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

(11) **EP 4 741 589 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.05.2026 Bulletin 2026/20

(21) Application number: **25211887.2**

(22) Date of filing: **29.10.2025**

(51) International Patent Classification (IPC):
E02F 9/28 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E02F 9/2816; E02F 9/2833; E02F 9/2841; E02F 9/2858

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

(30) Priority: **12.11.2024 IT 202400025434**

(71) Applicant: **ESTI S.r.l.**
25074 Idro (BS) (IT)

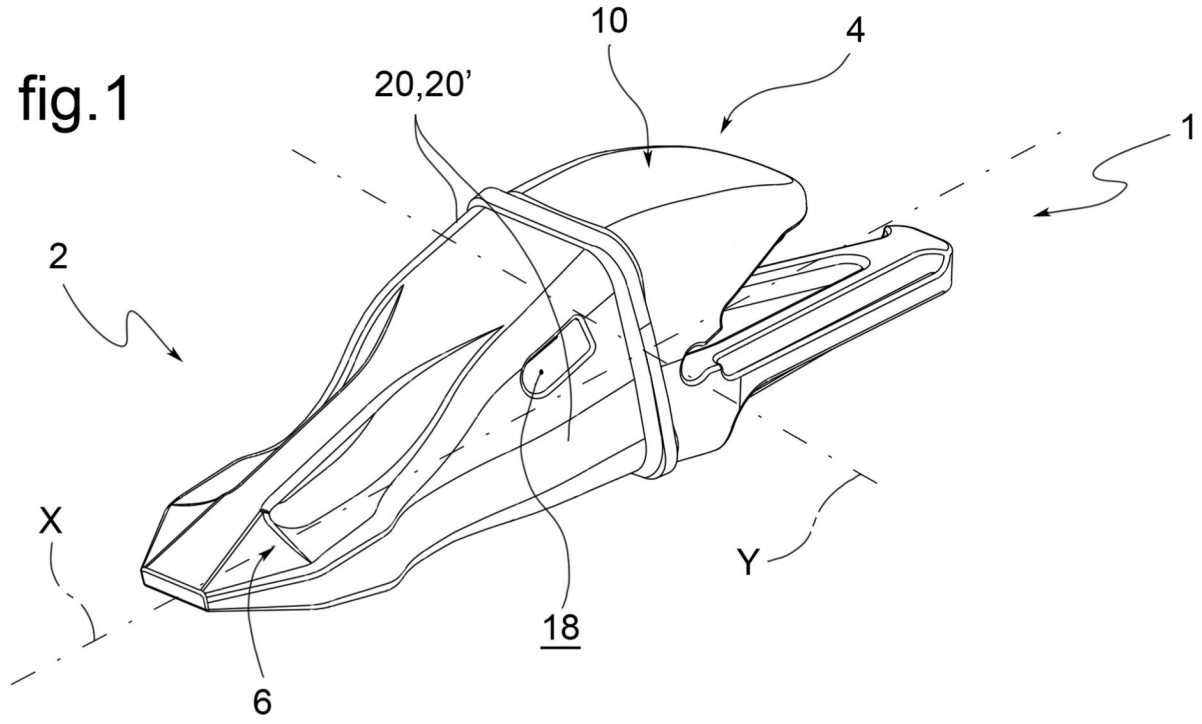
(72) Inventor: **BELOTTI, Francesco**
I-25074 Idro, BRESCIA (IT)

(74) Representative: **Chimini, Francesco et al**
Jacobacci & Partners S.p.A.
Piazza della Vittoria 11
25122 Brescia (IT)

(54) TIP GROUP FOR EARTH-MOVING MACHINES

(57) A tip group (1) for earth-moving machines, which predominantly extends along a longitudinal axis (X) between a front working portion (2) and a rear portion (4) for fastening to a bucket of an earth-moving machine, and comprises a tip (6) defining a pocket (8) open at the rear, a tip holder (10) having a nosepiece (12) defining a front protrusion (13), said nosepiece (12) being suitable for geometrically coupling with the pocket (8), so as to form a male-female type coupling. The tip group is characterized in that at least one of the nosepiece (12) and the inner surface of the pocket (8) has at least one lowered or recessed zone (15; 15'), which extends at least partially in a direction incident with respect to the longitudinal axis (X); and in that at least the other of the nosepiece (12) and the inner surface of the pocket (8) has at least one relief (16; 16') suitable for engaging said lowered or recessed zone (15; 15'), so that, following said engagement, the tip (6) and the tip holder (10) are integrally coupled.

fig.1



EP 4 741 589 A1

Description

Field of application

[0001] The present invention falls within the field of equipment and spare parts for earth-moving machines, for example excavators.

[0002] In particular, the subject of the present invention is a tip group for earth-moving machines.

Prior art

[0003] In the field, countless examples of tip groups for earth-moving machines are known. Typically, a tip group is composed of a tip, a tip holder, and a locking element for locking the tip to the tip holder, such as for example a locking pin.

[0004] Typically, the tip is provided with a pocket open at the rear, and with a locking element hole obtained in a pair of opposite walls of said pocket, suitable for being engaged by the locking element.

[0005] Typically, the tip holder has a body configured to be fixed, for example by welding, screwing or bolting, to the bucket of the earth-moving machine, and a nosepiece that extends from the body and geometrically couples to the pocket of the tip, so as to form a male-female type coupling.

[0006] Furthermore, the nosepiece is typically provided with a locking element seat suitable for being engaged by the locking element, which extends between two opposite surfaces of the nosepiece and is aligned with the locking element hole when the tip and the tip holder are coupled.

[0007] The making of the tip group in two separable parts, tip and tip holder, advantageously allows the replacement of the tip alone when worn, allowing the tip holder to remain permanently fixed to the bucket of the earth-moving machine. The locking system of the tip to the tip holder must therefore be suitable for allowing an easy and quick replacement of the tip, without giving rise to misunderstandings about the insertion direction of the locking element, and without requiring excessive effort by the operator for the operation of inserting said locking element.

[0008] However, this requirement clashes with the need to make the coupling between the tip and the tip holder as firm as possible, so as to withstand the considerable stresses to which the tip is subjected when the earth-moving machine is in operation.

[0009] In some known tip groups, in order to make the replacement operation of the tip easier and quicker, it has been chosen to forego achieving an optimal constraint between the locking element and the locking element seat engaged by it, with the result that, following prolonged use of the tip, the locking element can come out of its seat, causing the decoupling of the tip from the tip holder.

[0010] In other known embodiments, in order to firmly constrain the locking element, specific retaining devices have been provided in the locking element itself, for example of the elastic type, suitable for interacting with the nosepiece of the tip holder. These embodiments, in addition to making the structure of the tip group more complex, and consequently more expensive, have not completely solved the problem of avoiding the decoupling of the tip from the tip holder in demanding operating conditions. In fact, all efforts in this regard have been predominantly concentrated on the coupling between the locking element, the tip and the tip holder, and consequently limited to a restricted area of the tip group. However, the stresses to which the tip group is subjected during use are such that, if countered solely by the locking element, they can cause its breakage, and the consequent decoupling of the tip from the tip holder.

[0011] Other known tip groups provide a bore in the nosepiece of the tip holder, suitable for being engaged by the locking element. Such a bore entails an inevitable structural weakening of the tip group and of its components, in addition to making an additional machining of the tip holder necessary, with a consequent increase in production costs.

[0012] Other known embodiments for tip groups provide an integrated tip-tip holder locking system, without the need for a third locking element. However, such an integrated locking system entails the need for a tool such as a crowbar to lock, unlock or remove the tip, a tool not always readily available in such working environments. Furthermore, such integration also makes a further machining of the tip group necessary, with a consequent increase in production costs.

[0013] Other known tip groups are based on a helical coupling system between the tip and the tip holder. In such systems, the nosepiece of the tip holder, having a helical shape, couples with the tip, reducing the workload of the locking element, which simply has the function of preventing the rotational movement of the tip in the tip holder, and the consequent disengagement.

[0014] A typical problem of all these known systems consists in the fact that, in the absence of the locking element, the tip tends to come out of the tip holder when the tip group is tilted with respect to the horizontal position with respect to the ground, or if it is positioned vertically with respect to the ground.

[0015] Consequently, a bucket of an earth-moving machine having a typical tip group of the prior art must always be placed in a horizontal position with respect to the ground for the assembly of the tip group itself or the replacement of one of its components, since any different inclination of the bucket with respect to the ground would make such an operation of assembling and/or replacing the components difficult or impossible, due to the considerable weight of the tip group.

[0016] A further problem of such systems consists in the disengagement of the locking element during the operation, very frequent, of dragging the bucket of the earth-moving machine to level the ground.

[0017] A still further problem of such systems consists in the lack of compatibility and interchangeability of the various components of the tip group when they are procured each from a different supplier. In particular, tips and tip holders originating from different suppliers present, for example, an excessive play in the coupling between one another, causing a poor coupling of the components, which eventually causes the disengagement of the locking element, which in order to remain correctly constrained in its seat requires a correct sizing and positioning of both the tip and the tip holder.

