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(54) **PORTABLE EQUIPMENT WITH SAFETY DEVICE**

TRAGBARE AUSRÜSTUNG MIT SICHERHEITSVORRICHTUNG

ÉQUIPEMENT PORTABLE AVEC DISPOSITIF DE SÉCURITÉ

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Description

[0001] The present invention relates to portable equipment suitable for operating on a fastening element.

[0002] In particular, the present invention relates to the technical field of equipment suitable for carrying out fastening operations on fastening elements such as tear-off rivets, threaded inserts, or lockbolts, i.e., those fastening elements which are suitable for joining two distinct components, typically two sheet metal elements. The equipment in question is suitable for carrying out specific deformation operations, including plastic and/or permanent ones, of the fastening element or of a portion thereof, to obtain the fastening of the two distinct components.

[0003] In the prior art, this equipment is also known as guns and/or inserting and/or riveting machines, also depending on the type of fastening element on which they operate. In the present discussion, reference is made to said equipment with the generic definition of "portable equipment."

[0004] Depending on the type of fastening element, insert, or rivet or lockbolt, the equipment must perform specific operations and actions on the fastening element to complete the fastening. Said actions provide for axial movements in one direction, in both directions, with or without intermediate stops, and sometimes also involve rotational actions with respect to the axis along which the axial movements are performed.

[0005] Document US 2 820 566 A shows a portable equipment suitable for operating on a fastening element such as a tear-off blind rivet, and forms the basis for the preamble of claim 1.

[0006] For the aforesaid reason, the portable equipment belonging to the prior art comprises specific assemblies of components designed to engage fastening elements to command them in motion. In particular, the portable equipment comprises gripping members suitable for engaging a fastening member, and comprises specific actuation members that actuate the gripping members. Preferably, said actuation members are of the hydraulic type, and the hydraulic actuation of said actuation members is performed by means of a pneumatic group specially operatively connected to said hydraulic actuation members.

[0007] Typically, in fact, the portable equipment has a pressurized pneumatic cylinder, also known as an air tank or sometimes as a "barrel."

[0008] A typical problem of the portable equipment of the prior art is related to safety aspects of said pneumatic tank.

[0009] Specifically, during maintenance operations or under conditions of malfunction of the portable equipment, such as those caused by a blockage of a valve or drain line, the bottom cover that hermetically seals the pressure vessel must be disassembled, for example manually, by an operator.

[0010] Since, in certain situations, the tank contains pressurized gas, it is necessary to ensure that the re-

moval of the bottom cover is done under the safest conditions.

[0011] In addition, it is also important to avoid improper or accidental disassembly of the bottom cover, for example due to impact, or also at the same time any accidental event causing unwanted and uncommanded actuation of the portable equipment.

[0012] Therefore, there is a strong need in the industry for portable equipment provided with a pneumatic tank that is easy to make, in which improper or accidental disassembly of the bottom cover is prevented, and for which the disassembly operations of the bottom cover may be performed safely.

[0013] The object of the present invention is to meet the needs of the industry and to solve the problems of the prior art mentioned above.

[0014] This object is achieved by the equipment claimed in claim 1. The claims dependent on these request protection for further features and entail further technical benefits.

[0015] In addition, further features and advantages of the invention will become clear from the description provided below of its preferred embodiments, given as non-limiting examples in reference to the attached figures, wherein:

- Fig. 1 is a perspective view of the portable equipment in accordance with the present invention, according to a preferred embodiment;
- Fig. 2 is a perspective view of the pneumatic group of the portable equipment in accordance with the present invention, according to a first preferred embodiment;
- Fig. 3a is a perspective view of the pneumatic group in Fig. 2, without the safety device;
- Fig. 3b is a perspective view of the safety device in Fig. 2;
- Fig. 4 is a perspective view of the pneumatic group of the portable equipment in accordance with the present invention, according to a second preferred embodiment;
- Fig. 5a is a perspective view of the pneumatic group in Fig. 4, without the safety device;
- Fig. 5b is a perspective view of the safety device in Fig. 4;

[0016] With reference to the attached figures, number 1 indicates portable equipment suitable for operating on a fastening element. The portable equipment 1 is suitable for operating on a fastening device such as a tear-off rivet or a threaded insert or a lockbolt.

[0017] According to the present invention, the portable equipment 1 comprises gripping members 2, suitable for engaging and operating on the fastening element, and comprises actuation members suitable for actuating said gripping members 2.

[0018] The features, type and operation of the gripping members 2 and actuation members are in no way limiting

with respect to the present invention. In addition, the type of fastening element does not limit the present invention.

[0019] Preferably, the actuation members comprise a trigger that may be pulled by a user.

[0020] According to a preferred embodiment, the portable equipment 1 comprises a grippable equipment body 90 that houses the gripping members 2 and the actuation members and permits the connection to the pneumatic group 3, as described below.

[0021] According to a preferred embodiment, the equipment body 90 comprises a pipe extending orthogonally to a handle portion of said equipment body. Preferably, the gripping members are placed at the end of said pipe, for example in a removable and interchangeable manner as needed.

[0022] According to the present invention, the portable equipment 1 comprises a pneumatic group 3 operatively connected with the actuation members to pneumatically command the action thereof on the gripping members 2.

[0023] Said pneumatic group 3 comprises a tank 4 containing a pressurized gas.

[0024] Preferably, the tank 4 is fluidically connected to a gas source, such as an air compressing machine.

