(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 094 413 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
21.07.2010 Bulletin 2010/29

(21) Application number: **07819573.2**

(22) Date of filing: **05.11.2007**

(51) Int Cl.:
B21D 45/00 *(2006.01)*

(86) International application number:
PCT/EP2007/009550

(87) International publication number:
WO 2008/055631 (15.05.2008 Gazette 2008/20)

(54) **PUNCH STRIPPER**

ABSTREIFVORRICHTUNG FÜR STANZE

DÉVÊTISSEUR DE POINÇON

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR

(30) Priority: **06.11.2006 SE 0602363**
06.11.2006 US 856837 P

(43) Date of publication of application:
02.09.2009 Bulletin 2009/36

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EP 2 094 413 B1

Printed by Jouve, 75001 PARIS (FR)

Description

Technical Field

[0001] The present invention relates to a punch stripper and to a punching tool that includes a punch stripper. More particularly, the present invention is directed to a punch stripper that is adapted to be fastened to a punch retainer, which in turn may be mounted in a movable upper tool part of a press.

Background of the Invention

[0002] In the sheet metal forming industry, punching tools are used to punch holes in metal sheets. The punching tool consists primarily of a retainer, a punch and a stripper. The punching tool operates as a closed unit and is often mounted directly in press tools in which the metal sheet is formed, but may also be mounted on shuttles that operate in the press tool to punch holes in different directions.

[0003] The purpose of the punch is to punch a hole in metal sheets. The punches that are used come in different sizes and geometries. Since punches have become frequently used, they have become the subject of standardization. The same is true for the punch retainers used on the punches. The punch is mounted on a punch retainer and is retained in its position through a mechanical lock.

[0004] The retainer itself is mounted in the press tool. In a punching operation, the punching tool, which is located in the upper tool, meets in its downward movement with a static punching die, which is located in the lower tool part. During the downward movement, the stripper meets the metal sheet and makes contact therewith. The punch continues its movement towards the sheet and a hole is punched through the metal sheet. The main purpose of the stripper is to retain the metal sheet in its position during the punching operation, both during the downward movement and during the return movement. Another purpose of the stripper is to support the punch during the punching operation. A large stripping force is required to enable the stripper to pull back the punch after the punching operation without damaging the punched hole.

[0005] The stripping force can be generated by using a resilient part, such as a mechanical spring or an elastically deformable polyurethane element, which is biased against the stripper part. The magnitude of the force is determined by the size and spring constant of the resilient part being employed. Should the punching operation be carried out without a stripper or with too small a stripping force, there is an immediate risk of the metal sheet around the punched hole being deformed during the return movement, since the metal sheet due to friction tends to follow the movement of the punch.

[0006] Within the sheet metal forming industry, requirements are ever increasing, which has led to an increase in production rates. The consequences of this production rate increase are faster press procedures with higher press speeds and shorter idle time between press cycles, in order to maintain a high-level of efficiency. Moreover, longer production runs (up to 2 million is not unusual) have resulted in the operating time of the press tools being increased, which in turn means that more exacting requirements are placed on both the press tools and the types of presses used in the sheet metal forming industry today. Existing presses are designed for considerably higher speeds than the presses used in the industry twenty years ago. Faster press procedures also result in greater wear on the presses, press tools and press tool components, which means that the need for maintenance has to be monitored.

[0007] A consequence of increasing production rates is that punching tool requirements also have become more exacting in order to meet the increased production rates and to minimize maintenance.

The latest trend in the automotive industry is toward an extended use of high-strength sheet metal. By optimizing each individual component of a vehicle with respect to its intended function, it is possible to reduce the weight and the impact on the environment. This trend in the automotive industry also affects the standards for punching tools considering that holes are to be punched in such parts.

[0008] On the existing market, there are two types of punch strippers. A first type has a built-in mechanical spring and a second type has a polyurethane element adapted to generate the stripping force. Both variants are associated with problems and limitations.

[0009] Punch strippers with a mechanical spring operate by the mechanical spring, whose inner diameter is concentric with the outer diameter of the punch body, being mounted between a stripper part and an end part, thus exerting a pressure on the unit. The stripper part has two outer diameters, one at the point of punching and one at the end of the spring. Both surfaces guide the stripper part during its working stroke. The stripper part has a plane, machined surface to prevent it from rotating. The punch stripper is designed as an integrated unit that can be replaced in connection with maintenance. If a larger or smaller stripping force is desired, the springs are replaced. Since needs vary, there are a large number of different springs to choose from. In addition, the user has to know how much force is required for the punching operation. In case of doubt, several spring variants and settings may be needed before the correct force is obtained. A further limitation is the useful life of mechanical springs, which may be slightly too short to meet the increasing demands in the sheet metal forming industry.

[0010] US 6,182,545 B1 discloses different mechanisms for mounting a punch in a punch retainer, wherein the retainer comprises a retainer body in which a locking mechanism is provided for securing a punch relative to the punch retainer. The locking mechanism may comprise a spring-loaded ball that engages a groove in the

punch or a wedge mechanism that is set by means of a screw. The punch retainer of US 6,182,545 B1 is, in turn, adapted to be fixed relative to an upper, moveable tool part.

[0011] The types of punch retainers shown in US 6,182,545 B1 are common on the market. Examples of punch strippers are shown in EP 1 547 703 A1 and US 4,993,295. Punch strippers with a mechanical spring for use with punch retainers of the type disclosed in US 6,182,545 B1 are marketed by, for example, Moeller Manufacturing Company, Plymouth, MI, USA, see www.moellerpunch.com.

[0012] Punch strippers with a polyurethane element operate in a similar manner. They come in two variants. One operates in the same manner as punch strippers provided with a mechanical spring, but instead of a mechanical spring they use a polyurethane element. The other operates by the polyurethane forming the entire punch stripper. The two designs may seem simple, but the polyurethane elements must be adapted to the stripping force required to perform the intended function. Already at the design stage, the user has to know both the length to be used and the dimension/initial load intended to provide the desired force. Depending on the stripping force, there are many sizes to choose from. The useful life of polyurethane elements is generally shorter than that of mechanical springs. Thus, the useful life is a greater limitation for polyurethane. Another limitation is the ability of the polyurethane to withstand repeated stress while maintaining its dimensions, since the material is susceptible to compression set or creep. Therefore, polyurethane elements cannot, without difficulty, accommodate the increased production rate. In addition, the polyurethane element requires more space, since it expands in the radial direction when compressed.

[0013] Another problem that has been found when the polyurethane element is used as a stripper and enters into direct contact with the metal sheet is that particles from the polyurethane element may adhere to the sheet. The particles may have a detrimental effect on the quality of the subsequent application of lacquer, since the adhesive capacity of the ink is reduced in those places where the polyurethane has been in contact with the sheet.

[0014] Examples of punch strippers with a polyurethane element are shown in EP 1 384 535 A1. Punch strippers with a polyurethane element for use with punch retainers of the type disclosed in US 6,182,545 are marketed by, for example, Lane Punch Corporation.