[0018] There is therefore still a strong need to reconcile the requirements of making the tip as integrally constrained as possible to the tip holder, so as to effectively counter the considerable stresses to which the tip is subjected, and at the same time to facilitate the assembly or replacement of the tip itself, especially when the bucket of the earth-moving machine is inclined with respect to the ground.

Summary of the invention

[0019] The purpose of the present invention is therefore to meet this need, at the same time overcoming the drawbacks of the tip groups for earth-moving machines of the prior art.

[0020] These and other objects are achieved by means of a tip group for earth-moving machines in accordance with attached claim 1. The dependent claims describe preferred or advantageous embodiments of the invention, involving further advantageous aspects.

Description of the drawings

[0021] The features and advantages of the invention will nonetheless become evident from the description given below of some preferred embodiments, provided by way of non-limiting example, with reference to the accompanying figures, in which:

- Figure 1 is a perspective view of a tip group according to the present invention, in one embodiment;
- Figure 2 is a side view of the tip group of Figure 1;
- Figure 3 is a top plan view of the tip group of Figure 1;
- Figure 4 is an exploded perspective view of the tip group of the previous figures;
- Figures 5a and 5b are two perspective views of the tip holder alone of the tip group of the previous figures;
- Figures 6a, 6b, 6c and 6d are four perspective views of the tip alone of the tip group of the previous figures;
- Figure 7a is a perspective view of the assembled tip group of the previous figures provided with a locking pin;
- Figure 7b is a side view of the tip group of Figure 7a;
- Figure 7c is a vertical section of the tip group of Figure 7a;
- Figure 8 is a horizontal section of the tip group of Figure 7a;
- Figure 9 is an exploded perspective view of the tip group of Figure 7a;
- Figure 10a is a perspective view of the tip group with the connecting pin and related locking ring assembly inserted, according to an alternative embodiment of the present invention;
- Figure 10b is a vertical section of the tip group of Figure 10a;
- Figures 11a and 11b are two perspective views of the tip alone of the tip group of Figure 10a;
- Figure 12 is a horizontal section of the tip group of Figure 10a;
- Figure 13 is a cross section of the tip group of Figure 10a, at the connecting pin and related locking ring assembly;
- Figure 14 is a vertical section of the tip group of Figure 10a, provided with pin assembly;
- Figure 15 is an exploded perspective view of the tip group of Figure 10a;
- Figures 16a and 16b show, in side view, two steps of the insertion of the tip onto the tip holder;
- Figures 17a and 17b show, in perspective view, two steps of the angular movement for coupling the tip to the tip holder;
- Figures 17c and 17d are views similar to the previous ones, but with tip and tip holder in cross section;
- Figures 18a and 18b are two perspective views of the tip holder and of the tip according to an alternative embodiment of the present invention.

Detailed description

[0022] The reference numerals reported below are also shown in the aforementioned accompanying figures.

[0023] In the continuation of the present disclosure, all directional references (for example, upper, lower, upward, downward, left, right, to the left, to the right, top, bottom, above, below, vertical, horizontal, clockwise and counterclockwise) are used solely for identification purposes to assist the reader in understanding the embodiments described and do not create limitations, in particular with regard to the position, orientation or use of the embodiments described.

[0024] Furthermore, the references of connection (for example, fixed, coupled, connected and the like) must be interpreted in a broad sense and may include intermediate elements between a connection of elements and a relative movement between elements.

[0025] Therefore, the references of connection do not necessarily imply that two elements are directly connected and in a fixed relationship with each other.

[0026] The tip group (1) for earth-moving machines according to the present invention predominantly extends along a longitudinal axis (X) between a front working portion (2) and a rear portion (4) for fastening to a bucket of an earth-moving machine.

[0027] In a general embodiment, the tip group comprises a tip (6) and a tip holder (10). The tip defines a pocket (8) open at the rear. The tip holder (10) has a nosepiece (12) defining a front protrusion (13). The nosepiece (12) is suitable for geometrically coupling with the pocket (8), so as to achieve a male-female type coupling.

[0028] At least one between the nosepiece (12) and the inner surface of the pocket (8) has at least one lowered or recessed zone (15; 15'). Said lowered or recessed zone (15; 15') extends at least partially in a direction incident with respect to the longitudinal axis (X). At least the other between the nosepiece (12) and the inner surface of the pocket (8) has at least one relief (16; 16') suitable for engaging the lowered or recessed zone (15; 15'), so that, following said engagement, the tip (6) and the tip holder (10) are integrally coupled.

[0029] The tip (6) belonging to the tip group (1) for earth-moving machines according to the present invention constitutes the actual tool for earth handling, whereas the tip holder (10) belonging to the tip group (1) according to the present invention allows the entire tip group (1) to be fixed to a bucket of an earth-moving machine, for example an excavator.

[0030] The tip (6) has a front working portion and a rear portion for coupling to the tip holder (10). The coupling between the tip (6) and the tip holder (10) is of the male-female type, the rear portion of the tip (6) defining the female portion of the coupling. More in detail, the rear portion defines the pocket (8) open at the rear.

[0031] The nosepiece (12) constitutes the male portion of the coupling with the tip (6), and is shaped complementarily to the pocket (8) to be inserted and geometrically coupled with it.

[0032] The nosepiece (12) extends from a tip holder body (10). In one embodiment, the tip holder body has a configuration, for example V-shaped, to be fixed, for example by welding, screwing or bolting, to a bucket of an earth-moving machine.

[0033] In a general embodiment, the constraining reaction generated by the integral coupling between the tip (6) and the tip holder (10) is such as to balance the effect of the gravitational force acting on the tip (6), when the tip group (1) is in a vertical position with respect to the ground.

[0034] In other words, the engagement of the at least one relief (16; 16') with the at least one lowered or recessed zone (15; 15'), and the consequent coupling between the tip (6) and the tip holder (10), generates a constraining reaction that allows the tip (6) not to come out from the tip holder (10), even when the tip group (1) is inclined with respect to the ground.

[0035] Therefore, the integral coupling between the tip (6) and the tip holder (10) takes place by means of an axial insertion of the tip (6) into the tip holder (10) and a subsequent rotational movement of the tip (6) around the longitudinal axis (X).

[0036] Preferably, the integral coupling between the tip (6) and the tip holder (10) is a bayonet engagement.

[0037] The bayonet engagement is a mechanical connection that allows the tip (6) to be quickly joined to the tip holder (10), by means of an insertion movement of the tip (6) into the tip holder (10) and a subsequent rotation of a few degrees of the tip (6) around the longitudinal axis (X).

[0038] In a general embodiment, the bayonet engagement is designed so as to compensate the gravitational force acting on the tip (6) by means of a locking mechanism, which exploits the rotational movement to keep the connection between the tip (6) and the tip holder (10) firm.

[0039] In other words, the rotational movement causes the at least one relief (16; 16') to engage the at least one lowered or recessed zone (15; 15'), so that the final configuration reached is one of stable equilibrium, preventing the gravitational force from causing the tip (6) to come out of the tip holder (10), axially locking the tip (6) itself. In this way, although the gravitational force acts on the tip (6), the bayonet engagement resists through its mechanical structure, preventing the disconnection of the two components.

[0040] In one embodiment, both the nosepiece (12) and the inner surface of the pocket (8) have a lowered or recessed zone (15; 15'). Each of said lowered or recessed zones (15; 15') extends at least partially in a direction incident with respect to the longitudinal axis (X). Both the nosepiece (12) and the inner surface of the pocket (8) have a relief (16; 16'). Each of said reliefs (16; 16') is suitable for engaging a respective lowered or recessed zone (15; 15').

[0041] In one embodiment, both the nosepiece (12) and the inner surface of the pocket (8) have both a lowered or recessed zone (15; 15'), which extends at least partially in a direction incident with respect to the longitudinal axis (X), and a relief (16; 16'). The relief (16; 16') on the nosepiece (12) engages the lowered or recessed zone (15; 15') present on the inner surface of the pocket (8), while the relief (16; 16') on the inner surface of the pocket (8) engages the lowered or recessed zone (15; 15') on the nosepiece (12).

[0042] In other words, the presence of a pair of reliefs (16; 16') and of a pair of lowered or recessed zones (15; 15') allows a double bayonet engagement between the tip (6) and the tip holder (10).

[0043] According to a further aspect of the invention, the at least one lowered or recessed zone (15; 15') consists of a groove having a dimension in the direction parallel to the longitudinal axis (X) much smaller than the dimension in the direction incident to the longitudinal axis (X).

[0044] In one embodiment, each groove defines a broken line composed of at least two portions, of which one insertion portion is substantially parallel to the longitudinal axis (X), and one locking portion incident to said longitudinal axis (X).

[0045] For example, the locking portion is perpendicular to the longitudinal axis (X).