[0025] The type of gas used for the pneumatic command of the actuation members is in no way limiting to the objects of the present invention. Preferably, reference is made in this discussion to compressed air of the type available in manufacturing environments or more generally to compressed air supplied by an air compressing machine.

[0026] Specifically, said tank 4 comprises an annular body 5 that extends along an axis X-X.

[0027] The tank 4 is open at one of its bottom sections 6.

[0028] The tank 4 also comprises a bottom cover 7 which hermetically seals the annular body 5, the cover being located at the bottom section 6.

[0029] The coupling of the bottom cover 7 with the annular body 5 delimits a pressurized chamber 50 containing the gas.

[0030] Preferably, an inner face of the bottom cover 7 axially delimits the pressurized chamber 50.

[0031] According to a preferred embodiment, the pneumatic group 3 comprises a pneumatic piston housed in the tank 4. Said pneumatic piston slides in the annular body 5 and operates in said pressurized chamber 50, moved by the pressurized gas therein.

[0032] Preferably, the pneumatic piston is single-acting or double-acting.

[0033] Preferably, moreover, the portable equipment 1 comprises gas filling members 48 that may be fluidically connected to a hose from an external tank or air compressing machine to feed gas into the pressurized chamber 50.

[0034] According to the present invention, the tank 4 also comprises a ring recess 8 which is radially internally obtained in said bottom section 6 and positioned externally to the pressurized chamber 50.

[0035] For this object, preferably the bottom section 6 protrudes radially externally from the annular body 5, as it has larger dimensions in the radial direction.

[0036] In other words, along the axis X-X, the tank 4 comprises the ring recess 8, the bottom cover 7 and the pressurized chamber 50.

[0037] In still other words, the bottom section 6 protrudes axially from the bottom cover 7, beyond which the ring recess 8 is located.

[0038] Preferably, the ring recess 8 is a continuous annular groove accessible in a substantially radial direction from a region proximal to the axis X-X.

[0039] According to the present invention, the tank 4 comprises an elastic ring 9 housed in a non-deformed configuration in the ring recess 8 to lock the bottom cover 7.

[0040] Specifically, said elastic ring 9 extends over a circumferential section encompassing two angular ends 10, 11 separated angularly.

[0041] In other words, the elastic ring 9 is an at least partially elastically deformable and circumferentially interrupted component.

[0042] [00048] According to a preferred embodiment, the elastic ring 9 is an elastic stop ring, for example made of steel or made of a polymeric material.

[0043] In a preferred embodiment, the elastic ring 9 is a Seeger ring, also known as a "circlip."

[0044] In other words, the elastic ring 9 is removable from the ring recess 8 by bringing the two angular ends 10, 11 together angularly, thus reducing the outer diameter of said ring 9 and allowing it to exit the ring recess 8.

[0045] For this purpose, preferably, the elastic ring 9 comprises specific engagement openings, and said operations for removing the elastic ring 9 are conveniently carried out with a dedicated tool or implement, such as "Seeger pliers."

[0046] According to the present invention, the angular ends 10, 11 define a safety seat 12 therebetween. In other words, the safety seat 12 has a predefined angular width defined by the angular ends 10, 11.

[0047] Preferably, moreover, the safety seat 12 is open radially toward the axis X-X, i.e., it is accessible in a substantially radial direction from a region proximal to the axis X-X.

[0048] According to the present invention, the tank 4 comprises a safety device 13 fixed in the safety seat 12 so as to prevent the elastic ring 9 from being removed from the ring recess 8 by means of elastic deformation.

[0049] Preferably, the safety device 9 is appropriately placed between the angular ends 10, 11 in such a way as to prevent its movement, i.e., to make the removal operations of the elastic ring 9 inoperable.

[0050] Preferably, the safety device 9 is an elastically non-deformable component.

[0051] According to a preferred embodiment, the safety device 13 is at least partially housed in the ring recess 8.

[0052] According to a preferred embodiment, the safe-

ty device 13 may be inserted into the ring recess 8 from a region proximal to the axis X-X in a substantially radial direction.

[0053] In other words, the safety device 13 circumferentially at least partially occupies the ring recess 8 for an angular extension equal to or less than the angular extension of the safety seat 12.

[0054] According to a preferred embodiment, the elastic ring 9 is housed in the ring recess 8 in such a way as to prevent its improper or accidental removal in the axial direction.

[0055] Preferably, in fact, the ring recess 8 comprises a pair of mutually facing and axially separated annular surfaces, the axial distance of which defines the width, i.e., the height, of the ring recess 8. Preferably, moreover, the safety device 13 is positioned axially in contact with at least one of said annular surfaces.

[0056] According to a preferred embodiment, the safety device 13 consists of a T-shaped planar body and comprises an engagement portion 20 at least partially housed in the ring recess 8.

[0057] Preferably, said engagement portion 20 forms the head of the T-shaped safety device 13.

[0058] In other words, the lateral edges 28, 29 of the engagement portion 20 are positioned circumferentially proximal to the two angular ends 10, 11.

[0059] In still other words, preferably said engagement portion 20 is specially shaped to physically prevent the mutual approach of the angular ends 10, 11 of the elastic ring 9 in the circumferential direction.

[0060] According to a preferred embodiment, the engagement portion 20 has an axial dimension, also called the thickness, such that it engages, with interference, with the annular surfaces of the ring recess 8.

