridge-like apparatus 100 for the extraction of injectors I from the corresponding seat on the head of vehicles. This apparatus 100, shown in Figures 7 and 8, comprises at least two supporting feet 101 that can be arranged on the head of the engine, an externally threaded extraction bar 102, which has a first end 103 that can be associated with an injector I to be extracted and a second end 104, which is arranged opposite the first one, for grip and traction thereof, and a crossmember 105 for connecting the feet 101, which is provided with a seat 106 for guiding the axial sliding of the bar 102.

[0044] The device 1 is associated directly with the crossmember 105 and is arranged so that the corresponding hole 3 is coaxial to the guiding seat 106, so that the work direction D coincides with the axis of longitudinal extension of the bar 102.

[0045] The main body 2 can be connected to the crossmember 105 by way of screws inserted in the holes 26 provided in the lower face of said body and not visible in the figures.

[0046] In practice it has been found that the described invention achieves the intended aim and objects and in particular the fact is stressed that the device according to the invention does not require additional spaces with respect to its own space occupation in order to perform the intervention and therefore has greater possibilities of use with respect to known solutions.

[0047] Moreover, the device according to the invention does not require auxiliary components to lock the extraction/insertion bar and therefore is practical to use for operators.

[0048] Not least, the device according to the invention can be used in combination with conventional bridge-like apparatuses, or can be integrated therein, for optimum flexibility in use.

[0049] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

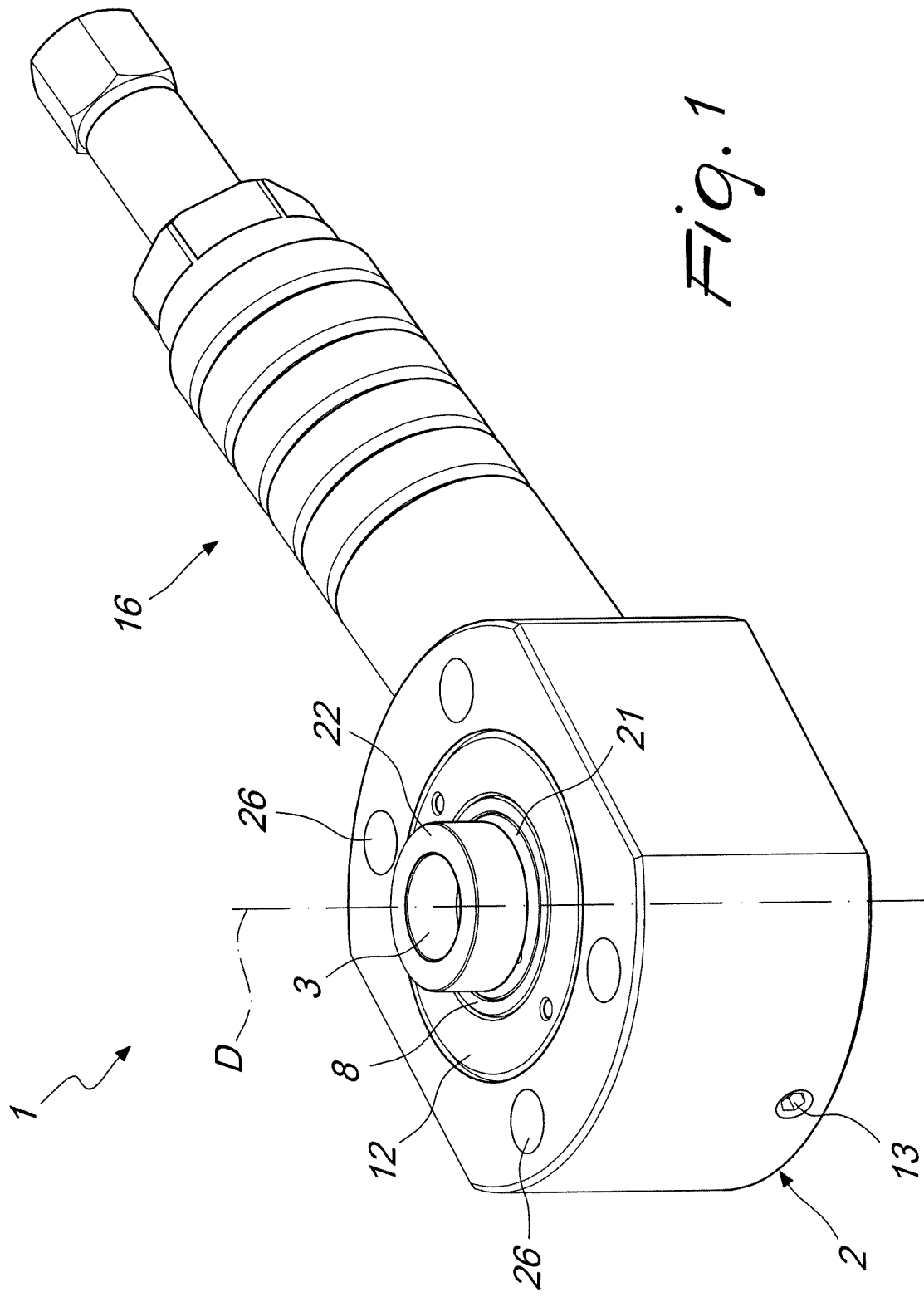
[0050] All the details may further be replaced with other technically equivalent elements.