[0015] US 4,292,869 discloses a punch stripper in which a gas spring is used instead of a mechanical spring or a polyurethane element. However, the punch stripper in US 4,292,869 is arranged in a C-shaped part, wherein a first shank forms the upper tool part and contains the punch and punch stripper, and wherein a second shank forms the lower tool part and contains the punching die. A pressure chamber is arranged in the base portion of the C-shaped part, and the punch stripper piston is movable in a gap between an inner sleeve and an outer sleeve. The space between the inner sleeve and the outer sleeve communicates with the pressure chamber through a passage in which an oil-soaked sponge is arranged for the purpose of providing lubrication for the punch stripper piston.

[0016] The punch stripper shown in US 4,292,869 is, however, very bulky and therefore difficult to use in modern standardized press tools.

[0017] US 4,316,399 discloses a punch stripper in which the punch stripper piston is sealed with respect to the punch and to an outer sleeve. The chamber in which the punch stripper piston is movable is connected to an external pressure source. In this punch stripper, the retainer, punch and stripping part are formed as one unit.

[0018] A consequence of this design, due to the seal against the punch, is an increased risk of gas leakage. In connection with maintenance and punch replacement, the gas has to be discharged before the punch can be dismantled.

[0019] Thus, the punch stripper shown in US 4,316,399 is too bulky and difficult to use in modem standardized press tools.

[0020] EP 0 622 135 B1 discloses a punch tool with a punch stripper containing a gas spring and which is intended for mounting in a turret punching press.

[0021] EP 0 646 427 B1 discloses a further development of the punch stripper shown in EP 0 622 135 B1.

[0022] The punch strippers shown in EP 0 622 135 B1 and EP 0 646 427 B1 are adapted to be mounted in an axial bore in a turret punching press, in the manner shown in EP 0 611 188 B1. In this kind of mounting, the punch stripper itself is resiliently suspended, by means of a lifting spring, relative to an upper tool part. The purpose of the lifting spring is to lift the whole assembly including punch and punch stripper from the work piece. A separate stripping spring provides the force required to achieve stripping of the work piece from the punch. The gas chambers occurring in EP 0 622 135 B1 and EP 0 646 426 B1 have a stripping function only. Furthermore, the punch strippers shown in EP 0 622 135 B1 and EP 0 646 427 B1 have a punch head which is actuated by an upper tool part of the press only during the actual punching operation.

[0023] The punch strippers shown in EP 0 622 135 B1 and EP 0 646 426 B1 cannot be used for the kind of punching presses shown in US 6,182,545 B1.

[0024] There is a need for a compact punch stripper, which can be used as an alternative or complement to the punch strippers presently available on the market.

Summary of the Invention

[0025] The present invention relates to an improved punch stripper and punching tool that includes a punch stripper. In particular, the present invention is directed to a punch stripper that is adapted to be fastened to a punch retainer, which punch retainer can be mounted in a mov-

able upper tool part of the press.

[0026] In accordance with the present invention, a punch stripper is provided which is adapted to be fastened to a punch retainer in a press tool. The punch retainer comprises a punch stripper piston and a pressure chamber adapted to spring-load the punch stripper piston. The pressure chamber is defined by a gap between an inner sleeve and an outer sleeve. The punch stripper piston has a portion that is axially displaceable in the gap. Substantially, the whole pressure chamber is located within the outer sleeve. As defined herein, "substantially the whole pressure chamber" means the space that forms the pressure chamber, excluding any ducts for charging/discharging gas or for interconnection with other, similar punch strippers. By using a pressure chamber, a larger initial force can be obtained. The larger force can be used to improve the punch performance in high-strength sheet metal; however, this is not required. By employing gas spring technology and forming the pressure chamber between the inner sleeve and the outer sleeve assembly, a more compact assembly than existing assemblies can be obtained; however, this is not required. The more compact assembly is advantageous since there is often little available space in today's press tools. By regulating the pressure in the chamber, the stripping force required can be easily altered and a minimal number of variants of the punch stripper can be achieved; however, this is not required. In addition, the use of gas spring technology can enhance punching process reliability, since, it allows for the provision of a larger stripping force and a better way of ensuring that the punching operation is carried out adequately and with the desired quality; however, this is not required. Moreover, the massive generation of force caused by mechanical springs can be avoided; however, this is not required. The use of the gas spring technology of the present invention allows inclined holes and contours to be punched with the same reliability and quality as a traditional punch stripper having a straight contour, since a gas spring-based punch stripper withstands a side load generated by an angle of up to 10°, and under certain conditions up to about 15-20°, and has the same useful life as when used for punching straight holes; however, this is not required. By causing the punch stripper piston to act on a pressure chamber, improved absorption of the shock force generated when the punch pierces the work piece can be obtained; however, this is not required.

[0027] Further, in accordance with the present invention, the pressure chamber has a guide portion, in which the displaceable portion is movable, and a chamber portion, which is axially separated from the guide portion and which has a larger cross-sectional area than the guide portion; however, this is not required. By use of this configuration, the required volume of the pressure chamber can be obtained while allowing the outer dimensions of the punch stripper to be reduced to a minimum.

[0028] In accordance with still another alternative of the present invention, the outer sleeve may have a first portion with a first, essentially constant inner cross-section, which forms a boundary surface of the guide portion, and a second portion with a second inner cross-section, which is greater than said first inner cross-section and which forms a boundary surface of the chamber portion; however, this is not required. Thus, an outer sleeve with an annular cross-section may have a constant outer diameter and varying inner diameter, i.e., varying wall thickness; however, this is not required. Alternatively, or as a complement, the outer sleeve may have a varying outer diameter too; however, this is not required. For example, the outer sleeve may have an essentially constant wall thickness, but a chamber portion with a greater inner cross-sectional area, and a guide portion with a smaller cross-sectional area; however, this is not required.

[0029] In accordance with yet another alternative aspect of the present invention, the inner sleeve may have a first portion with a first, essentially constant outer cross-section, which forms a boundary surface of the guide portion, and a second portion with a second outer cross-section, which is smaller than said first outer cross-section, and which forms a boundary surface of the chamber portion; however, this is not required. Thus, an inner sleeve with an annular cross-section may have a constant inner diameter and varying outer diameter; however, this is not required. Alternatively, or as a complement, the inner sleeve may have a varying inner diameter too; however, this is not required. For example, the inner sleeve may have an essentially constant wall thickness, but a first portion with a greater outer cross-sectional area and a second portion with a smaller outer cross-sectional area; however, this is not required. The inner sleeve may be fixed relative to the punch; however, this is not required. The outer sleeve may be fixed relative to the punch; however, this is not required. The portion of the punch stripper piston that is displaceable in the gap may be sealed with respect to the inner sleeve and/or the outer sleeve; however, this is not required.

[0030] In accordance with still yet another alternative aspect of the present invention, the punch stripper may include a pressure indicating arrangement to indicate a pressure in the pressure chamber; however, this is not required. This makes it possible to avoid a lack of pressure or an incorrect pressure in the punch stripper; however, this is not required. Moreover, it is possible to determine whether the punch stripper can be safely dismantled; however, this is not required. The pressure indicating arrangement may be adapted to indicate that the pressure in the pressure chamber exceeds and/or falls below a predetermined value; however, this is not required. The pressure indicating arrangement may be formed integrally with the punch stripper, for example with the outer sleeve and/or with a base portion; however, this is not required. The pressure indicating arrangement may comprise a spring-loaded part, which is visible from an outside of the punch stripper; however, this is not required.