[0061] According to a preferred embodiment, the bottom cover 7 comprises a vent duct 30 suitable for placing the pressurized chamber 50 in fluid connection with the external environment.

[0062] In a preferred embodiment, the vent duct 30 is open on the outer face 75 of the bottom cover 7.

[0063] According to a preferred embodiment, moreover, the safety device 13 hermetically closes said vent duct 30.

[0064] In other words, in a preferred embodiment, the safety device 13 mounted to the bottom cover 7 prevents the pressurized gas from flowing through the vent duct 30 to the outside environment.

[0065] Specifically, the safety device 13 comprises a sealing portion 21 that closes the vent duct 30, which sealing portion is, for example, provided with special sealing gaskets. Preferably, said sealing portion 21 extends in a radial direction, for example starting directly from the engagement portion 20.

[0066] Preferably, by removing the safety device 13, the vent duct 30 is in fluid connection with the external environment, i.e., the gas leaves the pressurized chamber 50.

[0067] In a preferred embodiment, the gas is dis-

charged through the vent duct 30 at the same time as the disassembly operations of the safety device 13.

[0068] Preferably, the gas is completely discharged through the vent duct 30 before the safety device 13 is removed.

[0069] According to a preferred embodiment, the safety device 13 comprises a connecting portion 22 configured for coupling to the bottom cover 7, and for example provided with connecting holes.

[0070] Preferably, moreover, said connecting portion 22 extends in a radial direction, for example starting directly from the sealing portion 21.

[0071] Preferably, the sealing portion 21 and the connecting portion 22 form the "stem" of the T-shaped safety device 13.

[0072] In a preferred embodiment, the safety device 13 is removably attached to the bottom cover 7, for example by form- or force-coupling or by snap-on or mechanical connection.

[0073] According to a preferred embodiment, the safety device 13 is attached to the bottom cover 7 by means of a threaded coupling comprising a screw 70 and a nut screw 60.

[0074] According to a first embodiment, the vent duct 30 and the nut screw 60 are two distinct openings in the bottom cover 7, for example aligned in radial direction and open on the outer face 75.

[0075] According to a second preferred embodiment, the nut screw 60 extends passing along the bottom cover 7, i.e., it is suitable for putting the pressurized chamber 50 into fluid connection with the external environment. Preferably, moreover, the screw 70 secures the safety device 13 and seals the nut screw 60.

[0076] In other words, the nut screw 60 and the vent duct 30 are a single opening that allows pressurized gas to escape at the same time as the disassembly operations of the safety device 13.

[0077] Preferably, by unscrewing the screw 70 from the nut screw 60, the gas flows around the threads of the screw 70 and the nut screw 60.

[0078] According to a preferred embodiment, the bottom cover 7 comprises at least one lightening groove 80, e.g., a plurality of lightening grooves 80 positioned on the outer face 75, and the safety device 13 has a varying thickness according to said at least one lightening groove 80.

[0079] Innovatively, the portable equipment fully fulfills the intended object by overcoming the typical problems of the prior art.

[0080] Advantageously, the portable equipment allows for the completely safe disassembly of its pressurized components.

[0081] Advantageously, the portable equipment is easy to make, allowing easy and intuitive assembly and disassembly operations.

[0082] Advantageously, the portable equipment prevents improper or accidental disassembly of its pressurized components.

[0083] Advantageously, the portable equipment is fool-proof, minimizing the risk of accidents.

[0084] Advantageously, in fact, the safety device is a multifunctional component which prevents accidental disassembly of the elastic ring with the tank under pressure and makes it possible to simplify the disassembly operations thereof.

[0085] Advantageously, the emptying of the pressurized chamber takes place simultaneously with the removal of the safety device, i.e., before the removal of the bottom cover.

[0086] Advantageously, the presence of a separate hole from the connecting nut screw further minimizes risk during disassembly operations. Advantageously, in fact, the risk of overpressure on the screw threads is remedied.

[0087] Advantageously, the safety device is designed to achieve a simplified attachment that ensures maximum tightness. Advantageously, in fact, the sealing portion is comprised in the radial direction between the engagement portion and the connecting portion.

[0088] It is clear that a person skilled in the art may make changes to the invention described above in order to meet contingent needs, which changes all fall within the scope of protection as defined in the following claims.

Claims

1. Portable equipment (1) suitable for operating on a fastening element, for example a tear-off rivet or a threaded insert or a lockbolt, comprising:

- gripping members (2) suitable for engaging said fastening element;
- actuation members suitable for actuating the gripping members (2);
- a pneumatic group (3) operatively connected to the actuation members to pneumatically command the action thereof on the gripping members (2), said pneumatic group (3) comprising a tank (4) containing a pressurized gas, wherein the tank (4) comprises:

- i) an annular body (5) that extends along an axis (X-X) and that is open at a bottom section (6);
- ii) a bottom cover (7) positioned at the bottom section (6) to hermetically close the annular body (5), delimiting a pressurized chamber (50) therewith;
- iii) a ring recess (8) radially internally obtained in said bottom section (6);
- iv) an elastic ring (9) housed in a non-deformed configuration in the ring recess (8) to lock the bottom cover (7),

characterized in that

the elastic ring (9) extends over a circum-

ferential section, comprising two angularly separated angular ends (10, 11) defining a safety seat (12) therebetween; and **in that** v) a safety device (13) is fixed in the safety seat (12) so as to prevent the elastic ring (9) from being removed from the ring recess (8) by means of elastic deformation.