[0046] In accordance with one embodiment, the tip (6) has at least one locking element hole (18) obtained in a

pair of opposite walls (20, 20') defining the pocket (8), and suitable for being engaged by a locking element (22; 23, 23'). Furthermore, a locking element seat (24) suitable for being engaged by the locking element (22; 23, 23') is obtained in the nosepiece (12). The locking element seat (24) is at least partially aligned with the locking element hole (18) when the tip (6) and the tip holder (10) are integrally coupled.

[0047] In a general embodiment, the locking element seat (24) is perfectly aligned with the locking element hole (18) when the tip (6) and the tip holder (10) are integrally coupled.

[0048] In a general embodiment, the locking element seat (24) is defined by a lowered or recessed zone (14) obtained in the surface of the nosepiece (12).

[0049] In a general embodiment, the locking element hole (18) and the locking element seat (24) extend along a transverse axis (Y) perpendicular to the longitudinal axis (X).

[0050] Preferably, the transverse axis (Y) is parallel to the ground, so that the locking element (22; 23, 23') is positioned parallel to the ground when the earth-moving machine is in operation.

[0051] In accordance with one embodiment, the nosepiece (12) and the pocket (8) have respective upper (26, 26') and lower (28, 28') surfaces inclined with respect to the longitudinal axis (X) and converging at the front. The nosepiece (12) and the pocket (8) also have respective opposite side surfaces (30, 30', 30'', 30'''). For example, the opposite side surfaces (30'', 30''') of the pocket (8) are substantially vertical.

[0052] In a general embodiment, the locking element seat (24) and the locking element hole (18) extend between the opposite side surfaces (30, 30', 30'', 30''').

[0053] In accordance with one embodiment, the pocket (8) ends at the front with a substantially hemispherical bottom (32). The front protrusion (13) defined by the nosepiece (12) is substantially hemispherical, so that said front protrusion (13) abuts against the bottom (32) when the tip (6) and the tip holder (10) are integrally coupled.

[0054] In accordance with one embodiment, the front protrusion (13) defined by the nosepiece (12) and the body of the tip holder (10) are joined by a transition surface (36) substantially free of edges.

[0055] Preferably, said transition surface (36) is substantially hyperboloidal in shape.

[0056] In one embodiment, the tip group (1) further comprises a locking pin (22). The locking pin (22) predominantly extends along a pin axis (Z) and is suitable for engaging the locking element seat (24) and the locking element hole (18).

[0057] In one embodiment, the locking pin (22) has an intermediate portion (34), in the direction perpendicular to the pin axis (Z), suitable for allowing a compression insertion of the locking pin (22) into the locking element hole (18) and into the locking element seat (24), so as to constrain the locking pin (22) in the direction of the pin axis (Z).

[0058] In a general embodiment, the locking pin (22) has a rear portion defining a rear surface and a front portion defining a front surface.

[0059] Preferably, the intermediate portion (34) of the locking pin (22) is made of an elastomeric material, for example rubber.

[0060] In an alternative embodiment illustrated in Figure 10a, the tip group (1) is provided with a connecting pin assembly (23) comprising a connecting pin and a related locking ring (23'). The connecting pin (23) predominantly extends along a pin axis (P) and is suitable for engaging the locking element seat (24) and the locking element hole (18). The locking ring (23') is suitable for constraining the connecting pin (23) in the direction of the pin axis (P).

[0061] In a general embodiment, the connecting pin (23) is suitable for being inserted into the locking element hole (18) and into the locking element seat (24), and for being constrained along the pin axis (P) by the related locking ring (23').

[0062] Preferably, the connecting pin (23) and the related locking ring (23') are made of steel.

[0063] The advantages offered by the tip group (1) described above are many.

[0064] First of all, the simultaneous presence of lowered or recessed zones (15; 15') in the nosepiece (12) and corresponding reliefs (16; 16') in the inner surface of the pocket (8), and corresponding reliefs (16; 16') in the nosepiece (12) and lowered or recessed zones (15; 15') in the inner surface of the pocket (8), allows involving in the coupling between tip (6) and tip holder (10) multiple sides of the surface of the nosepiece (12) and of the inner surface of the pocket (8), greatly increasing the solidity of the tip group (1), and the resistance of the tip (6) to tearing.

[0065] Moreover, the presence of a double coupling mechanism between the tip (6) and the tip holder (10) protects the tip group (1) from possible casting defects due to mass production of the components, such as the absence of one of the reliefs (16; 16'), thereby reducing the impact of production defects on the product.

[0066] Advantageously, the presence of a locking pin (22), unlike integrated locking systems of the prior art, allows the use of a hammer for the assembly or replacement of the tip (6), without the need for specific tools not always readily available in such working environments, while also containing production costs.

[0067] Moreover, the presence of a locking pin (22) made of elastomeric material, easy to compress, allows to compensate any excessive play in the coupling between the components, offering solidity to the entire tip group (1), and preventing possible disengagements of the locking pin (22) from the locking element seat (24).

[0068] Advantageously, the tip group (1) according to the invention allows an intuitive, safe and reliable assembly of the tip (6). In fact, the insertion of the locking pin (22) takes place unambiguously thanks to the geometry of the

system, and the engagement takes place with a simple insertion movement followed by a rotation of a few degrees.

[0069] Innovatively, the locking pin (22) is in a horizontal position with respect to the ground when the earth-moving machine is in operation, thus avoiding the risk of its possible disengagement, with consequent disengagement of the tip (6) from the tip holder (10), due to the dragging of the bucket on the ground to level it.

[0070] Extremely advantageously, the locking between tip (6) and tip holder (10) is not conditioned by the simultaneous full conformity of both the tip (6) and the tip holder (10), allowing faster and more economical interchange of the various components of the tip group (1).

[0071] Innovatively, the locking element (22; 23, 23') can be inserted into the tip (6) independently of the presence of the tip holder (10), allowing greater flexibility of the locking mechanism.

[0072] Extremely advantageously, the bayonet engagement allows the tip (6) and the tip holder (10) to remain integrally coupled even in the absence of the locking pin (22), allowing the components of the tip group (1) to be mounted or replaced with flexibility in the positioning of the bucket, with less risk of sudden falls of the components before the insertion of the locking pin (22), especially when the bucket is in a vertical position, thereby ensuring greater safety for operators.

[0073] Advantageously, the bayonet engagement allows a distribution of the pressure exerted by the gravitational force along the entire contact surface between the reliefs (16; 16') and the lowered or recessed zones (15; 15'), rather than at a single point. This greatly improves the overall robustness of the tip group (1), making it very difficult for the tip (6) to disengage from the tip holder (10).

[0074] Advantageously, the use of a connecting pin (23) and related locking ring (23') made of steel allows the operator to work with hot slag.

[0075] Even more advantageously, the use of a connecting pin (23) and related locking ring (23') made of steel makes it possible to create larger tip groups, being capable of supporting their weight and ensuring their solidity.

[0076] Furthermore, the locking pin (22) is sized in such a way that the intermediate elastic portion is compressed not only during the insertion operation into its seat, but remains compressed even after insertion is completed. Such compression greatly reduces the risk of disengagement of the locking pin (22), for example due to the impact of the tip (6) with objects or debris while the earth-moving machine is in operation.

[0077] Advantageously, the transition surface (36) between the front protrusion (13) defined by the nosepiece (12) and the body of the tip holder (10) is substantially free of edges, allowing reinforcement of the nosepiece (12) in one of the areas most subject to breakage due to the impact of the tip (6) with objects or debris while the earth-moving machine is in operation.

[0078] Finally, the coupling between the tip (6) and the tip holder (10) gives the tip group (1) an extremely compact and homogeneous design, as if the two elements formed a single body. This helps prevent soil, debris or other working materials from entering the tip group (1), compromising its solidity.

[0079] It is clear that a person skilled in the art, in order to meet contingent needs, may make modifications to the invention described above, all within the scope of protection as defined by the following claims.

Claims

1. A tip group (1) for earth-moving machines, said tip group (1) predominantly extending along a longitudinal axis (X) between a front working portion (2) and a rear portion (4) to be fixed to a bucket of an earth-moving machine, and comprising:

   - a tip (6) defining a pocket (8) open at the rear;
   - a tip holder (10) having a nosepiece (12) defining a front protrusion (13), said nosepiece (12) suitable for being coupled geometrically to the pocket (8), so as to create a male-female type coupling;

   characterized in that at least one of the nosepiece (12) and the inner surface of the pocket (8) has at least one lowered or recessed zone (15; 15'), said lowered or recessed zone (15; 15') extending at least partially in an incident direction with respect to the longitudinal axis (X); and **in that** at least the other of the nosepiece (12) or the inner surface of the pocket (8) has at least one relief (16; 16') suitable for engaging said lowered or recessed zone (15; 15') so that, following said engagement, the tip (6) and the tip holder (10) are integrally coupled.

2. Tip group according to claim 1, wherein the constraining reaction generated by the integral coupling between the tip (6) and the tip holder (10) balances the effect of the gravitational force acting on the tip (6), when the tip group (1) is in a vertical position with respect to the ground.