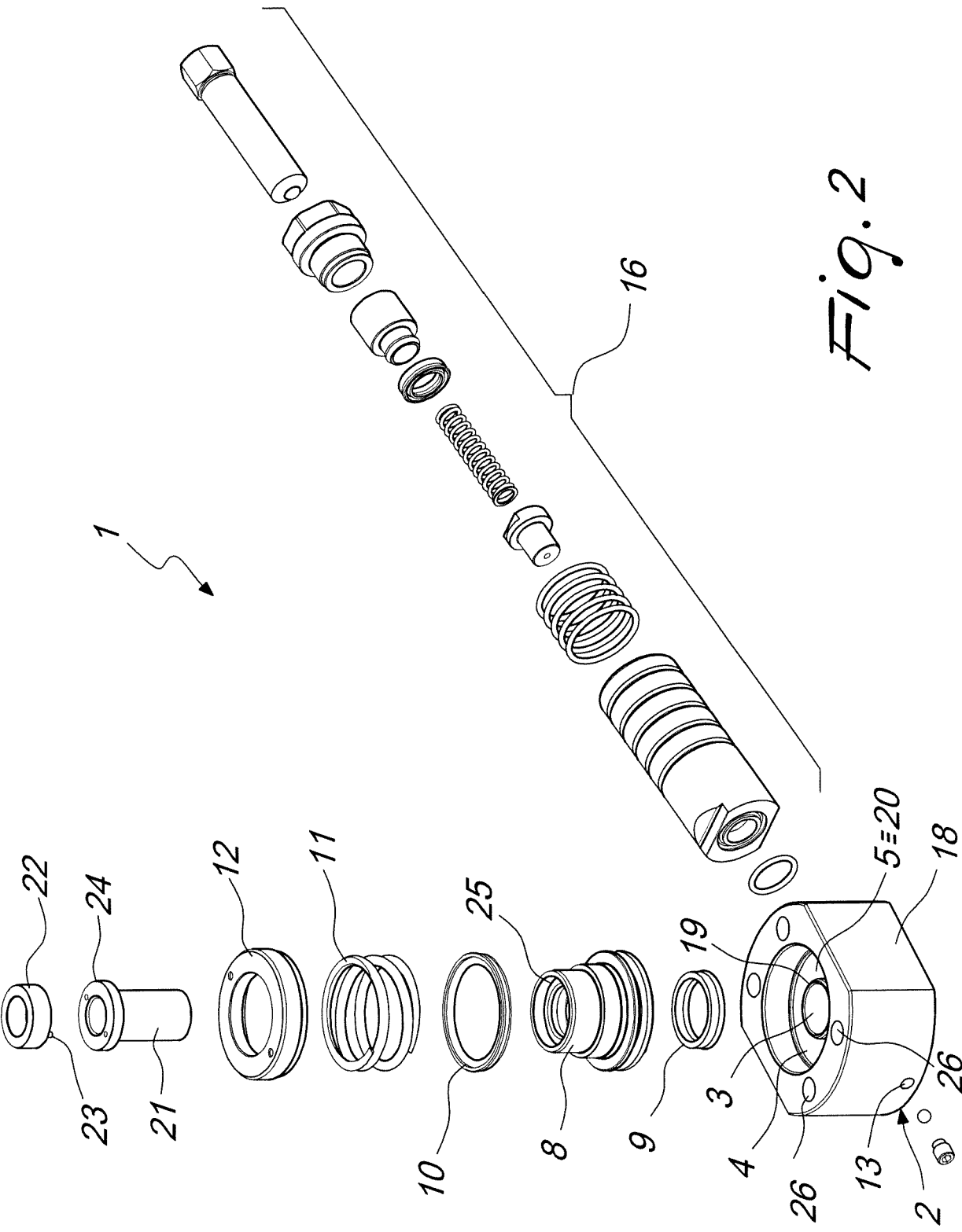
[0051] In practice, the materials used, as well as the contingent shapes and dimensions, may be any according to requirements without thereby abandoning the protective scope of the appended claims.