2. Portable equipment (1) according to claim 1, wherein the safety device (13) is removably fastened to the bottom cover (7).

3. Portable equipment (1) according to any one of the preceding claims, wherein the safety device (13) is at least partially housed in the ring recess (8).

4. Portable equipment (1) according to claim 3, wherein the safety device (13) consists of a T-shaped planar body, comprising an engagement portion (20) at least partially housed in the ring recess (8) between the two angular ends (10, 11).

5. Portable equipment (1) according to any one of the preceding claims, wherein the bottom cover (7) comprises a vent duct (30) suitable for putting the pressurized chamber (50) into fluid connection with the external environment, wherein the safety device (13) hermetically closes said vent duct (30).

6. Portable equipment (1) according to claim 5, wherein the safety device (13) comprises a sealing portion (21) that closes the vent duct (30), wherein said sealing portion (21) extends in radial direction from the engagement portion (20).

7. Portable equipment (1) according to any one of the preceding claims, wherein the safety device (13) is fastened to the bottom cover (7) by means of a threaded coupling which comprises a screw (70) and a nut screw (60).

8. Portable equipment (1) according to claim 7, wherein the nut screw (60) extends passing through the bottom cover (7), wherein the screw (70) sealingly closes the nut screw (60).

9. Portable equipment (1) according to claims 6 to 8, wherein the safety device (13) comprises a connecting portion (22) which extends in radial direction from the sealing portion (21).

10. Portable equipment (1) according to claims 4 to 9, wherein the bottom cover (7) comprises at least one lightening groove (80), wherein the safety device (13) has a varying thickness according to said at least one lightening groove (80).

11. Portable equipment (1) according to any one of the

preceding claims, wherein the pneumatic group (3) comprises a single effect or double effect piston housed in the tank (4) in the pressurized chamber (50).

Patentansprüche

1. Tragbares Gerät (1), das zum Bearbeiten eines Befestigungselements, beispielsweise einer Abreißniete oder eines Gewindeeinsatzes oder eines Schließringbolzens, geeignet ist und aufweist:

- Greifelemente (2), die zum Eingreifen in das Befestigungselement geeignet sind;
- Betätigungselemente, die zur Betätigung der Greifelemente (2) geeignet sind;
- eine pneumatische Gruppe (3), die mit den Betätigungselementen wirkverbunden ist, um deren Wirkung auf die Greifelemente (2) pneumatisch zu steuern, wobei die pneumatische Gruppe (3) einen Tank (4) aufweist, der ein unter Druck stehendes Gas enthält, wobei der Tank (4) aufweist:

- i) einen ringförmigen Körper (5), der sich entlang einer Achse (X-X) erstreckt und an einem unteren Abschnitt (6) offen ist;
- ii) eine Bodenabdeckung (7), die an dem unteren Abschnitt (6) positioniert ist, um den ringförmigen Körper (5) hermetisch zu verschließen und damit eine unter Druck stehende Kammer (50) abzugrenzen;
- iii) eine Ringaussparung (8), die radial innen in dem unteren Abschnitt (6) ausgebildet ist;
- iv) einen elastischen Ring (9), der unverformt in der Ringaussparung (8) aufgenommen ist, um die Bodenabdeckung (7) zu sichern,

dadurch gekennzeichnet, dass

der elastische Ring (9) sich über einen Umfangsabschnitt erstreckt, der zwei winkelig getrennte Winkelenden aufweist (10, 11), die zwischen sich einen Sicherheitssitz (12) definieren; und dadurch, dass

v) eine Sicherheitsvorrichtung (13) in dem Sicherheitssitz (12) befestigt ist, um zu verhindern, dass der elastische Ring (9) durch elastische Verformung aus der Ringaussparung (8) entfernt wird.

2. Tragbares Gerät (1) nach Anspruch 1, wobei die Sicherheitsvorrichtung (13) lösbar an der Bodenabdeckung (7) befestigt ist.
3. Tragbares Gerät (1) nach einem der vorstehenden Ansprüche, wobei die Sicherheitsvorrichtung (13) zumindest teilweise in der Ringaussparung (8) auf-

genommen ist.

4. Tragbares Gerät (1) nach Anspruch 3, wobei die Sicherheitsvorrichtung (13) aus einem T-förmigen ebenen Körper besteht, der einen Eingriffsabschnitt (20) aufweist, der zumindest teilweise in der Ringaussparung (8) zwischen den beiden winkelförmigen Enden aufgenommen ist (10, 11).
5. Tragbares Gerät (1) nach einem der vorstehenden Ansprüche, wobei die Bodenabdeckung (7) einen Entlüftungskanal (30) aufweist, der geeignet ist, die Druckkammer (50) in Fluidverbindung mit der Außenumgebung zu bringen, wobei die Sicherheitsvorrichtung (13) den Entlüftungskanal (30) hermetisch verschließt.
6. Tragbares Gerät (1) nach Anspruch 5, wobei die Sicherheitsvorrichtung (13) einen Dichtungsabschnitt (21) aufweist, der den Entlüftungskanal (30) verschließt, wobei sich der Dichtungsabschnitt (21) in radialer Richtung von dem Eingriffsabschnitt (20) erstreckt.
7. Tragbares Gerät (1) nach einem der vorstehenden Ansprüche, wobei die Sicherheitsvorrichtung (13) an der Bodenabdeckung (7) mittels einer Gewindekupplung befestigt ist, die eine Schraube (70) und eine Mutterschraube (60) aufweist.
8. Tragbares Gerät (1) nach Anspruch 7, wobei sich die Mutterschraube (60) durch die Bodenabdeckung (7) erstreckt, wobei die Schraube (70) die Mutterschraube (60) abdichtend verschließt.
9. Tragbares Gerät (1) nach den Ansprüchen 6 bis 8, wobei die Sicherheitsvorrichtung (13) einen Verbindungsabschnitt (22) aufweist, der sich in radialer Richtung von dem Dichtungsabschnitt (21) erstreckt.
10. Tragbares Gerät (1) nach den Ansprüchen 4 bis 9, wobei die Bodenabdeckung (7) zumindest eine Erleichterungsnut (80) aufweist, wobei die Sicherheitsvorrichtung (13) entsprechend der zumindest einen Erleichterungsnut (80) eine variierende Dicke aufweist.
11. Tragbares Gerät (1) nach einem der vorstehenden Ansprüche, wobei die pneumatische Gruppe (3) einen Kolben mit einfacher oder doppelter Wirkung aufweist, der in dem Tank (4) in der Druckkammer (50) aufgenommen ist.