3. Tip group according to any one of the preceding claims, wherein the integral coupling between the tip (6) and the tip holder (10) occurs by axially engaging the tip (6) in the tip holder (10) and then rotationally moving the tip (6) about the longitudinal axis (X).

4. Tip group according to any one of the preceding claims, wherein the integral coupling between the tip (6) and the tip holder (10) is a bayonet engagement.

5. Tip group according to any one of the preceding claims, wherein both the nosepiece (12) and the inner surface of the pocket (8) have a lowered or recessed zone (15; 15'), each of said lowered or recessed zones (15; 15') extending at least partially in an incident direction with respect to the longitudinal axis (X), and both the nosepiece (12) and the inner surface of the pocket (8) have a relief (16; 16'), each of said reliefs (16; 16') being suitable for engaging a respective one of said lowered or recessed zones (15; 15').

6. Tip group according to any one of the preceding claims, wherein the at least one lowered or recessed zone (15; 15') consists of a groove having a much smaller dimension in the direction parallel to the longitudinal axis (X) than the dimension in the direction incident to the longitudinal axis (X).

7. Tip group according to any one of the preceding claims, wherein the tip (6) has at least one locking element hole (18) obtained in a pair of opposite walls (20, 20') defining the pocket (8) and suitable for being engaged by a locking element (22; 23, 23'); and wherein a locking element seat (24) suitable for being engaged by said locking element (22; 23, 23') is obtained in the nosepiece (12), said locking element seat (24) being at least partially aligned with said locking element hole (18) when the tip (6) and the tip holder (10) are integrally coupled.

8. Tip group according to claim 7, **characterized in that** the locking element seat (24) is defined by a lowered or recessed zone (14) obtained in the surface of the nosepiece (12).

9. Tip group according to claim 7 or 8, wherein the locking element hole (18) and the locking element seat (24) extend along a transverse axis (Y) perpendicular to the longitudinal axis (X).

10. Tip group according to any one of claims 7 to 9, wherein the nosepiece (12) and the pocket (8) have respective upper (26, 26') and lower (28, 28') surfaces inclined with respect to the longitudinal axis (X) and converging at the front; and wherein the nosepiece (12) and the pocket (8) have respective opposite side surfaces (30, 30', 30'', 30‴), at least said opposite side surfaces (30", 30‴) of the pocket (8) being substantially vertical.

11. Tip group according to claim 10, the locking element seat (24) and the locking element hole (18) extending between said opposite side surfaces (30, 30', 30", 30‴).

12. Tip group according to any one of the preceding claims, **characterized in that** the pocket (8) ends at the front with a substantially hemispherical bottom (32); and **in that** the front protrusion (13) defined by the nosepiece (12) is substantially hemispherical, so that said front protrusion (13) abuts against said bottom (32) when the tip (6) and the tip holder (10) are integrally coupled.

13. Tip group according to any one of claims 7 to 12, further comprising a locking key (22), said locking key (22) predominantly extending along a key axis (Z), and being suitable for engaging the locking element seat (24) and the locking element hole (18).

14. Tip group according to claim 13, wherein the locking key (22) has an intermediate portion (34) in the direction perpendicular to the key axis (Z), said intermediate portion (34) being suitable for allowing a compression insertion of the locking key (22) into the locking element hole (18) and into the locking element seat (24), so as to constrain the locking key (22) in the direction of the key axis (Z).

15. Tip group according to any one of claims 13 or 14, wherein the intermediate portion (34) of the locking key (22) is made of an elastomeric material, for example rubber.

16. Tip group according to any one of claims 7 to 12, further comprising a connecting pin (23) and related locking ring (23'), said connecting pin (23) predominantly extending along a pin axis (P), and being suitable for engaging the locking element seat (24) and the locking element hole (18); and said related locking ring (23') being suitable for constraining the connecting pin (23) in the direction of the pin axis (P).