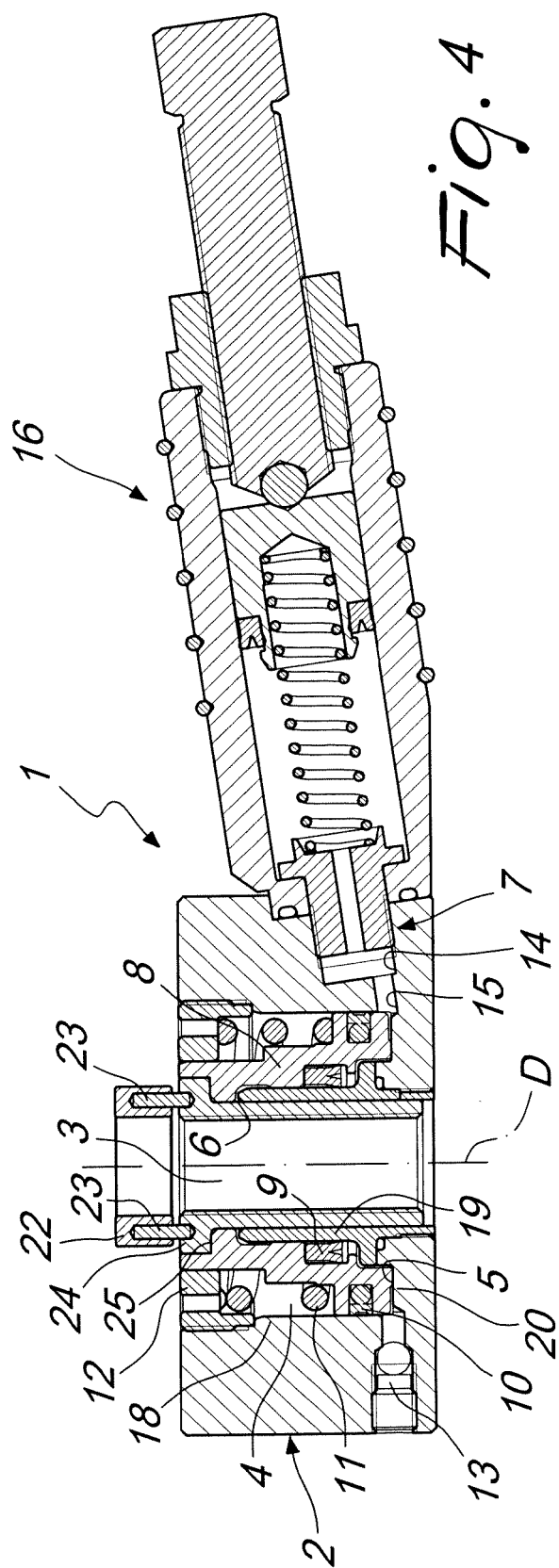
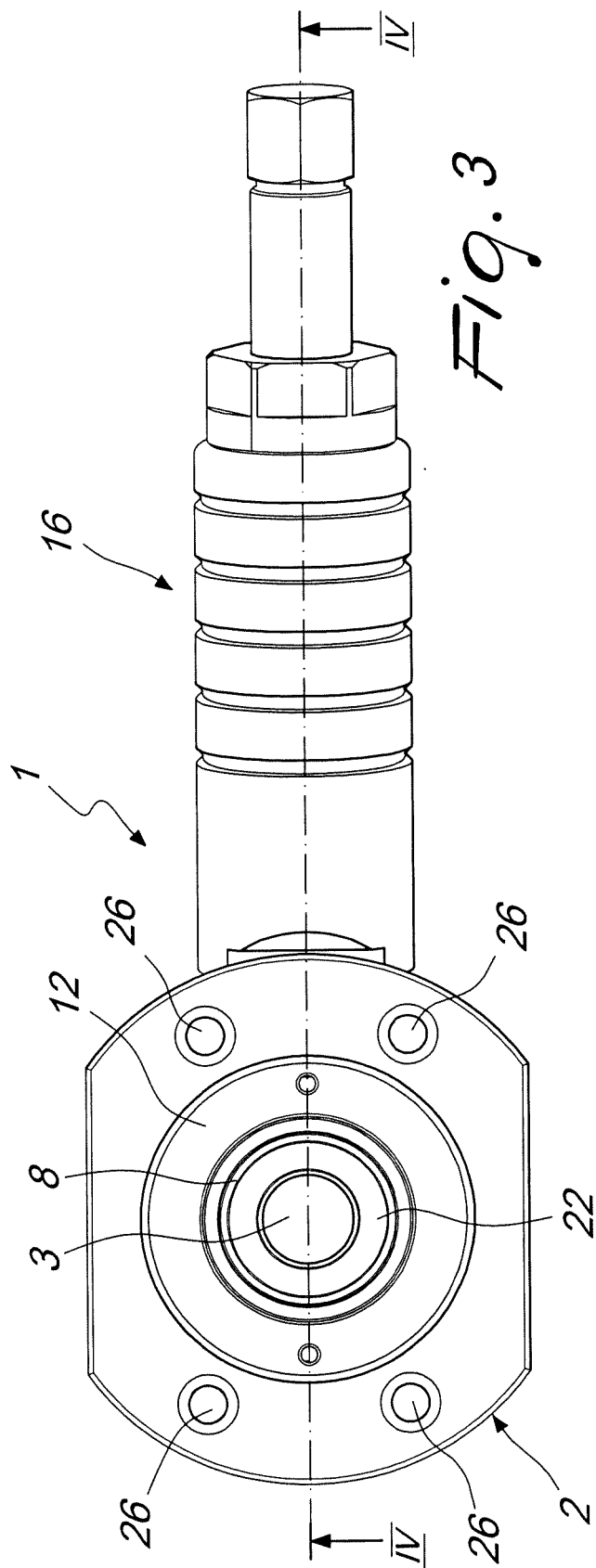
Claims