[0031] In accordance with another alternative aspect

of the present invention, there is provided a press tool that includes a punch fastened to a punch retainer and a punch stripper that are fastened to the punch retainer; however, this is not required. In the press tool, the punch retainer may be fastened to a stroke part of the press tool; however, this is not required. As defined herein, "stroke part" means the part that causes the pressing motion, i.e., the piston of an eccentric press or a hydraulic press, or the runner of a screw press.

[0032] In accordance with still another alternative aspect of the present invention, there is provided a press tool that includes at least two punch strippers; however, this is not required. In one non-limiting embodiment, the respective pressure chambers of the at least two punch strippers may be in fluid communication with one another in order to maintain substantially the same pressure in the respective pressure chambers of the at least two punch strippers; however, this is not required. The advantage of this arrangement is that an operator only has to charge the gas in one place without dismantling the punch stripper from the retainer; however, this is not required. Furthermore, when the stripping force needs to be adjusted, the gas pressure can be regulated in all punch strippers at the same time in a simple and flexible manner; however, this is not required.

[0033] In accordance with yet another alternative aspect of the present invention, there is provided a punch stripper that is adapted to be fastened to a punch retainer in a press tool; however, this is not required. The punch stripper includes a punch stripper piston and a pressure chamber adapted to apply a spring-load to the punch stripper piston; however, this is not required. The punch stripper includes a pressure indicating arrangement to indicate a pressure in the pressure chamber; however, this is not required. In accordance with yet another alternative aspect of the present invention, there is provided a punch stripper disclosed above, or any other arbitrary design, provided that a pressure chamber is used to achieve the spring load; however, this is not required. Examples of such an arrangement that can be used in the present invention are disclosed in US 4,292,869, US 4,316,399, EP 0 622 135 B1 or EP 0 646 427 B1.

[0034] In another alternative aspect of the present invention, there is provided a punch stripper adapted to be fastened to a punch retainer of a press tool, which punch stripper includes a punch stripper piston and a pressure chamber. The pressure chamber is adapted to spring-load the punch stripper piston. The pressure chamber is at least partially defined by a gap between an inner sleeve and an outer sleeve in the punch stripper. The punch stripper piston includes a displaceable portion that is axially displaceable in the gap of the pressure chamber. Substantially, the whole pressure chamber is located between the inner and outer sleeve of the punch stripper. The pressure chamber includes a guide portion in which the displaceable portion is movable therein. The chamber portion of the pressure chamber is axially separated from the guide portion of the pressure chamber. The chamber portion of the pressure chamber has a larger cross-sectional area than the guide portion. In another alternative aspect of the invention, the outer sleeve has a first portion with a first, substantially constant inner cross section, which forms a boundary surface of the guide portion, and a second portion with a second inner cross section, which is greater than the first inner cross section, and which forms a boundary surface of the chamber portion; however, this is not required. In still another alternative aspect of the invention, the inner sleeve has a first portion with a first, substantially constant outer cross section, which forms a boundary surface of the guide portion, and a second portion with a second outer cross section, which is smaller than the first cross section, and which forms a boundary surface of the chamber portion; however, this is not required. In yet another alternative aspect of the invention, the inner sleeve is fixed relative to the punch; however, this is hot required. In still yet another alternative aspect of the invention, the outer sleeve is fixed relative to the punch; however, this is not required. In another alternative aspect of the invention, the portion of the punch stripper piston that is displaceable in the gap is sealed with respect to the inner sleeve and/or the outer sleeve; however, this is not required. In still another alternative aspect of the invention, the punch stripper piston includes an arrangement to prevent it from rotating relative to the inner sleeve and/or the outer sleeve; however, this is not required. In yet another alternative aspect of the invention, there is proved an arrangement to indicate a pressure in the pressure chamber; however, this is not required. In still yet another alternative aspect of the invention, the pressure indicating arrangement is adapted to indicate that the pressure in the pressure chamber exceeds and/or falls below a predetermined value; however, this is not required. In another alternative aspect of the invention, the pressure indicating arrangement is formed integrally with the punch stripper; however, this is not required. In still another alternative aspect of the invention, the pressure indicating arrangement includes a spring-loaded part which is visible from an outside of the punch stripper; however, this is not required. In yet another alternative aspect of the invention, there is provided a press tool that includes a punch fastened to a punch retainer and a punch stripper that are fastened to the punch retainer, and the punch retainer is fastened to a stroke part of the press tool; however, this is not required. In another alternative aspect of the invention, the press tool includes at least two punch strippers; however, this is not required. In still another alternative aspect of the invention, the pressure chambers of at least two punch strippers are in fluid communication with one another in order to maintain substantially the same pressure in the pressure chambers of the at least two punch strippers; however, this is not required. In still another alternative aspect of the invention, there is provided a punch

[0035] stripper that is adapted to be fastened to a punch retainer of a press tool that includes a punch stripper piston, and a pressure chamber adapted to spring-

load the punch stripper piston; however, this is not required. An indicating arrangement can be provided to indicate a pressure in the pressure chamber; however, this is not required. In yet another alternative aspect of the invention, the indicating arrangement is adapted to indicate whether the pressure in the pressure chamber exceeds and/or falls below a predetermined value; however, this is not required. In still another alternative aspect of the invention, the indicating arrangement is an integral part with the punch stripper; however, this is not required. In yet another alternative aspect of the invention, the indicating arrangement includes a spring-loaded part which is visible from an outside of the punch stripper; however, this is not required.

[0036] One object of the present document is to provide an improved punch stripper.

[0037] Another object of the present invention is to provide a punch stripper that can be used as an alternative or complement to the punch strippers presently available on the market.

[0038] Still another object of the present invention is to provide a punch stripper that minimizes the risk of errors and the risk of damage to equipment and personnel in the vicinity of the punch stripper.

[0039] Yet another object of the present invention is to provide a punch stripper that can be used together with punch retainers of the type shown in US 6,182,545 B1.

[0040] These and other objects and advantages will become apparent to those skilled in the art upon reading and following the description taken together with the accompanying drawings.

Brief DescriDtion of the Drawings

[0041] Reference may now be made to the drawings which illustrate various preferred embodiments that the invention may take in physical form and in certain parts and arrangement of parts wherein:

FIGURES 1a-1b are schematic cross-sectional views of a press tool 3a, 3b in which a punch retainer 2 with a punch 1 and a punch stripper 10 are mounted;

FIGURES 2 and 2' are schematic cross-sectional views of a punch retainer 2 with a punch 1 and a punch stripper 10;

FIGURE 3 is a schematic side view of a punch stripper 10;

FIGURES 4a-4b are schematic plan views of the punch stripper 10 in FIGURE 3 viewed from above and from below, respectively; and,

FIGURES 5a-5c are schematic plan views of a modified punch stripper 10.

Detailed Description of Preferred Embodiments

[0042] Referring now to the drawings wherein the showings are for the purpose of illustrating preferred embodiments of the invention only and not for the purpose of limiting same, FIGURE 1 illustrates a press tool having an upper tool part 3a and a lower tool part 3b is shown.