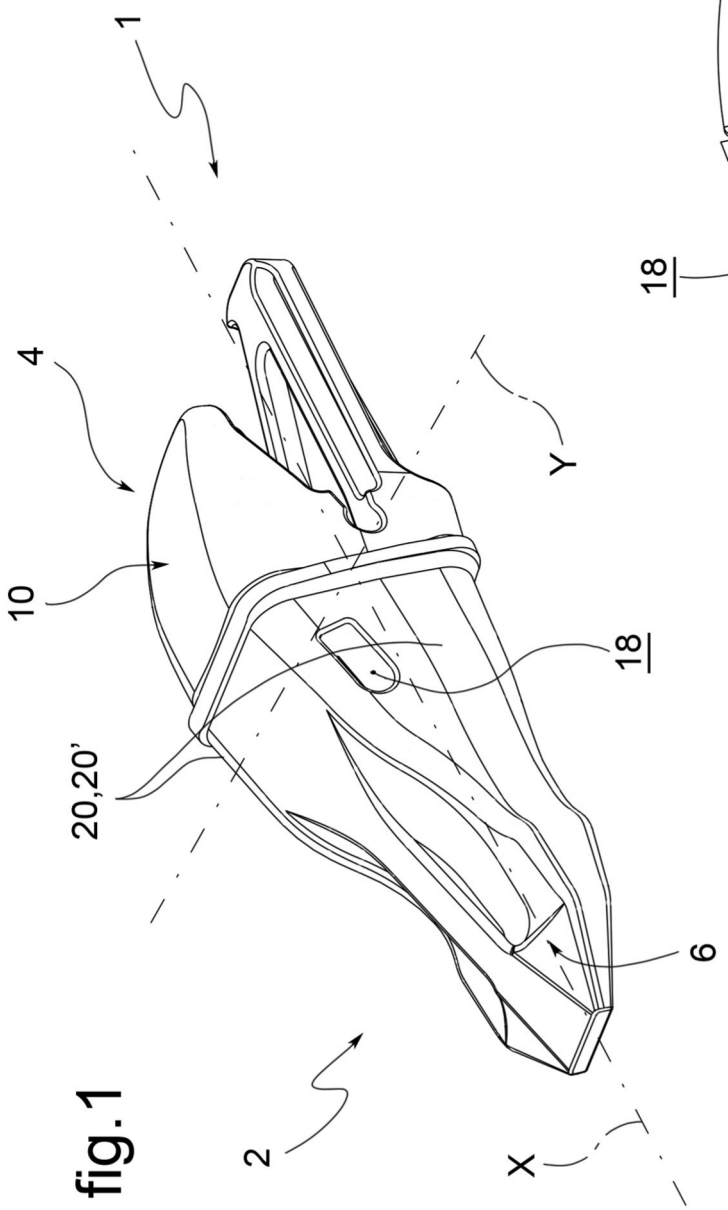


fig.1

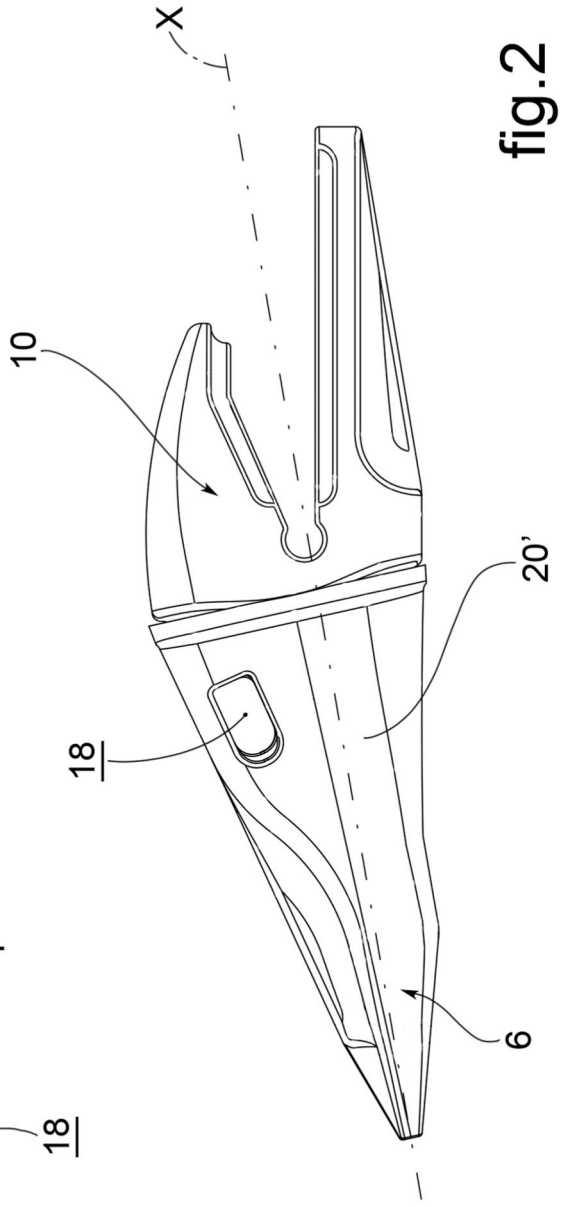


fig.2

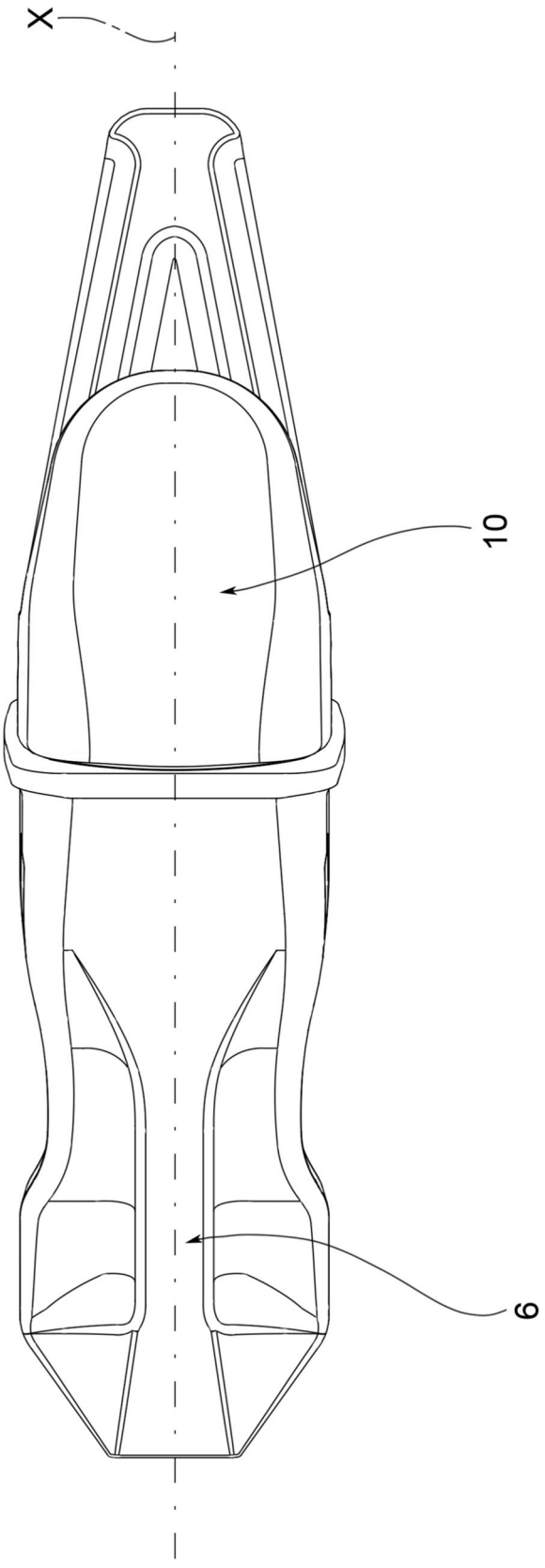


fig.3

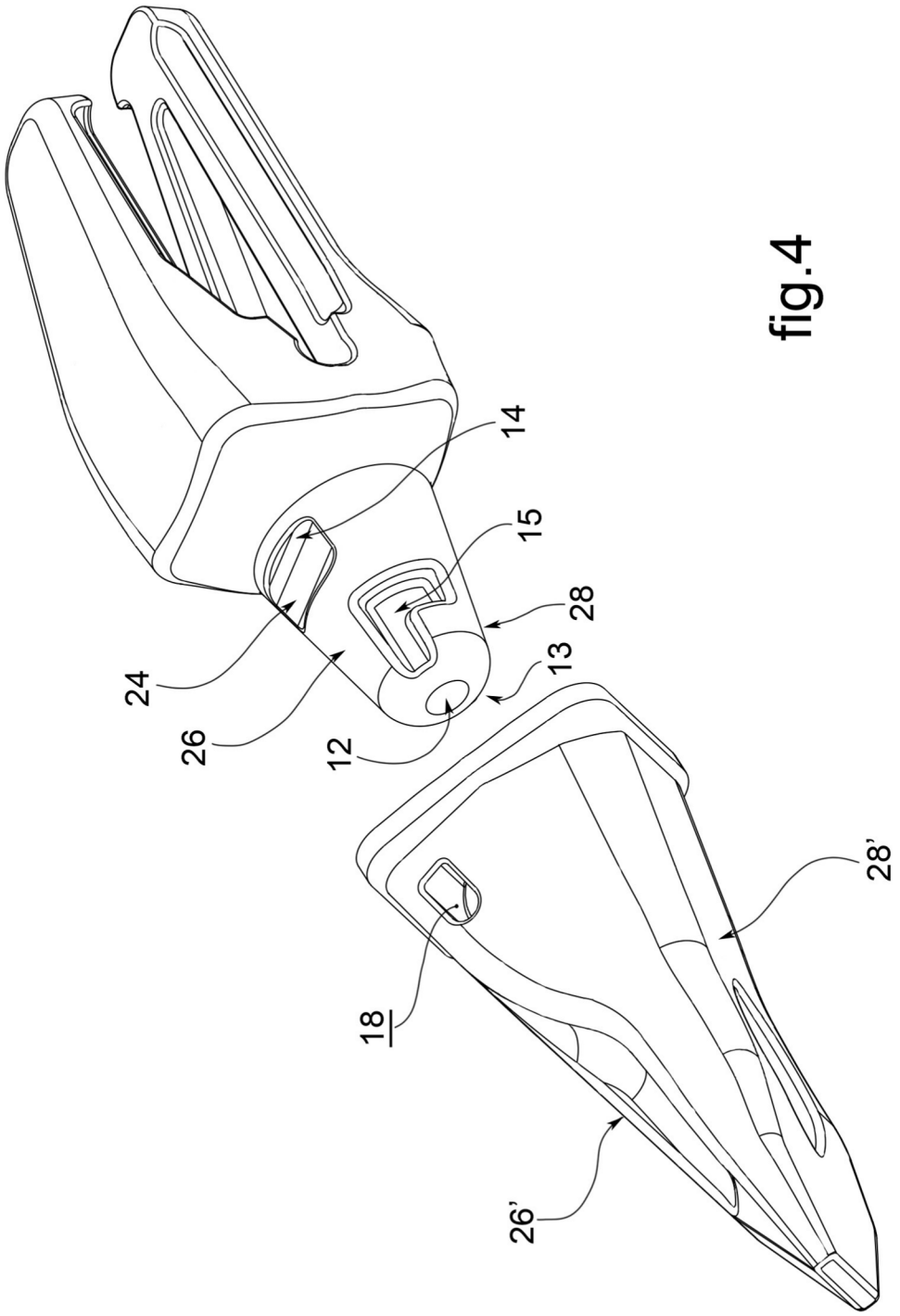


fig.4