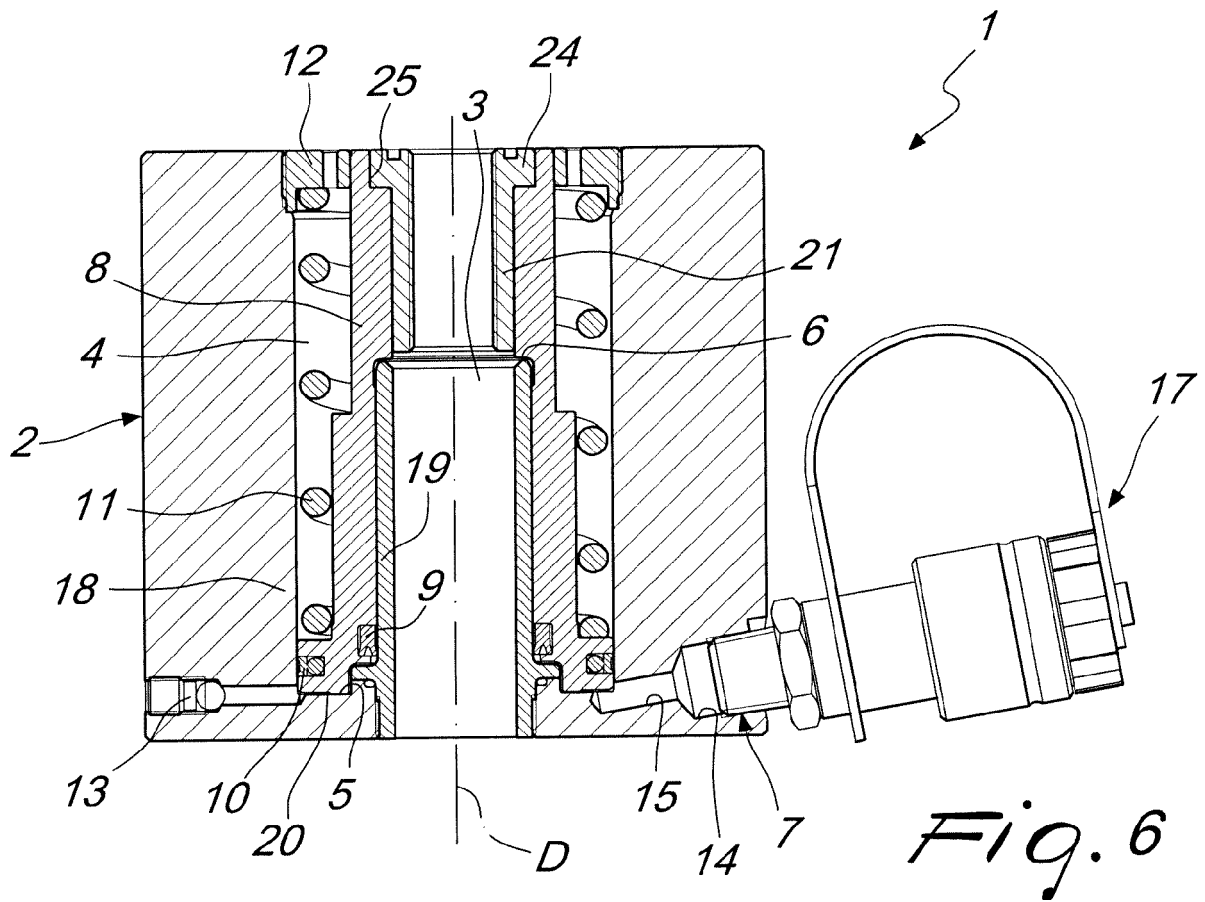
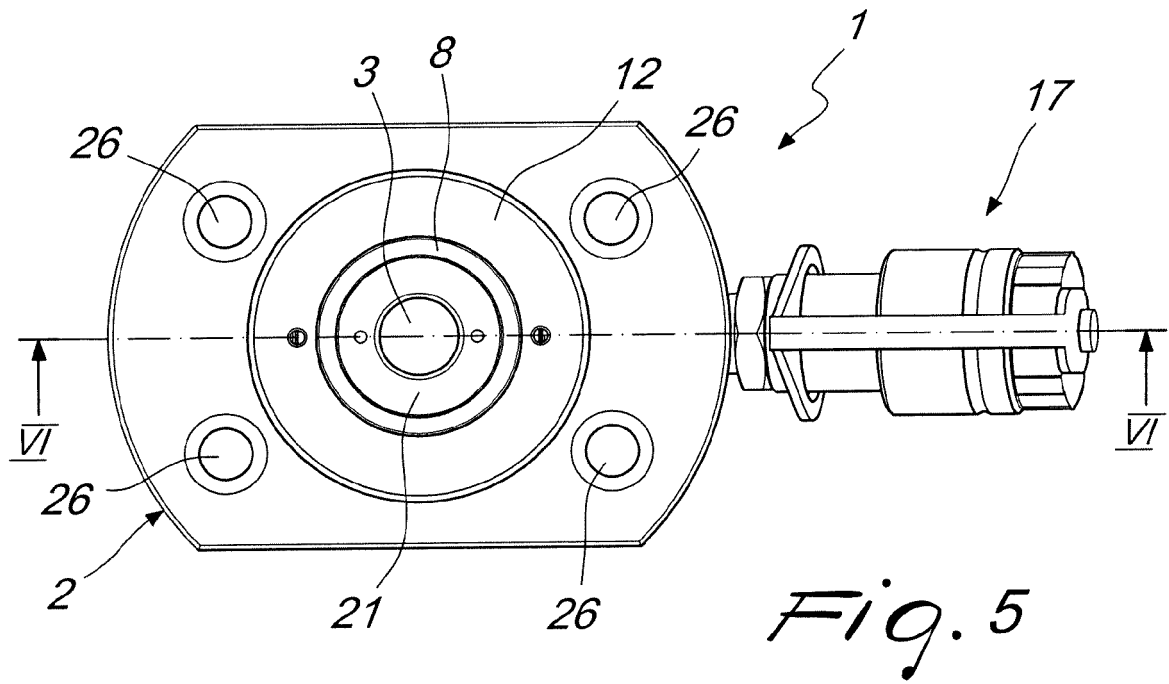
1. A device (1) for handling mechanical components, particularly for extracting or inserting vehicle components in their seats, comprising a main body (2) provided with a through hole (3) extended along a work direction (D), with an annular chamber (4) that is extended externally to said hole