[0043] In the lower tool part 3b, a punching die is provided. A work piece 5, which may be a metal sheet, is arranged to be machined by the press tool 3a, 3b.

[0044] The upper tool part 3 has a punch retainer 2 on which a punch 1 has a punch stripper that is fastened by means of fastening means 18a, 18b (e.g., screw, bolt, rivet, etc.). The fastening means may, as shown in FIGURES 1a, 1b and 2, be a mounting screw/fastening bolt 18a, whose shank is arranged in a bore 18b in a base portion 14a of the punch stripper.

[0045] In a non-limiting example of the invention, the punch retainer 2 may be designed in any of the ways disclosed in US 6,182,545 B1 (i.e., the punch retainer may have a locking mechanism for securing a punch relative to the punch retainer). As can be appreciated, other locking mechanisms for the punch retainer can be used. The punch retainer 2 may be fixed relative to the upper tool part 3a, for example by means of a suitable joint, such as, but not limited to, a screw joint, bolt, rivet, weld, etc.

[0046] The punch 1 is surrounded by a punch stripper 10. The punch stripper 10 is designed in such manner that it works against a chamber pressurized by a gas, such as nitrogen gas and/or other types of gas (e.g., air, inert gas, etc.), instead of against a mechanical spring or a polyurethane element.

[0047] The punch stripper is formed of an outer sleeve 14, here in the form of a tube part, that is mounted on the punch retainer 2. In the tube part, an inner sleeve 13 is mounted, here in the form of an inner piston rod, which is retained in position by a locking ring 16. As can be appreciated, the inner sleeve can be locked in position in other or additional ways. The inner piston rod has a concentric, axial through hole intended to receive the punch 1, and a static seal 15a that are arranged at one end thereof. In the other portion of the tube, an annular piston is mounted which, during the punching operation, operates between an outer position (See FIGURE 1a) and an inner position (See FIGURE 1b). The outer position is limited by the piston 11 striking a mechanical stop 19. A dynamic seal 15b is mounted against the inner end 11 b of the piston, between the inner diameter of the tube (outer sleeve 14) and the outer diameter of the inner piston rod (inner sleeve 13). The outer sleeve 14 may be formed integrally, for instance formed in one piece, with the base portion 14a, so that they together form a punch stripper body. The inner sleeve too may be formed integrally, for instance formed in one piece, with the punch stripper body. The punch stripper body may, for instance by way of the base portion 14a, be adapted to be detachably fastened to the punch retainer by means of fastening means 18a, 18b.

[0048] The piston 11 can have a concentric, axial through hole intended to receive the punch. A milled groove 17 as illustrated in FIGURE 3 may be formed in

the lateral surface of the piston. A corresponding groove may be formed in the inner surface of the tube part, adjacent to one end surface thereof. Together the milled surfaces form a rotary lock that prevents the piston 11 from rotating in the tube. An alternative arrangement is illustrated in FIGURES 5a-c. In this alternative arrangement, an opening, milled groove or slot is inserted on the piston. As illustrated in FIGURE 5a, slot 32 is positioned along the vertical or longitudinal axis of piston 11. Outer sleeve 14 includes an opening 34 that is used to receive a pin or screw 36 as illustrated in FIGURE 5c. The end of the pin or screw is at least partially inserted into slot 32 of the piston to thereby inhibit or prevent the piston from rotating in the tube. If required, a seal stripper (not shown) can be mounted in the other end of the tube part for the purpose of removing dirt particles from the lateral surface of the piston.

[0049] The pressure chamber 12a, 12b is formed by the space between the outer sleeve 14 and the inner sleeve 13, i.e., between the inner diameter of the tube part and the outer diameter of the inner piston rod and the seals. The pressure chamber 12a, 12b can be pressurized by nitrogen gas being charged through a valve 30 (See FIGURE 2') mounted in the tube part. The charging pressure used may be varied depending on the application, and the pressure may be up to about 200 bars. Typically, the filling pressure is between about 20-100 bars, depending on the punching application.

[0050] The punch stripper 10 operates in the following manner: when the piston 11 meets the work piece 5 in the downward movement and the punch 1 continues its downward movement, the gas is compressed in the pressure chamber 12a, 12b by the piston 11 and the dynamic seal 15b moving axially in a first portion 12a of the pressure chamber. The stripping force, which is generated by the gas being compressed when the piston carries out its working stroke during the punching operation, helps to pull back the punch 1 through the punched hole, without deforming or damaging the punched hole.

[0051] To easily determine if the pressure chamber 12a, 12b of the punch stripper is pressurized, a pressure indicator 20 may be integrated into the tube part, for example adjacent to the charging valve 30. The pressure indicator 20 may comprise an inwardly biased resilient pin 21, possibly connected to a plate 24, which is pushed out when the pressure chamber 12a, 12b is pressurized. If the pressure chamber 12a, 12b is pressureless, the pin 21 will be pulled in. In this way, it is easy to check whether there is any pressure in the pressure chamber 12a, 12b. Furthermore, the pressure indicator 20 may comprise a resilient element 22, the spring constant of which can be selected so as to indicate pressures exceeding a predetermined value, and a seal 23, which may be in the form of an O-ring or the like.

[0052] According to an embodiment not shown here, a longer pin 21, which is integrated into the outer sleeve 14, may form, together with scale marks provided on the outer sleeve 14, a pressure scale similar to a thermometer, which can be read directly.

[0053] Another way of determining whether the pressure chamber is pressurized is to connect the punch stripper to some other visual indicator (e.g., light, electronic meter, etc.) and/or sound generating device. Still another or additional way of determining whether the pressure chamber is pressurized is to connect the punch stripper to a device for external pressure monitoring. This allows easy control and monitoring of the pressure in the punch stripper from outside the punching tool. It is also possible to provide an electrical indicator, for instance through a pressure transducer, which is connected by way of a control circuit to a signal arrangement such as, but not limited to, a form of a display, speaker, lamp or transmitter.

[0054] In the event that two or more punch strippers 10 are provided in a press tool 3a, 3b, these may be connected to one another, so that the pressure is substantially the same in all the punch strippers 10; however, this is not required. In this embodiment, the punch strippers may be connected to a control block, which may have a gas charging arrangement, reducing valve, excess-pressure protection and/or a pressure monitoring device to indicate that the pressure exceeds or falls below a predetermined value. The pressure indicator as described above may be integrated into such a control block.

Claims

1. A punch stripper (10) adapted to be fastened to a punch retainer (2) of a press tool (3a, 3b) comprising a punch (1) a punch stripper piston (11) and a pressure chamber (12a, 12b) said pressure chamber (12a, 12b) designed to spring-load said punch stripper piston (11); said pressure chamber (12a, 12b) at least partially defined by a gap between an inner sleeve (13) and an outer sleeve (14), said punch stripper piston (11) having a displaceable portion (11b) that is axially displaceable in said gap, substantially the whole pressure chamber (12a, 12b) is located between said inner sleeve (13) and said outer sleeve (14) **characterised in that** said pressure chamber (12a, 12b) further includes a guide portion (12a) and a chamber portion (12b), said guide portion (127) designed to enable said displaceable portion (11b) of said punch stripper piston (11) to move therein, said chamber portion (12b) axially separated from said guide portion (12a); said chamber portion (12b) having a larger cross-sectional area than said guide portion (12a).