Revendications

1. Équipement portable (1) approprié pour fonctionner sur un élément de fixation, par exemple un rivet dé-

tachable ou une douille taraudée ou un boulon de blocage, comprenant :

- des organes de saisie (2) appropriés pour venir en prise avec ledit élément de fixation ;
- des organes d'actionnement appropriés pour actionner les organes de saisie (2) ;
- un groupe pneumatique (3) relié fonctionnellement aux organes d'actionnement pour commander pneumatiquement l'action de ceux-ci sur les organes de saisie (2), ledit groupe pneumatique (3) comprenant un réservoir (4) contenant un gaz sous pression, dans lequel le réservoir (4) comprend :

- i) un corps annulaire (5) qui s'étend le long d'un axe (X-X) et qui est ouvert à une section de fond (6) ;
- ii) un couvercle de fond (7) positionné à la section de fond (6) pour fermer hermétiquement le corps annulaire (5), délimitant une chambre pressurisée (50) avec celui-ci ;
- iii) un creux en anneau (8) obtenu radialement de manière interne dans ladite section de fond (6) ;
- iv) un anneau élastique (9) logé dans une configuration non déformée dans le creux en anneau (8) pour bloquer le couvercle de fond (7),

caractérisé en ce que

l'anneau élastique (9) s'étend sur une section circonférentielle, comprenant deux extrémités angulaires (10, 11) séparées angulairement définissant un siège de sécurité (12) entre elles ; et **en ce que**

- v) un dispositif de sécurité (13) est fixé dans le siège de sécurité (12) de manière à empêcher l'anneau élastique (9) d'être retiré du creux en anneau (8) au moyen d'une déformation élastique.

2. Équipement portable (1) selon la revendication 1, dans lequel le dispositif de sécurité (13) est fixé de manière amovible au couvercle de fond (7).

3. Équipement portable (1) selon l'une quelconque des revendications précédentes, dans lequel le dispositif de sécurité (13) est au moins partiellement logé dans le creux en anneau (8).

4. Équipement portable (1) selon la revendication 3, dans lequel le dispositif de sécurité (13) consiste en un corps plan en forme de T, comprenant une partie de mise en prise (20) au moins partiellement logée dans le creux en anneau (8) entre les deux extrémités angulaires (10, 11).

5. Équipement portable (1) selon l'une quelconque des

revendications précédentes, dans lequel le couvercle de fond (7) comprend un événement (30) approprié pour mettre la chambre pressurisée (50) en liaison fluide avec l'environnement externe, dans lequel le dispositif de sécurité (13) ferme hermétiquement ledit événement (30).

6. Équipement portable (1) selon la revendication 5, dans lequel le dispositif de sécurité (13) comprend une partie de scellement (21) qui ferme l'événement (30), dans lequel ladite partie de scellement (21) s'étend dans une direction radiale à partir de la partie de mise en prise (20).

7. Équipement portable (1) selon l'une quelconque des revendications précédentes, dans lequel le dispositif de sécurité (13) est fixé au couvercle de fond (7) au moyen d'un accouplement par filetage qui comprend une vis (70) et un écrou (60).

8. Équipement portable (1) selon la revendication 7, dans lequel l'écrou (60) s'étend en passant à travers le couvercle de fond (7), dans lequel la vis (70) ferme de manière scellée l'écrou (60).

9. Équipement portable (1) selon les revendications 6 à 8, dans lequel le dispositif de sécurité (13) comprend une partie de liaison (22) qui s'étend dans une direction radiale à partir de la partie de scellement (21).

10. Équipement portable (1) selon les revendications 4 à 9, dans lequel le couvercle de fond (7) comprend au moins une rainure d'allègement (80), dans lequel le dispositif de sécurité (13) a une épaisseur variable conformément à ladite au moins une rainure d'allègement (80).

11. Équipement portable (1) selon l'une quelconque des revendications précédentes, dans lequel le groupe pneumatique (3) comprend un piston à simple effet ou à double effet logé dans le réservoir (4) dans la chambre pressurisée (50).