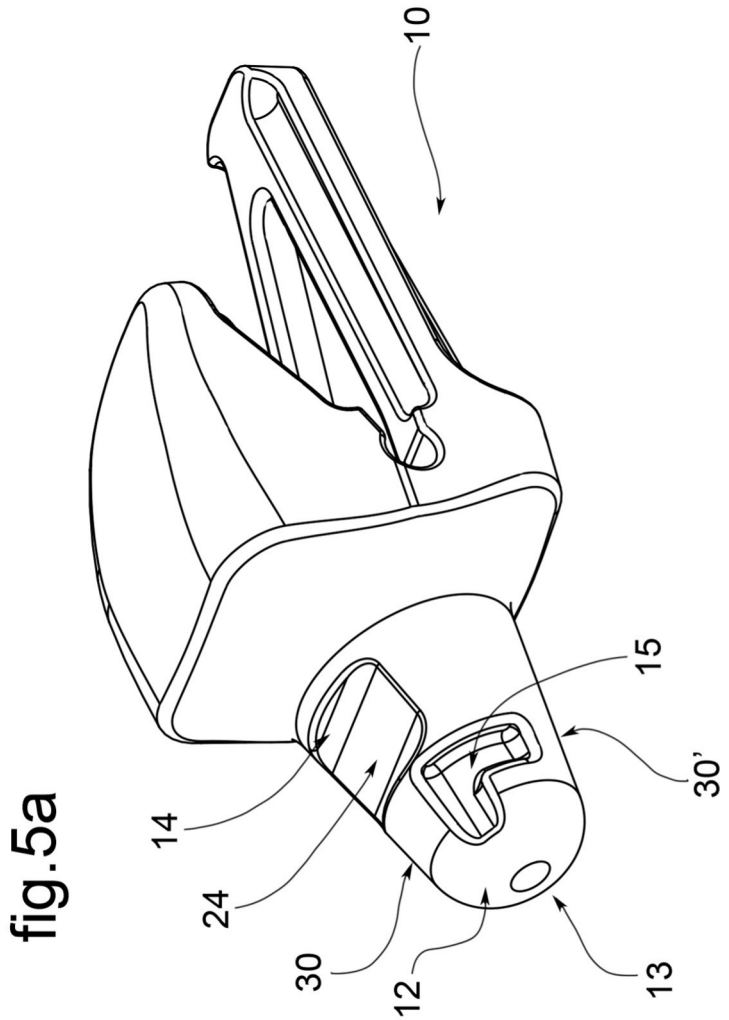


fig.5a

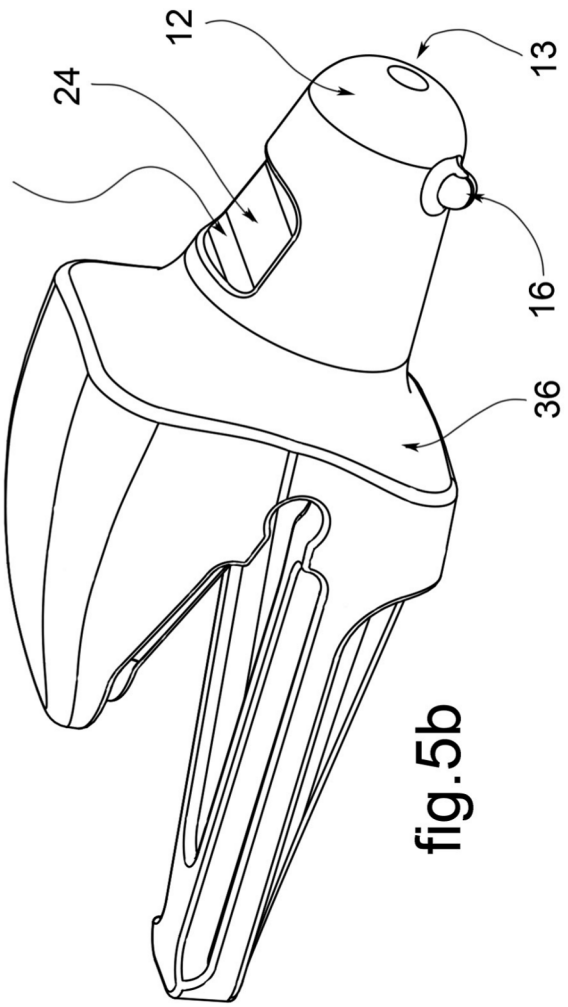


fig.5b

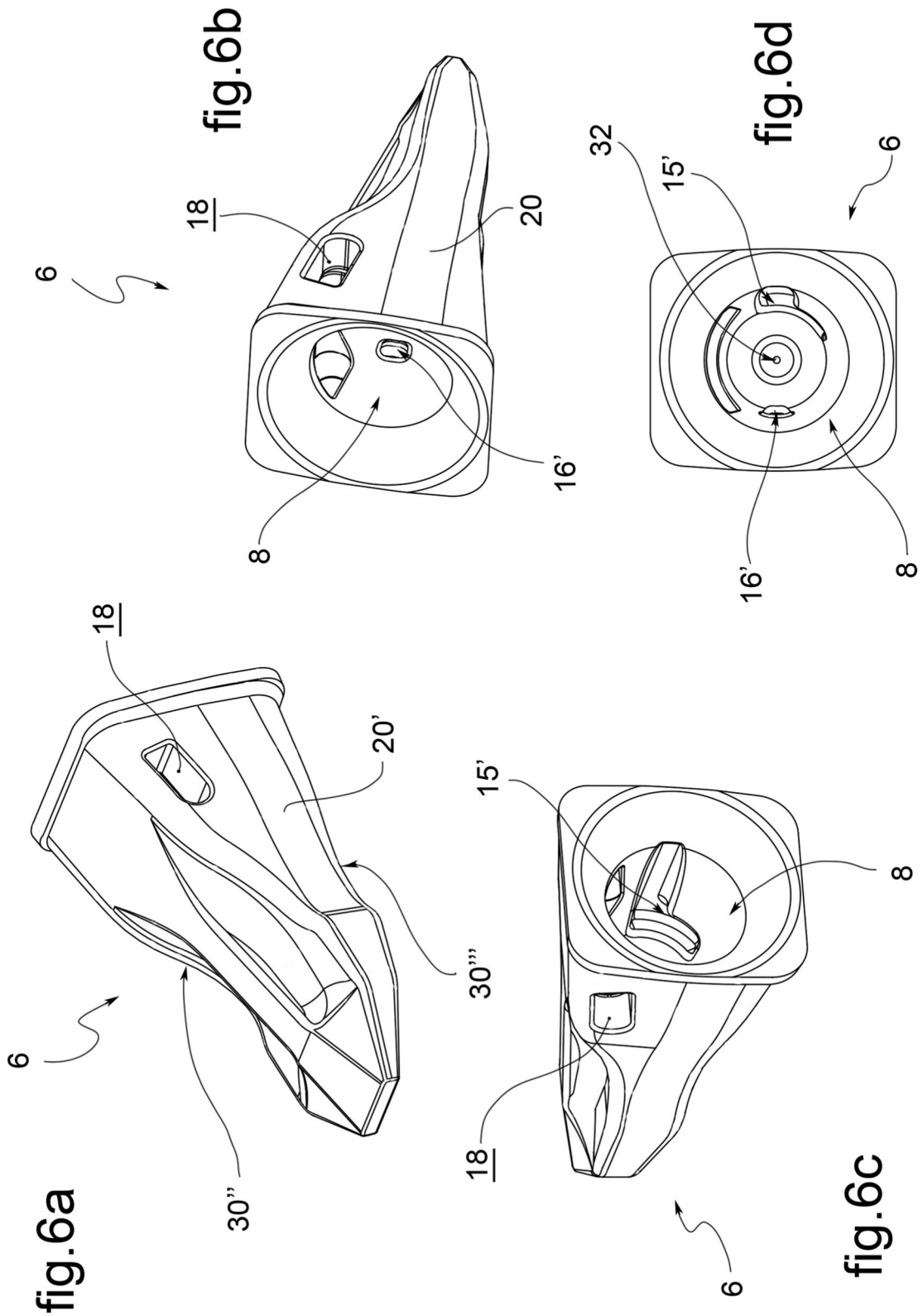


fig.6a fig.6b fig.6c fig.6d

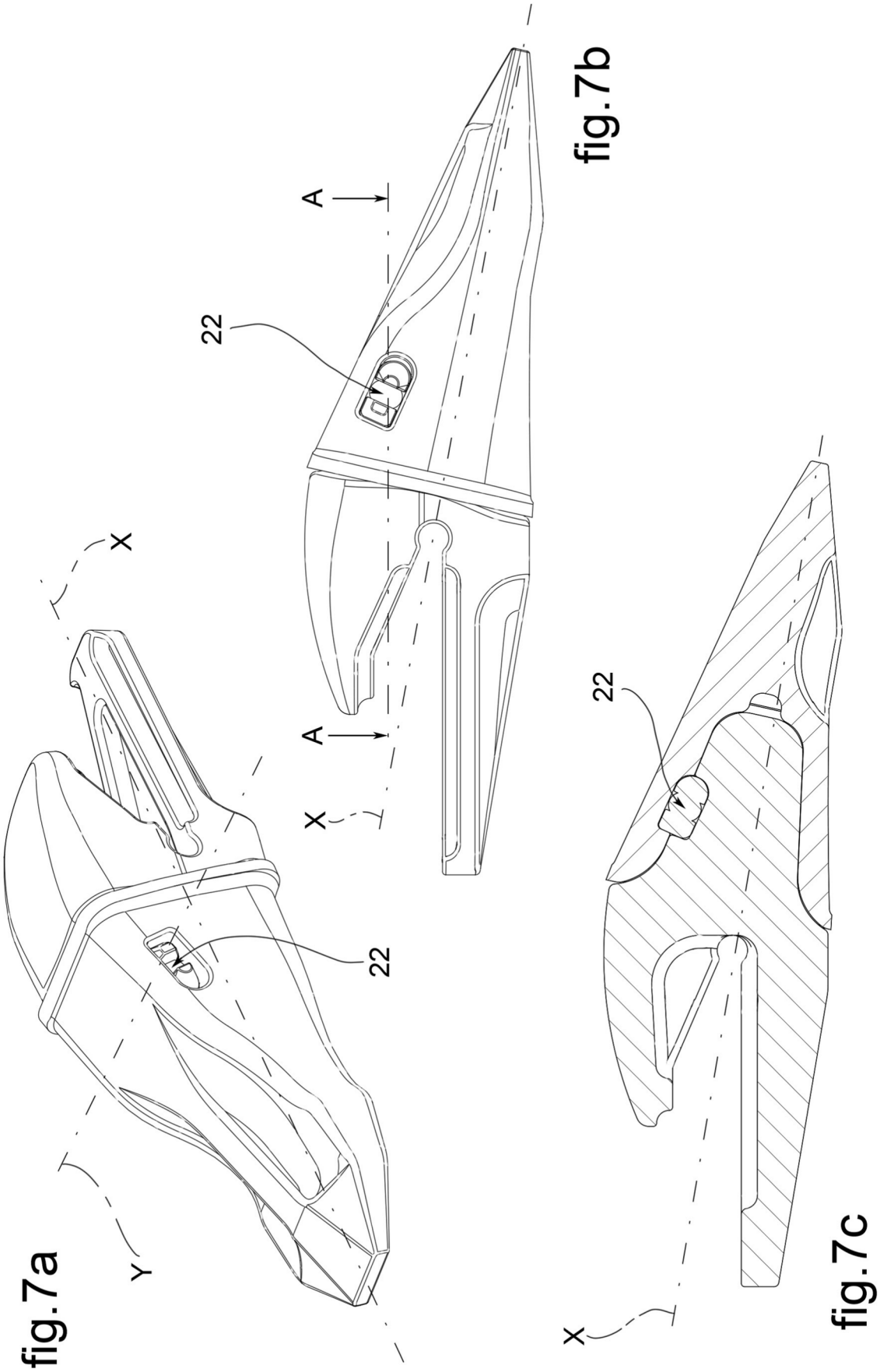


fig.7a