2. The punch stripper (10) as defined in claim 1, wherein said outer sleeve (14) having a first portion and second portion, said first portion having a first inner cross section that forms a boundary surface of said guide portion (12a) said pressure chamber (12a, 12b) said second portion having a second inner

cross section, at least a portion of said second inner cross section being greater than at least a portion of said first inner cross section, said second portion forming a boundary surface of said chamber portion (12b) said pressure chamber (12a, 12b).

3. The punch stripper (10) as defined in claim 2, wherein said first inner cross section having an average cross-sectional area, said second inner cross section having an average cross-sectional area, said average cross-sectional area of said second inner cross section greater than said average cross-sectional area of said first inner cross section.

4. The punch stripper (10) as defined in claim 3, wherein said first inner cross section having a substantially constant cross-section area, said second inner cross section having a substantially constant cross-section area, or combinations thereof.

5. The punch stripper (10) as defined in anyone of claims 1-4, wherein the inner sleeve (13) includes a first portion and a second portion; said first and second portions axially spaced from one another, said first portion forming a boundary surface ofsaid guide portion (12a) of said pressure chamber (12a, 12b); said second portion forming a boundary surface of said chamber portion (24) of said pressure chamber (12a, 12b); at least a portion of said first and second portions of said inner sleeve having different cross-sectional areas.

6. The punch stripper (10) as defined in claim 5, wherein said cross-sectional area of said first portion of said inner sleeve (13) is substantially constant.

7. The punch strippers (10) as defined in claim 5 or 6, wherein at least portion of said cross-sectional area of said second portion is greater than said cross-sectional area of said first portion.

8. The punch stripper (10) as defined in anyone of claims 1-7, wherein said inner sleeve (13) is fixed relative to said punch (1), said outer sleeve (14) is fixed relative to said punch (1), combinations thereof.

9. The punch stripper (10) as defined in anyone of claims 1-8, wherein said displaceable portion (11b) of said punch stripper piston (11) is sealed with respect to said inner sleeve (13) said outer sleeve (14), or combinations thereof.

10. The punch stripper (10) as defined in anyone of claims 1-9, wherein said punch stripper piston (11) at least partially includes a rotation inhibiting arrangement to inhibit or prevent said punch stripper piston (11) from rotating relative to said inner sleeve (13) said outer sleeve (14); combinations thereof.

11. The punch stripper (10) as defined in anyone of claims 1-10, including a pressure indicating arrangement (20) to indicate a pressure in said pressure chamber (12a, 12b), said pressure indicating arrangement (20) is designed to indicate that a pressure in said pressure chamber (12a, 12b) exceeds a predetermined value, falls below a predetermined value, or combinations thereof.

12. The punch stripper (10) as defined in claim 11, wherein said pressure indicating arrangement (20) is formed integrally with said punch stripper (10).

13. The punch stripper (10) as defined in claim 11 or 12, wherein said pressure indicating arrangement (20) includes a spring-loaded part (22) which is at least partially visible from an outside of said punch stripper (10).

14. The punch stripper (10) as defined in anyone of claims 1-13, wherein said punch stripper (10) is at least partially connected to a press tool (3a, 3b) by a punch retainer (2).

15. The punch stripper (10) as defined in claim 14, wherein said punch retainer (2) is at least partially fastened to a stroke part of the press tool (3a, 3b).

16. A punching tool including the punch stripper (10) as defined in anyone of claims 1-15, and including a second punch stripper connected to the press tool (3a, 3b) and pressure chambers of said two punch strippers are in fluid communication with one another.

17. A punching tool including the punch stripper (10) as defined in claim 16, wherein said pressure in said pressure chambers of said two punch strippers is substantially the same.

Patentansprüche

1. Stanzenabstreifvorrichtung (10), dazu angepasst, an einer Stanzenaufnahme (2) eines Presswerkzeuges (3a, 3b) befestigt zu werden, aufweisend eine Stanze (1), einen Stanzenabstreifvorrichtungskolben (11) und eine Druckkammer (12a, 12b), wobei die Druckkammer (12a, 12b) dazu ausgelegt ist, den Stanzenabstreifvorrichtungskolben (11) unter Vorspannung zu setzen; wobei die Druckkammer (12a, 12b) zumindest teilweise durch einen Spalt zwischen einer inneren Hülse (13) und einer äußeren Hülse (14) definiert ist; wobei der Stanzenabstreifvorrichtungskolben (11) einen verlagerbaren Bereich (11b) hat, der axial in dem Spalt verlagerbar ist, wobei die gesamte Druckkammer (12a, 12b) zwischen der inneren Hülse (13) und der äußeren Hülse

(14) angeordnet ist,
dadurch gekennzeichnet, dass
die Druckkammer (12a, 12b) ferner einen Führungsbereich (12a) und einen Kammerbereich (12b) aufweist, wobei der Führungsbereich (12a) dazu ausgelegt ist, den verlagerbaren Bereich (11b) des Stanzenabstreifvorrichtungskolbens zu ermöglichen, sich darin zu bewegen, wobei der Kammerbereich (12b) axial von dem Führungsbereich (12a) separiert ist, wobei der Kammerbereich (12b) eine größere Querschnittsfläche hat als der Führungsbereich (12a).

2. Stanzenabstreifvorrichtung nach Anspruch 1, wobei die äußere Hülse (14) einen ersten Bereich und einen zweiten Bereich hat, wobei der erste Bereich einen ersten inneren Querschnitt hat, der eine Grenzfläche des Führungsbereichs (12a) der Druckkammer (12a, 12b) bildet, wobei der zweite Bereich einen zweiten inneren Querschnitt hat, wobei zumindest ein Bereich des zweiten inneren Querschnitts größer ist als mindestens ein Bereich des ersten inneren Querschnitts, wobei der zweite Bereich eine Grenzfläche des Kammerbereichs (12b) der Druckkammer (12a, 12b) bildet.

3. Stanzenabstreifvorrichtung (10) nach Anspruch 2, wobei der erste innere Querschnitt eine gemittelte Querschnittsfläche hat, wobei der zweite innere Querschnitt eine gemittelte Querschnittsfläche hat, wobei die gemittelte Querschnittsfläche des zweiten inneren Querschnitts größer ist als die gemittelte Querschnittsfläche des ersten inneren Querschnitts.

4. Stanzenabstreifvorrichtung (10) nach Anspruch 3, wobei der erste innere Querschnitt eine im Wesentlichen konstante Querschnittsfläche hat, und/oder der zweite innere Querschnitt eine im Wesentlichen konstante Querschnittsfläche hat.

5. Stanzenabstreifvorrichtung (10) nach einem der Ansprüche 1 bis 4, wobei die innere Hülse (13) einen ersten Bereich und einen zweiten Bereich aufweiset, wobei der erste und der zweite Bereich axial voneinander beabstandet sind, wobei der erste Bereich eine Grenzfläche des Führungsbereichs (12a) der Druckkammer (12a, 12b) bildet, wobei der zweite Bereich eine Grenzfläche des Kammerbereichs (12b) der Druckkammer (12a, 12b) bildet, wobei mindestens ein Bereich des ersten und des zweiten Bereichs der inneren Hülse verschiedene Querschnittsflächen haben.