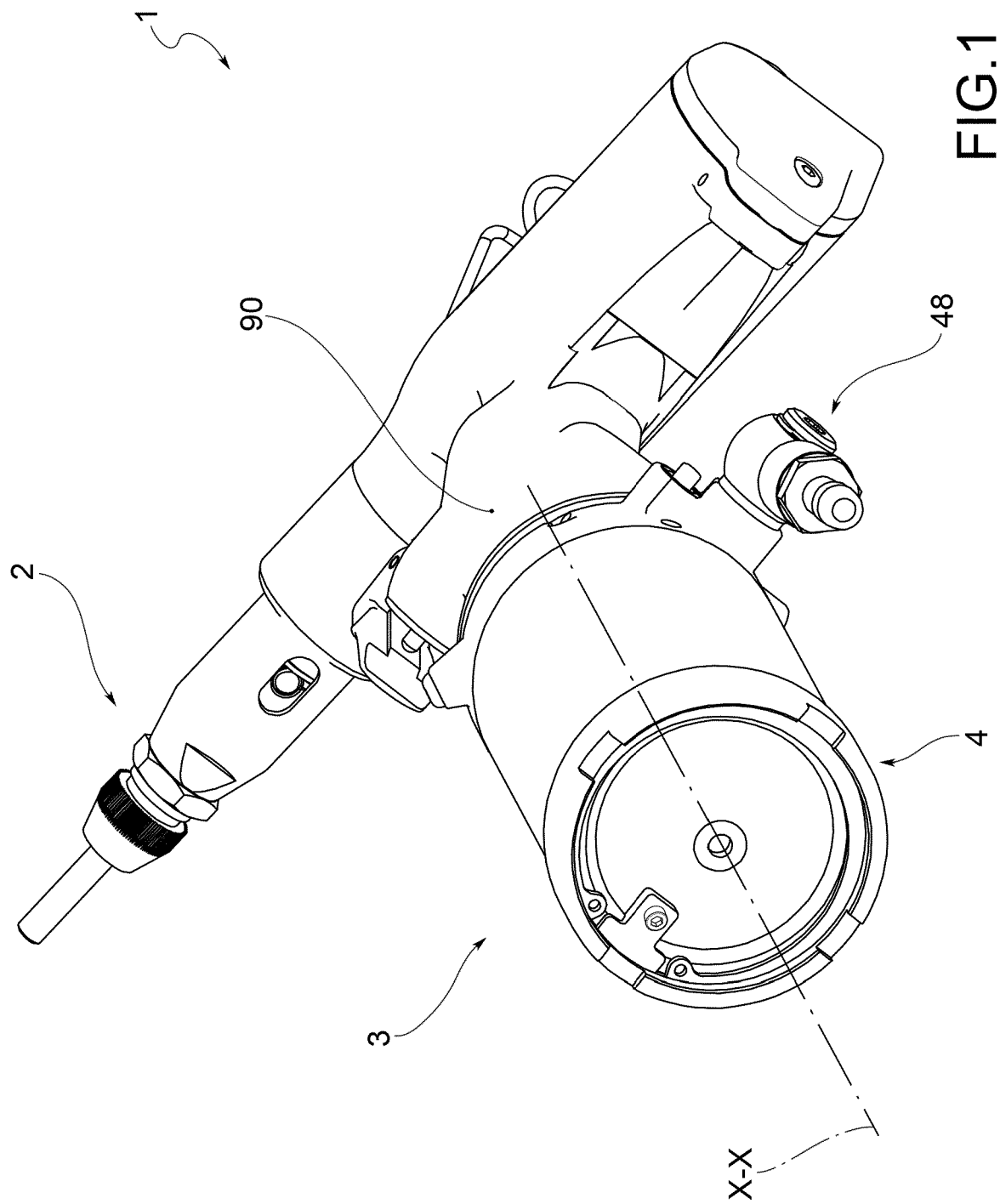


FIG.1

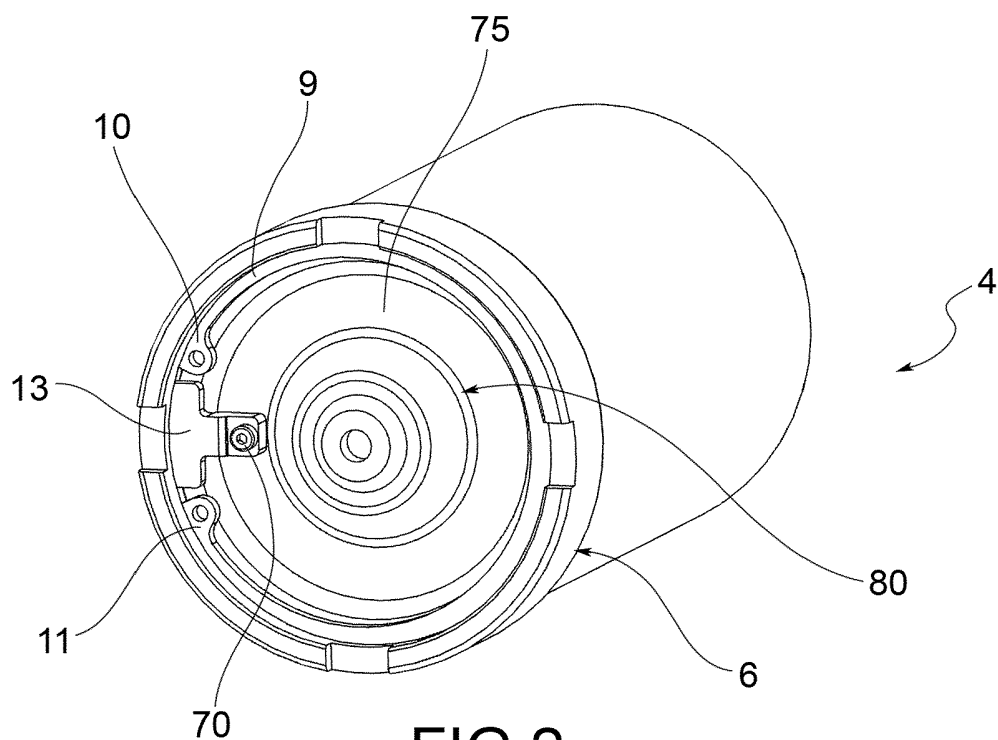


FIG. 2

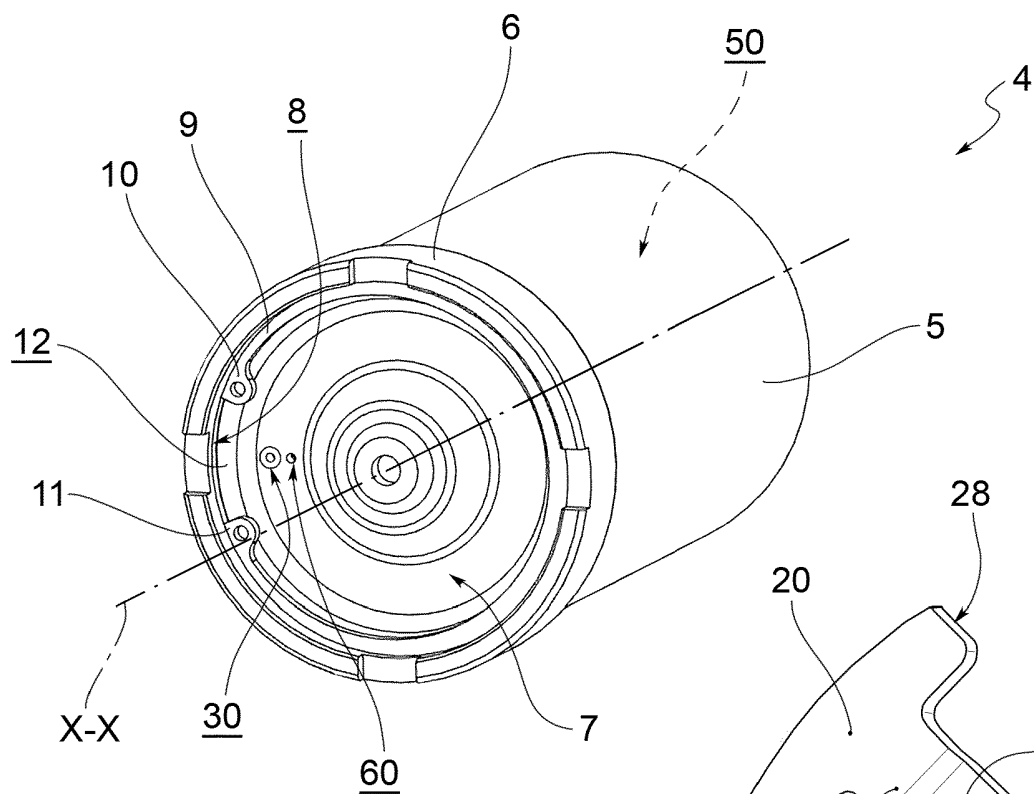


FIG. 3a