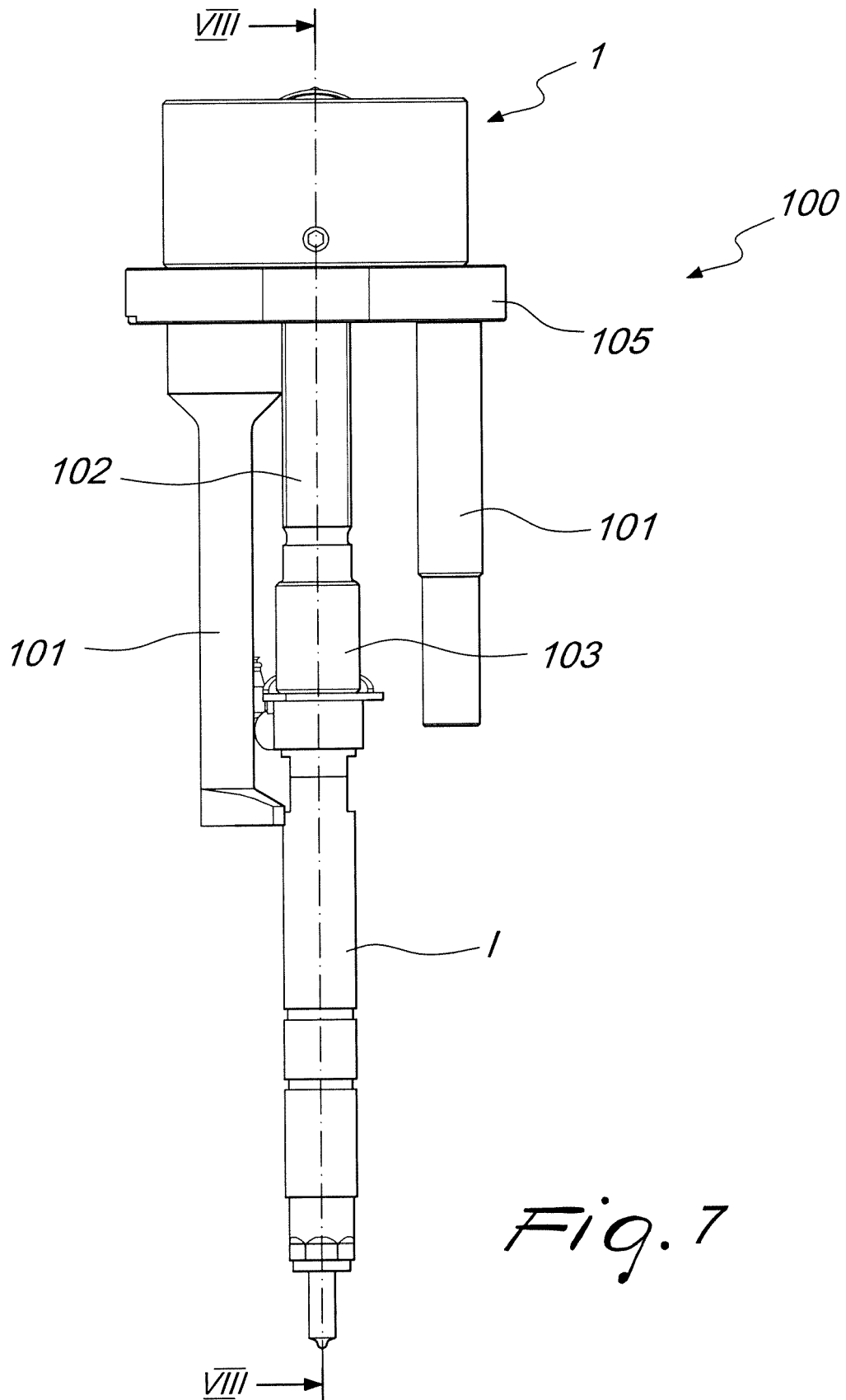
- (3) along an axis that is substantially parallel to said work direction and has a closed bottom (5) and an open end (6) that is arranged opposite said bottom and at least one port (7) for connection to means for supplying a pressurized working fluid within said annular chamber (4) arranged proximate to its bottom (5),
 a piston (8) which is accommodated in said annular chamber (4) and is movable by translation along said work direction (D) between an inactive position, in which it is closer to the bottom (5) of said annular chamber (4), and an active position, in which it is spaced from it and protrudes partially from said chamber through its open end (6),
 and hydraulic sealing means (9, 10) that are interposed between said piston (8) and the walls of said annular chamber (4),
 the sliding of the piston (8) along the work direction (D) away from the bottom (5) of the annular chamber (4) being actuated by the delivery of pressurized working fluid through the connection port (7) and spring means (11, 12) being provided for the return of the piston (8) to the inactive position,
characterized in that it comprises an internally threaded bushing (21) that is integral with said piston (8) in the stroke from the inactive position to the active position, which is associated with said body (2) so that it can translate freely along the work direction (D) at said hole (3) and can be associated with an externally threaded extraction/insertion bar (102), in the inactive position the bushing (21) not protruding from the main body (2) along the work direction (D).
2. The device (1) according to claim 1, **characterized in that** said bushing (21) comprises an annular protrusion (24) that protrudes radially and **in that** said piston (8) comprises an annular seat (25) for the abutment of said protrusion (24) for the translational actuation of the bushing (21) from the inactive position to the active position.
 3. The device (1) according to claim 1 or 2, **characterized in that** said bushing (21) is substantially coaxial to said work direction (D) and has a longitudinal extension along said work direction that is at most equal to that of said hole (3).
 4. The device (1) according to one or more of the preceding claims,