6. Stanzenabstreifvorrichtung (10) nach Anspruch 5, wobei die Querschnittsfläche des ersten Bereichs der inneren Hülse (13) im Wesentlichen konstant ist.

7. Stanzenabstreifvorrichtung (10) nach Anspruch 5 oder 6, wobei mindestens ein Bereich der Querschnittsfläche des zweiten Bereichs größer ist als die Querschnittsfläche des ersten Bereichs.

8. Stanzenabstreifvorrichtung (10) nach einem der Ansprüche 1 bis 7, wobei die innere Hülse (13) bezogen auf die Stanze 1 fixiert ist und/oder wobei die äußere Hülse (14) bezogen auf die Stanze (1) fixiert ist.

9. Stanzenabstreifvorrichtung (10) nach einem der Ansprüche 1 bis 8, wobei der verlagerbare Bereich (11b) des Stanzenabstreifvorrichtungskolbens (11) bezogen auf die innere Hülse (13) und/oder bezogen auf die äußere Hülse (14) abgedichtet ist.

10. Stanzenabstreifvorrichtung (10) nach einem der Ansprüche 1 bis 9, wobei der Stanzenabstreifvorrichtungskolben zumindest teilweise eine rotationshemmende Anordnung aufweist, um den Stanzenabstreifvorrichtungskolben (11) zu hemmen oder daran zu hindern, relativ zu der inneren Hülse (13) und/oder der äußeren Hülse (14) zu rotieren.

11. Stanzenabstreifvorrichtung (10) nach einem der Ansprüche 1 bis 10, aufweisend eine Druck angebende Anordnung (20), um einen Druck in der Druckkammer (12a, 12b) anzugeben, wobei die Druck angebende Anordnung 20 dazu ausgelegt ist, anzugeben, dass ein Druck in der Druckkammer (12a, 12b) einen vorbestimmten Wert übersteigt und/oder unter einen vorbestimmen Wert fällt.

12. Stanzenabstreifvorrichtung (10) nach Anspruch 11, wobei die Druck angebende Anordnung (20) integral mit der Stanzenabstreifvorrichtung (10) ausgebildet ist.

13. Stanzenabstreifvorrichtung (10) nach Anspruch 11 oder 12, wobei die Druck angebende Anordnung (20) einen vorgespannten Teil (22) aufweist, der zumindest teilweise von außerhalb der Stanzenabstreifvorrichtung (10) sichtbar ist.

14. Stanzenabstreifvorrichtung (10) nach einem der Ansprüche 1 bis 13, wobei die Stanzenabstreifvorrichtung (10) zumindest teilweise durch eine Stanzenaufnahme (2) mit einem Presswerkzeug (3a, 3b) verbunden ist.

15. Stanzenabstreifvorrichtung (10) nach Anspruch 14, wobei die Stanzenaufnahme (2) zumindest teilweise an einem Hubteil des Presswerkzeuges (3a, 3b) befestigt ist.

16. Stanzwerkzeug aufweisend die Stanzenabstreifvorrichtung (10) nach einem der Ansprüche 1 bis 15 und aufweisend eine zweite Stanzenabstreifvorrichtung, verbunden mit dem Presswerkzeug (3a, 3b),

und wobei Druckkammern der zwei Stanzenabstreifvorrichtungen in Fluidverbindung miteinander sind.

17. Stanzwerkzeug aufweisend die Stanzenabstreifvorrichtung (10) nach Anspruch 16, wobei der Druck in den Druckkammer der zwei Stanzenabstreifvorrichtungen im Wesentlichen gleich ist.

Revendications

1. Dévêtisseur de poinçon (10) adapté pour être fixé à un dispositif de retenue de poinçon (2) d'un outil à presse (3a, 3b) comprenant un poinçon (1), un piston de dévêtisseur de poinçon (11) et une chambre de pression (12a, 12b), ladite chambre de pression (12a, 12b) étant conçue pour charger par ressort ledit piston de dévêtisseur de poinçon (11) ; ladite chambre de pression (12a, 12b) étant au moins partiellement définie par un intervalle entre un manchon interne (13) et un manchon externe (14) ; ledit piston de dévêtisseur de poinçon (11) ayant une partie pouvant être déplacée (11b) qui peut être axialement déplacée dans ledit intervalle, la quasi-totalité de la chambre de pression (12a, 12b) est située entre ledit manchon interne (13) et ledit manchon externe (14), **caractérisé en ce que** ladite chambre de pression (12a, 12b) comprend en outre une partie de guide (12a) et une partie de chambre (12b), ladite partie de guide (12a) est conçue pour permettre à ladite partie pouvant se déplacer (11b) dudit piston de dévêtisseur de poinçon (11) de se déplacer à l'intérieur, ladite partie de chambre (12b) étant axialement séparée de ladite partie de guide (12a), ladite partie de chambre (12b) ayant une superficie transversale supérieure à ladite partie de guide (12a).

2. Dévêtisseur de poinçon (10) selon la revendication 1, dans lequel ledit manchon externe (14) a une première partie et une seconde partie, ladite première partie ayant une première section transversale interne qui forme une surface limite de ladite partie de guide (12a) de ladite chambre de pression (12a, 12b), ladite seconde partie ayant une seconde section transversale interne, au moins une partie de ladite seconde section transversale interne étant supérieure à au moins une partie de ladite première section transversale interne, ladite seconde partie formant une surface limite de ladite partie de chambre (12b) de ladite chambre de pression (12a, 12b).

3. Dévêtisseur de poinçon (10) selon la revendication 2, dans lequel ladite première section transversale interne a une superficie transversale moyenne, ladite seconde section transversale interne a une superficie transversale moyenne, ladite superficie transversale moyenne de ladite seconde section transversale interne est supérieure à ladite superficie transversale moyenne de ladite première section transversale interne.

4. Dévêtisseur de poinçon (10) selon la revendication 3, dans lequel ladite première section transversale interne a une superficie transversale sensiblement constante, ladite seconde section transversale interne a une superficie transversale sensiblement constante, ou des combinaisons correspondantes.

5. Dévêtisseur de poinçon (10) selon l'une quelconque des revendications 1-4, dans lequel le manchon interne (13) comprend une première partie et une seconde partie, lesdites première et seconde parties étant axialement espacées l'une de l'autre, ladite première partie formant une surface limite de ladite partie de guide (12a) de ladite chambre de pression (12a, 12b), ladite seconde partie formant une surface limite de ladite partie de chambre (12b) de ladite chambre de pression (12a, 12b), au moins une partie desdites première et seconde parties dudit manchon interne ayant des superficies transversales différentes.

6. Dévêtisseur de poinçon (10) selon la revendication 5, dans lequel ladite superficie transversale de ladite première partie dudit manchon interne (13) est sensiblement constante.

7. Dévêtisseur de poinçon (10) selon les revendications 5 ou 6, dans lequel au moins une partie de ladite superficie transversale de ladite seconde partie est supérieure à ladite superficie transversale de ladite première partie.