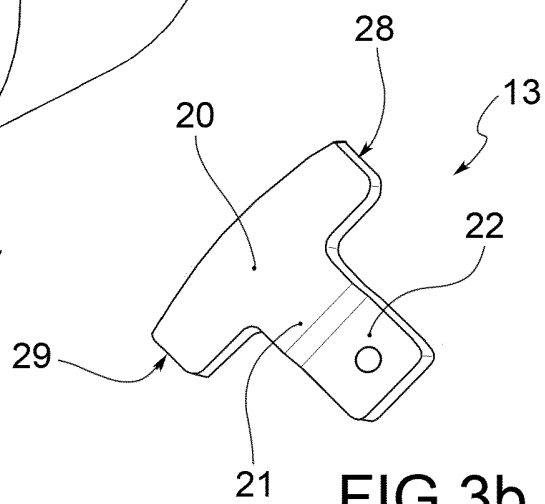


FIG. 3b

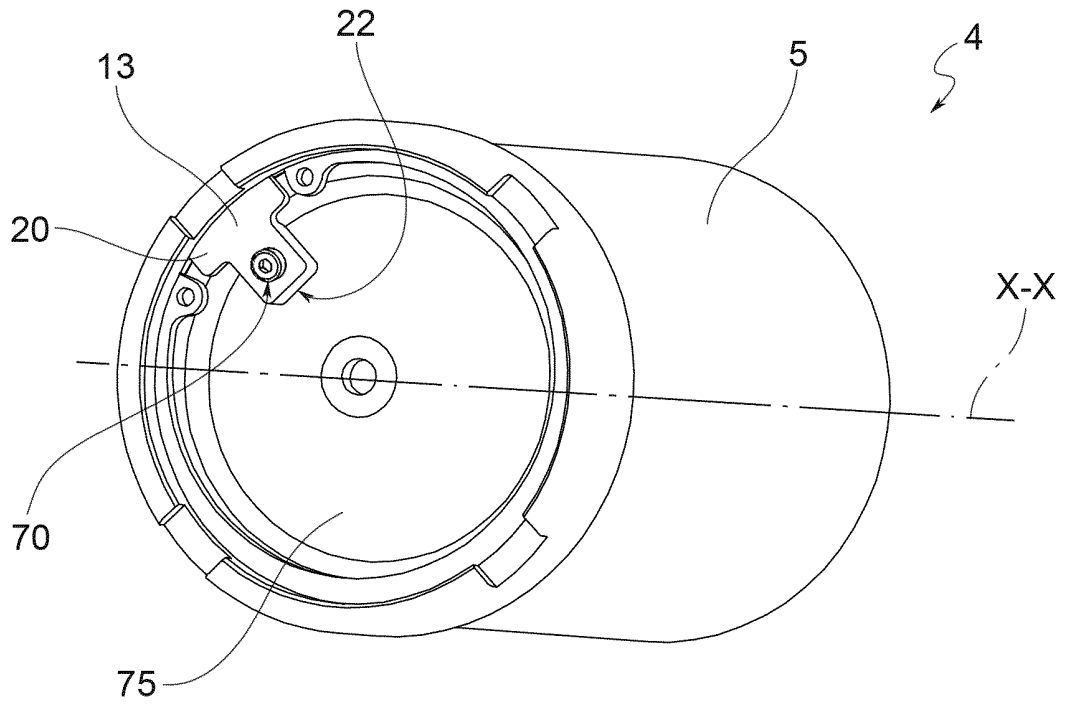


FIG. 4

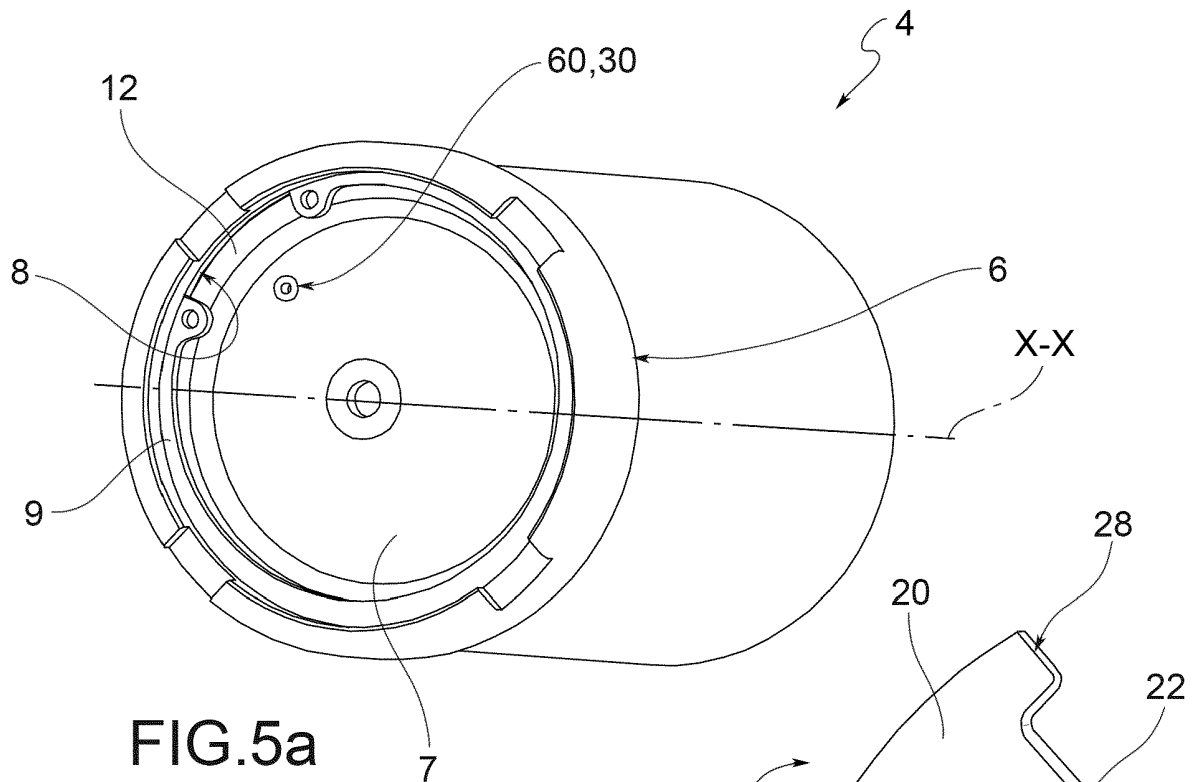


FIG. 5a

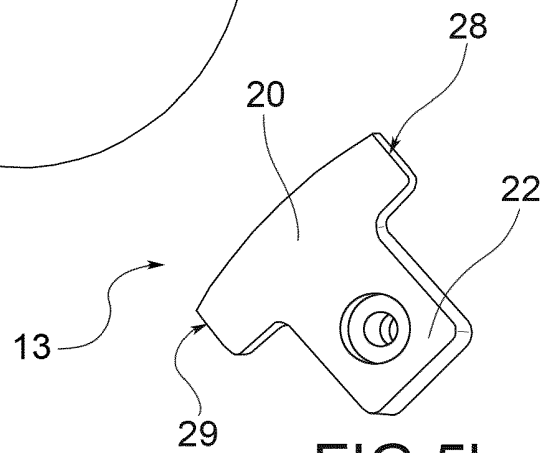


FIG. 5b

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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