characterized in that said main body (2) comprises an outer jacket (18), an inner skirt (19) and a bottom wall (20), which are mutually associated and define respectively the outer wall, the inner wall and the bottom (5) of said annular chamber (4), the inner skirt (19) having a shorter extension along the work direction (D) than the outer jacket (18), so as to allow connection between the piston (8) and the bushing (2) at the open end (6) of said annular chamber.
 5. The device (1) according to one or more of the preceding claims,
characterized in that it comprises an actuation ring (22) that can be associated temporarily with said bushing (21).
 6. The device (1) according to one or more of the preceding claims,
characterized in that said connection port (7) comprises a first portion (14) for connection to means for supplying pressurized working fluid and a second portion (15) for connection to said annular chamber (4), the second portion (15) having a transverse cross-section that is smaller than that of the first portion (14) and facing at the bottom (5) of said chamber.
 7. The device (1) according to claim 1 or 6, **characterized in that** said supply means comprise a manually actuated pump (16) that is associated directly with said connection port (7).
 8. The device (1) according to claim 1 or 6, **characterized in that** said connection port (7) can be associated with external supply means.
 9. The device (1) according to one or more of the preceding claims,
characterized in that said annular chamber (4) and said hole (3) are mutually substantially coaxial.
 10. An apparatus (100) for extracting injectors from their seat on the head of an engine, comprising at least two supporting feet (101) that can be arranged on said head, an extraction bar (102) that is externally threaded and has a first end (103) that can be associated with an injector (I) to be extracted and a second end (104), which is arranged opposite the first one, for the grip and traction thereof and a cross-member (105) for connecting said feet (101), which is provided with a seat (106) for the sliding guiding of said bar (102), **characterized in that** it comprises a device (1) according to one or more of the preceding claims, in which the corresponding main body (2) is associated directly with said crossmember (105) and is arranged so that the corresponding hole (3) is aligned with said guiding seat (106).