8. Dévêtisseur de poinçon (10) selon l'une quelconque des revendications 1-7, dans lequel ledit manchon interne (13) est fixé relativement audit poinçon (1), ledit manchon externe (14) est fixé relativement audit poinçon (1) ou une combinaison correspondante.

9. Dévêtisseur de poinçon (10) selon l'une quelconque des revendications 1-8, dans lequel ladite partie pouvant être déplacée (11b) dudit piston de dévêtisseur de poinçon (11) est scellée relativement audit manchon interne (13), audit manchon externe (14) ou des combinaisons correspondantes.

10. Dévêtisseur de poinçon (10) selon l'une quelconque des revendications 1-9, dans lequel ledit piston de dévêtisseur de poinçon (11) comprend au moins partiellement un dispositif d'inhibition de la rotation pour inhiber ou empêcher ledit piston de dévêtisseur de poinçon (11) de tourner relativement audit manchon interne (13), audit manchon externe (14) ou des combinaisons correspondantes.

11. Dévêtisseur de poinçon (10) selon l'une quelconque

des revendications 1-10, comprenant un dispositif indicateur de pression (20) pour indiquer une pression dans ladite chambre de pression (12a, 12b), ledit dispositif indicateur de pression (20) étant conçu pour indiquer qu'une pression dans ladite chambre de pression (12a, 12b) dépasse une valeur prédéterminée, tombe en deçà d'une valeur prédéterminée, ou des combinaisons correspondantes.

12. Dévêtisseur de poinçon (10) selon la revendication 11, dans lequel ledit dispositif indicateur de pression (20) est formé d'un seul tenant avec ledit dévêtisseur de poinçon (10).

13. Dévêtisseur de poinçon (10) selon les revendications 11 ou 12, dans lequel ledit dispositif indicateur de pression (20) comprend une partie chargée par ressort (22) qui est au moins partiellement visible depuis l'extérieur dudit dévêtisseur de poinçon (10).

14. Dévêtisseur de poinçon (10) selon l'une quelconque des revendications 1-13, dans lequel ledit dévêtisseur de poinçon (10) est au moins partiellement raccordé à un outil de presse (3a, 3b) par un dispositif de retenue de poinçon (2).

15. Dévêtisseur de poinçon (10) selon la revendication 14, dans lequel ledit dispositif de retenue de poinçon (2) est au moins partiellement fixé à une partie de course de l'outil de presse (3a, 3b).

16. Outil de poinçonnage comprenant un dévêtisseur de poinçon (10) selon l'une quelconque des revendications 1-15, et comprenant un second dévêtisseur de poinçon raccordé à l'outil de presse (3a, 3b), et des chambres de pression desdits deux dévêtisseurs de poinçon étant en communication fluidique l'une avec l'autre.

17. Outil de poinçonnage comprenant un dévêtisseur de poinçon (10) selon la revendication 16, dans lequel ladite pression dans lesdites chambres de pression desdits deux dévêtisseurs de poinçon est sensiblement la même.