fig.7b

fig.7c

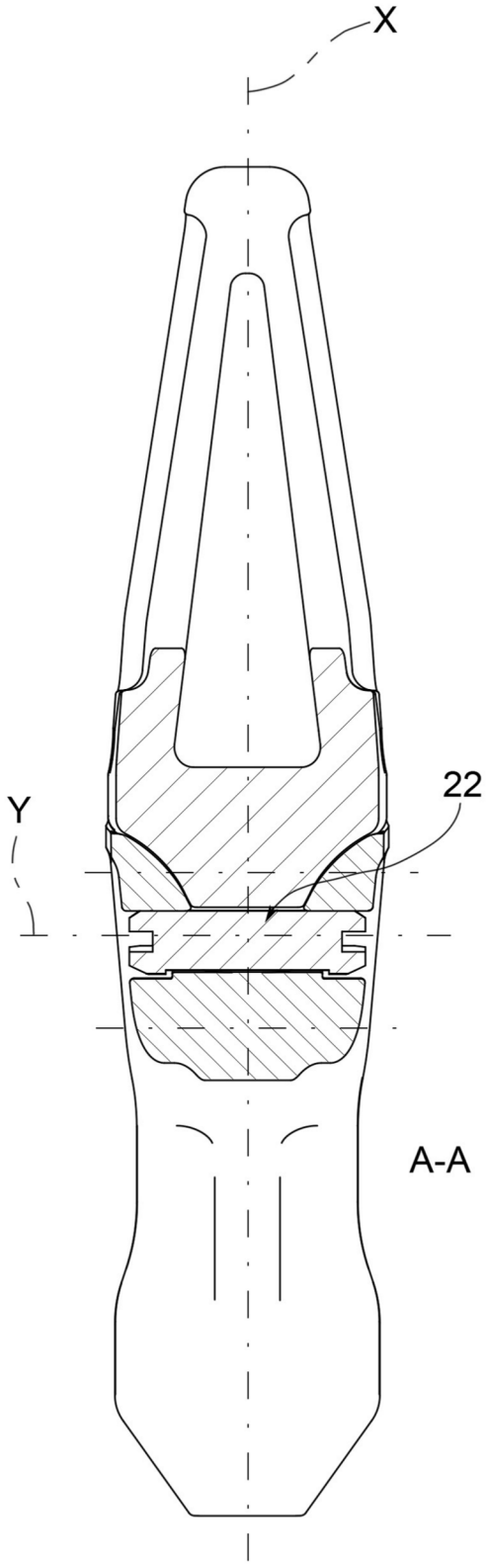


fig.8

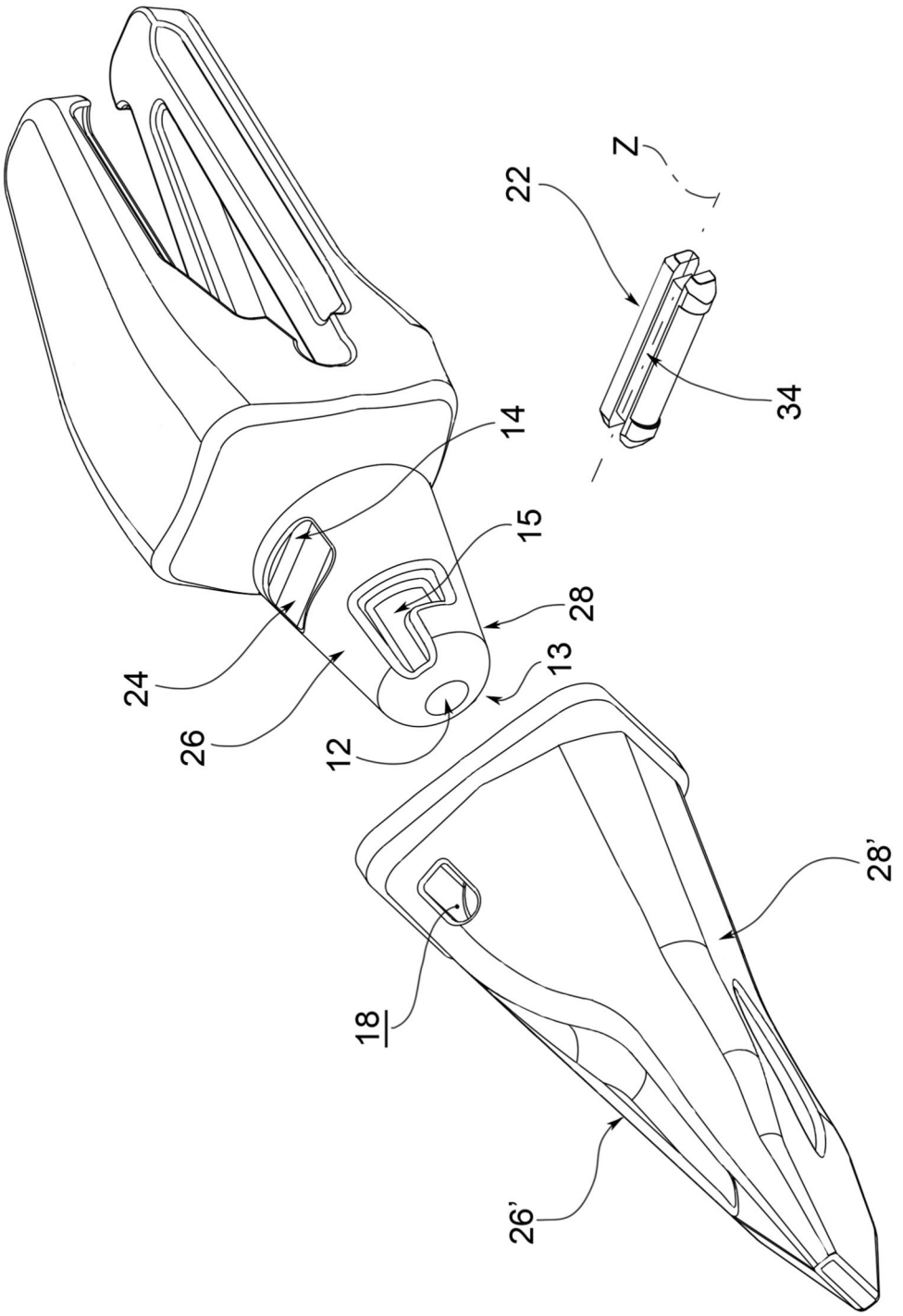


fig.9

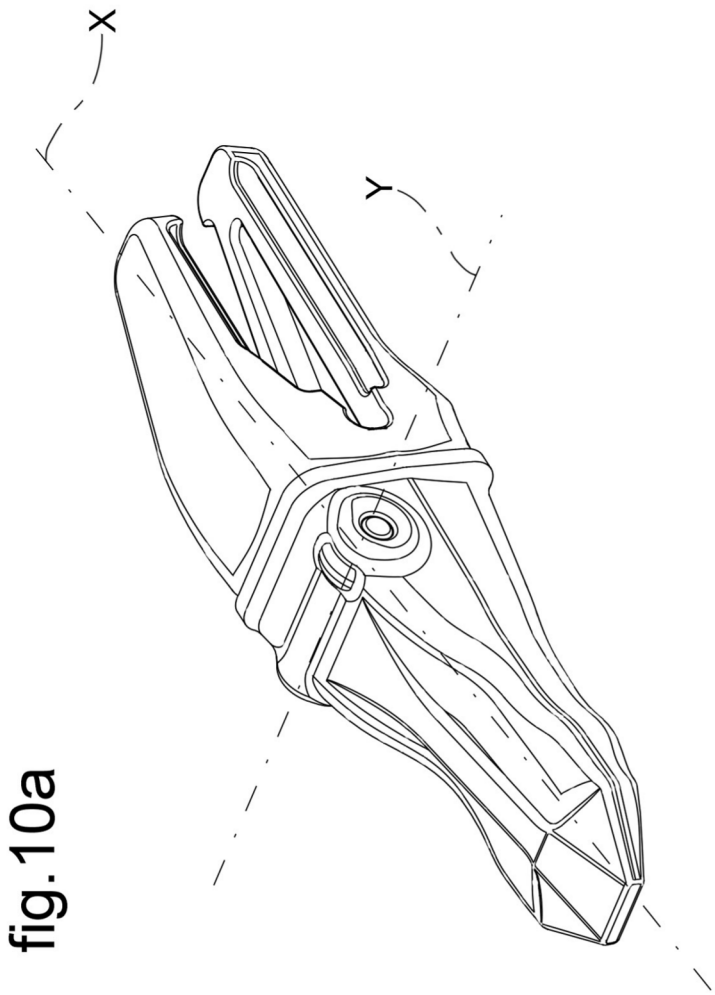


fig.10a

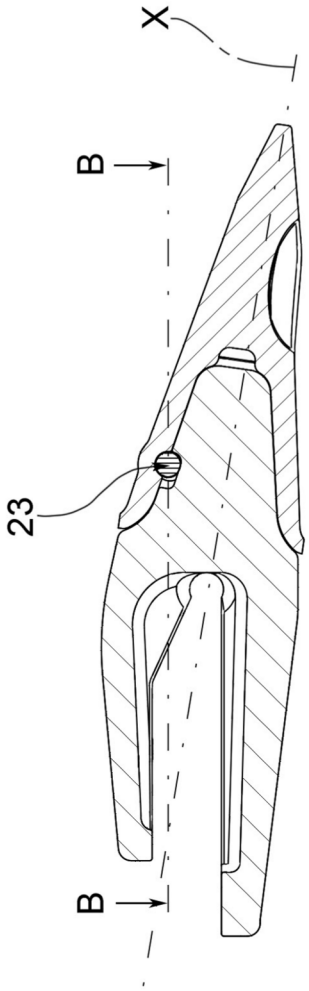