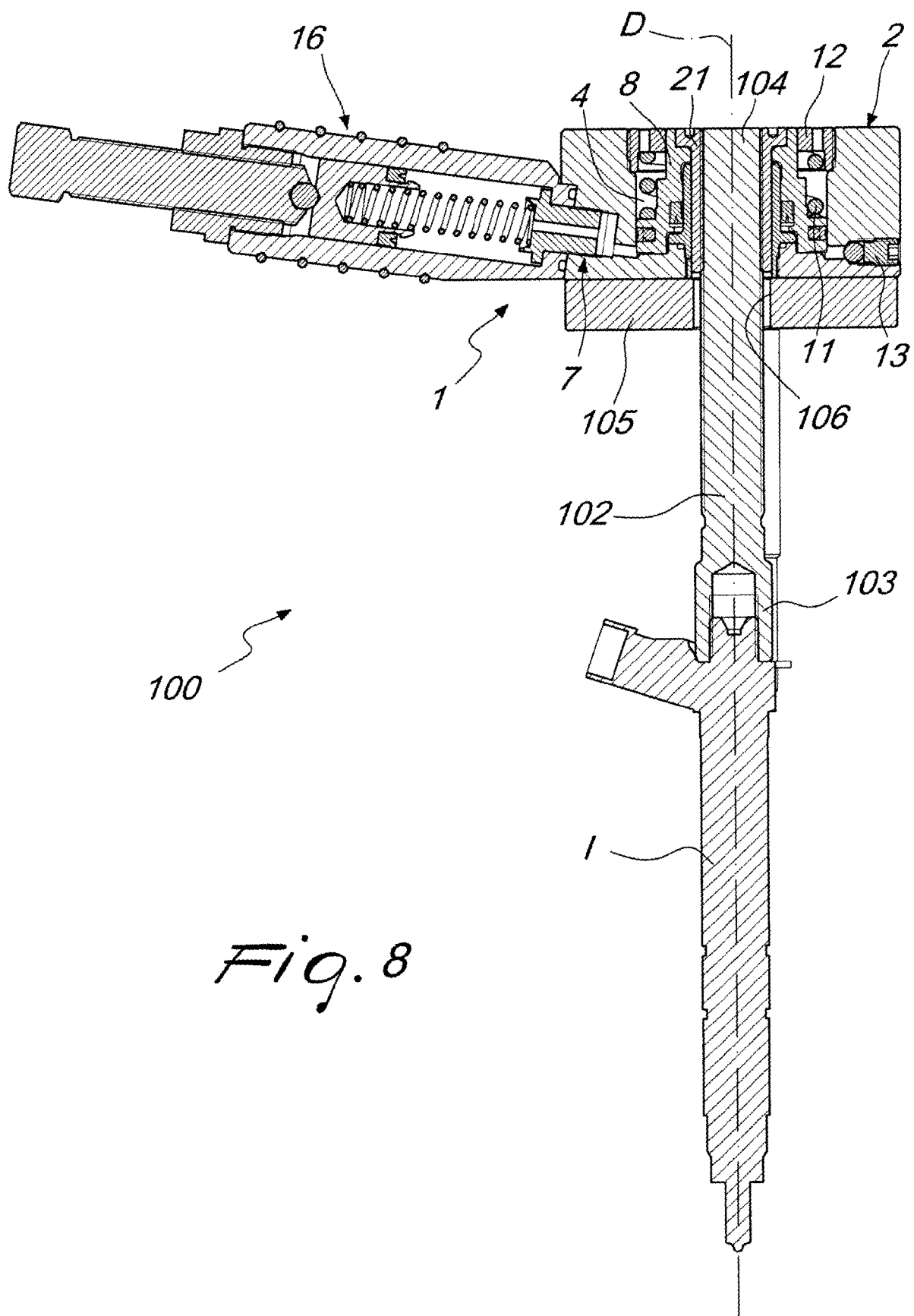














EUROPEAN SEARCH REPORT

 Application Number
 EP 16 42 5007

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 1 684 226 A (CLEVELAND JOHNSON DAVID) 11 September 1928 (1928-09-11) * the whole document * -----	1-10	
A	US 2004/187283 A1 (OSER ADAM [US]) 30 September 2004 (2004-09-30) * paragraphs [0017] - [0021]; figures * -----	1-10	
A	US 2005/278917 A1 (KLANN HORST [DE]) 22 December 2005 (2005-12-22) * paragraphs [0019] - [0037]; figures * -----	1-10	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B25B
Place of search		Date of completion of the search	Examiner
The Hague		12 August 2016	David, Radu
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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