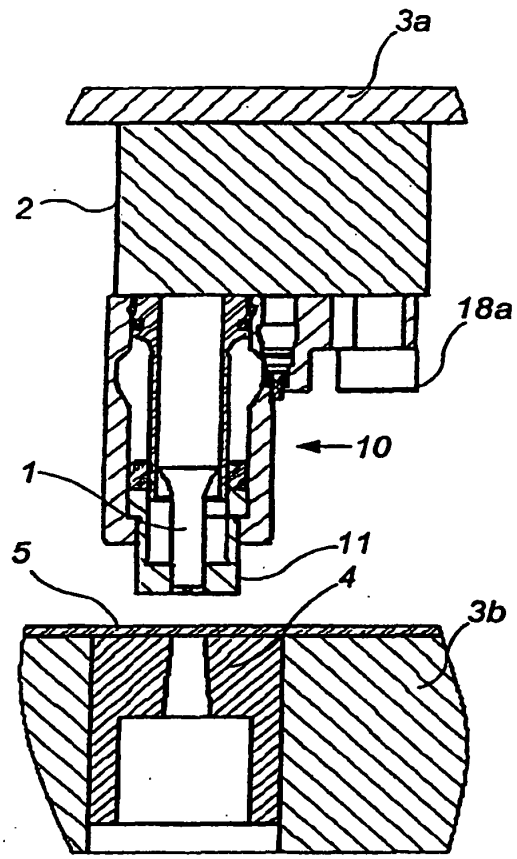


Fig 1a

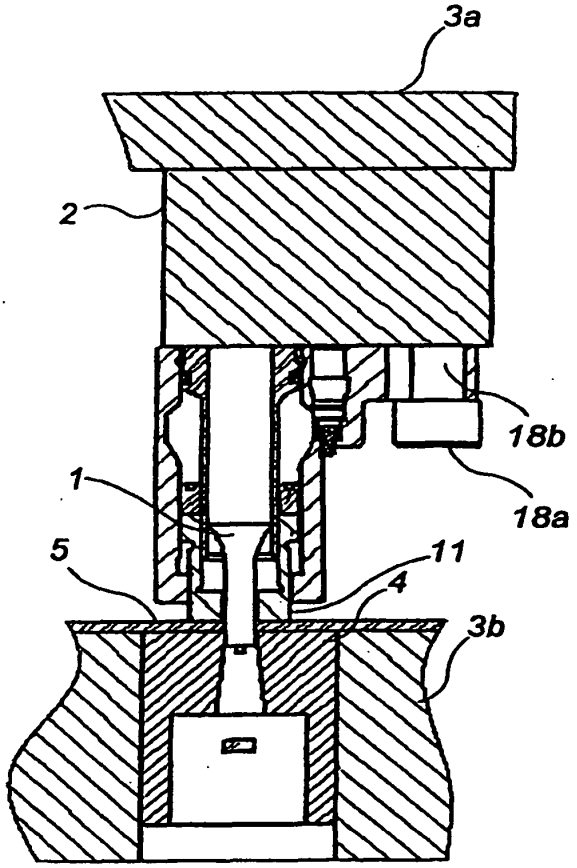


Fig 1b

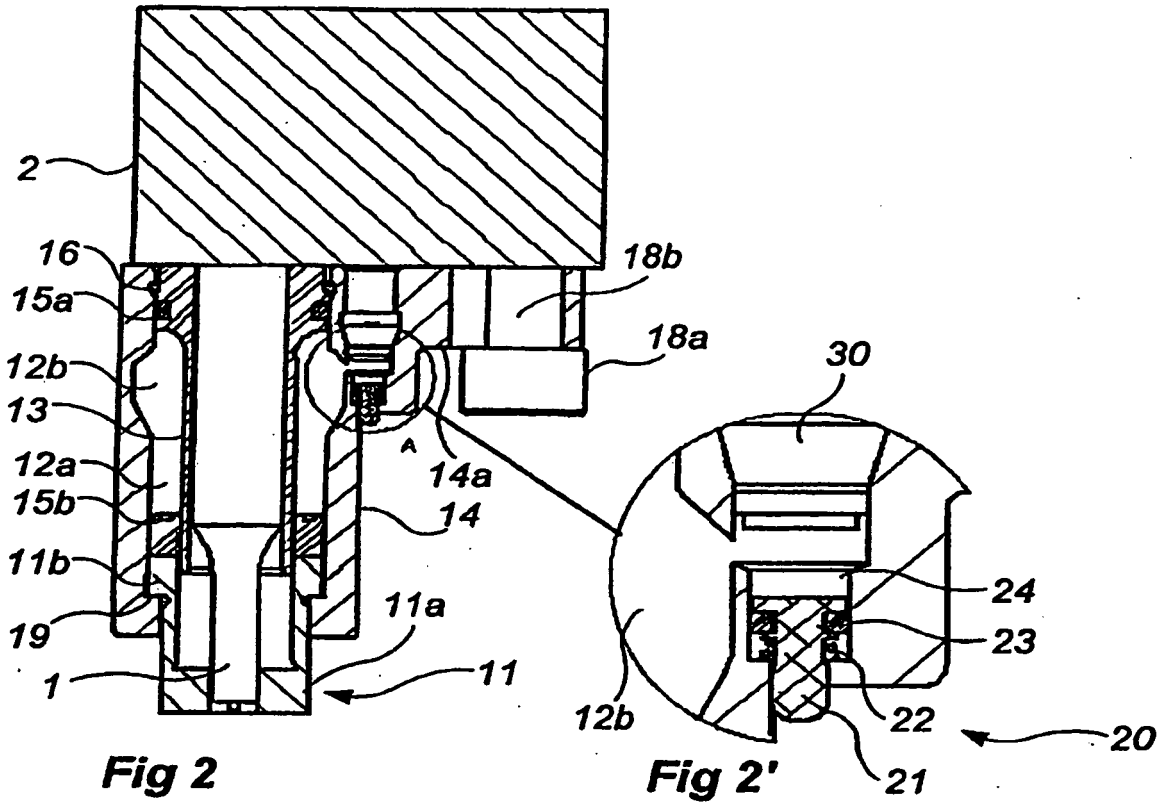

2
16
15a
12b
13
12a
15b
11b
19
1
18b
18a
A
14a
14
11a
11
30
24
23
22
21
20
12b

Fig 2

Fig 2'

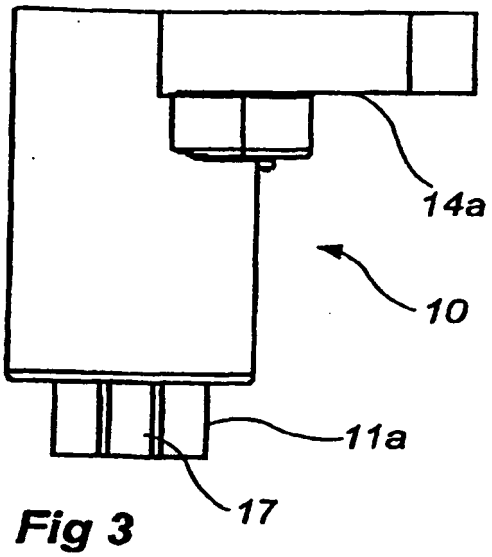


Fig 3

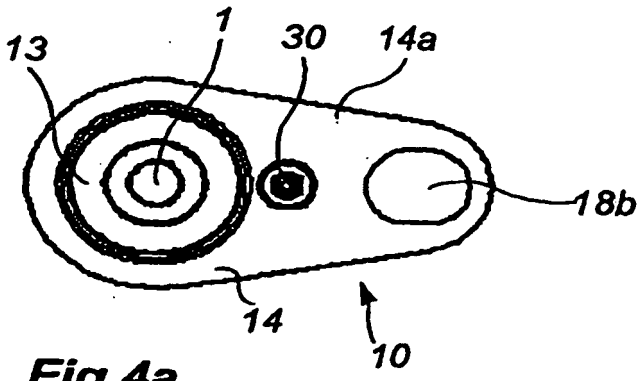


Fig 4a

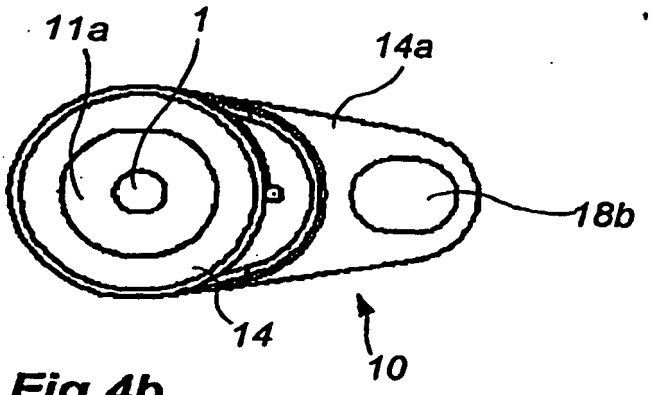


Fig 4b

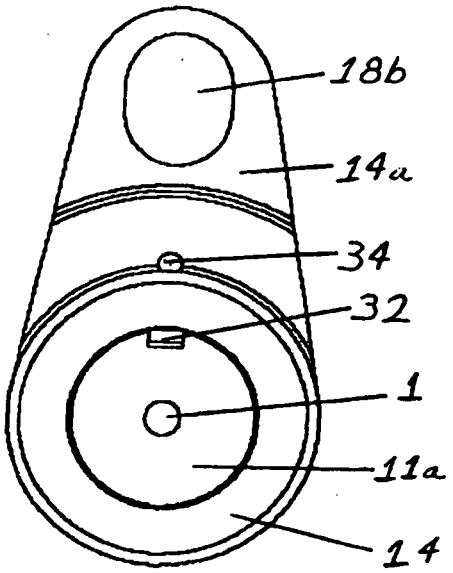


Fig 5a

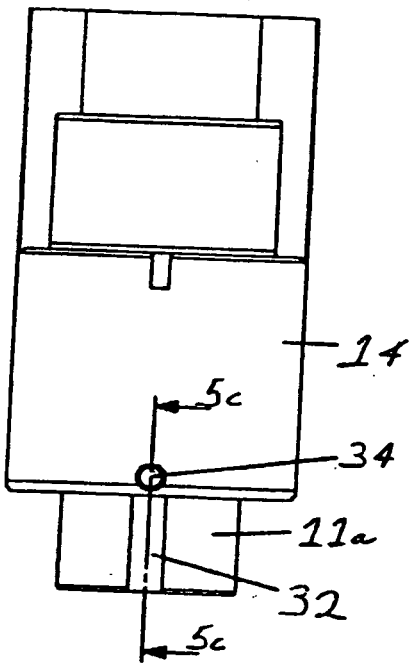


Fig 5b

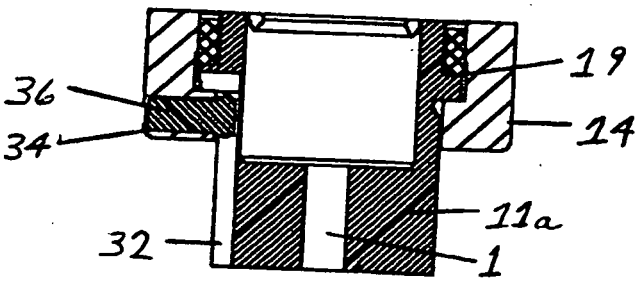


Fig 5c

REFERENCES CITED IN THE DESCRIPTION

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