fig.10b

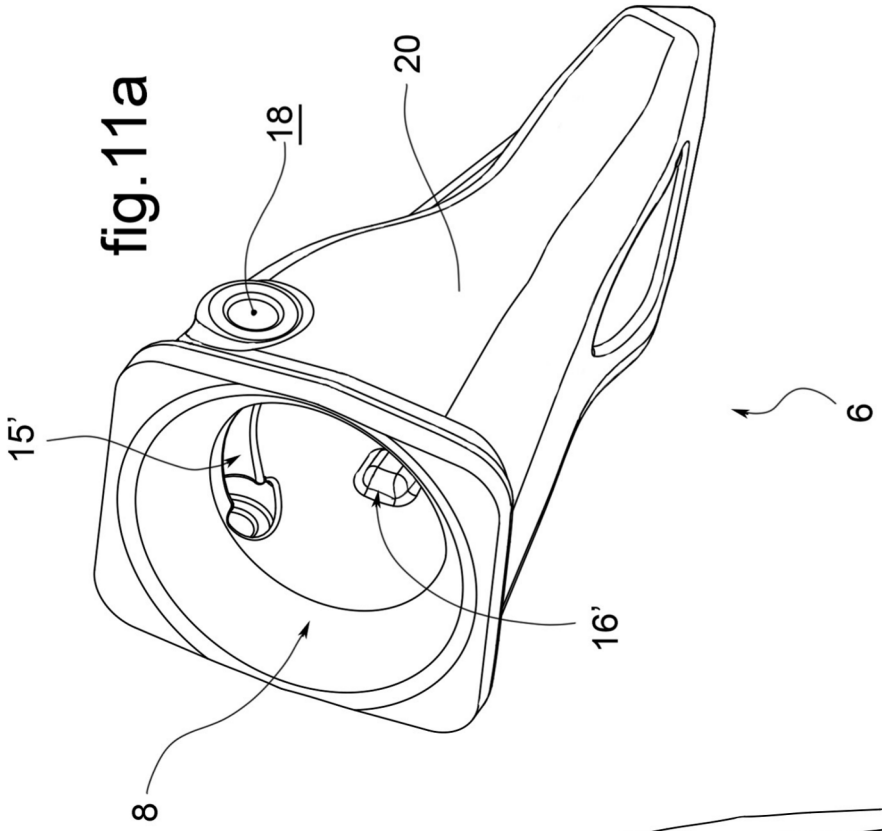


fig.11a

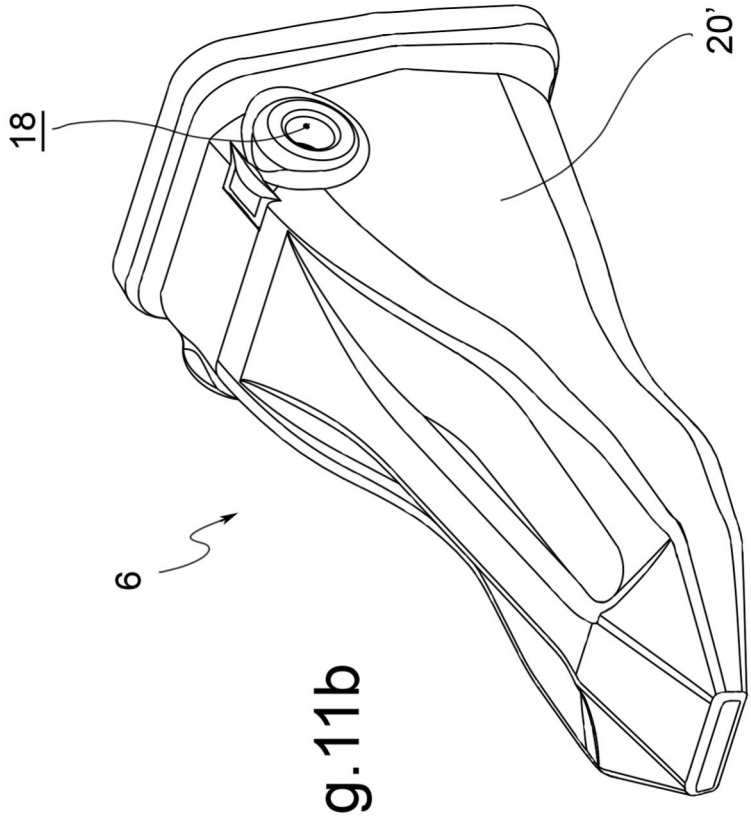


fig.11b

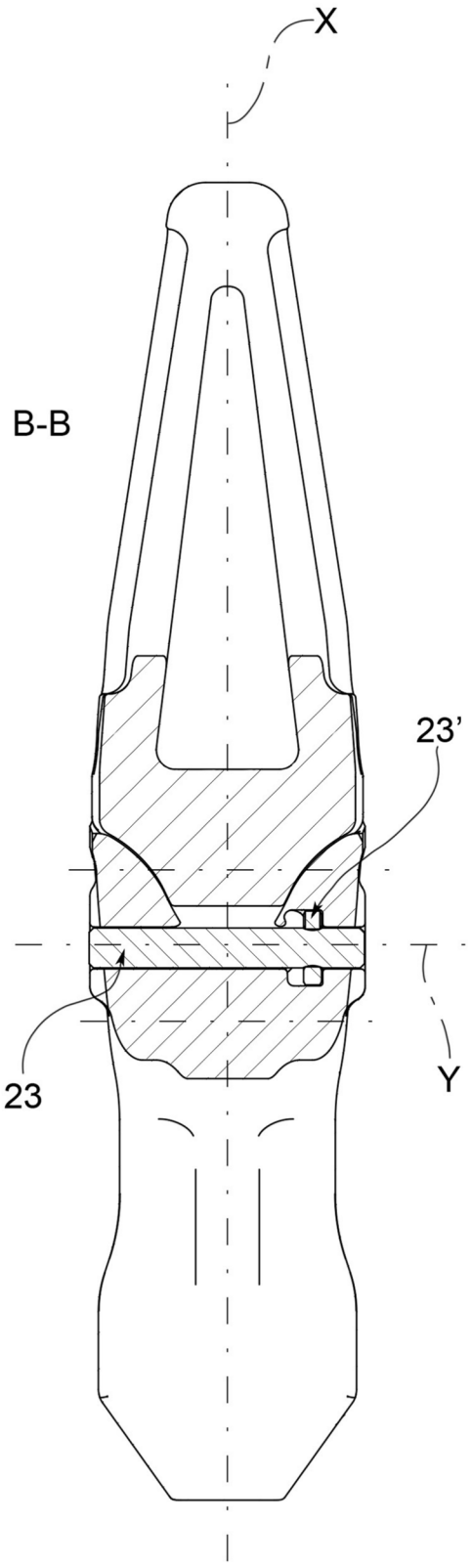


fig.12

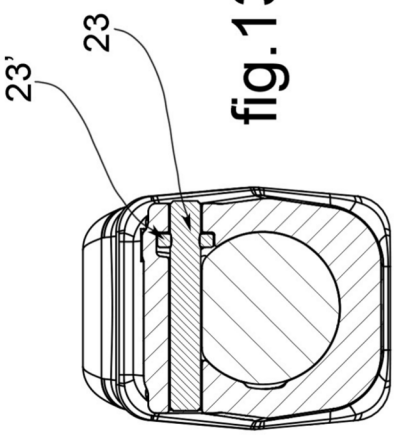


fig.13

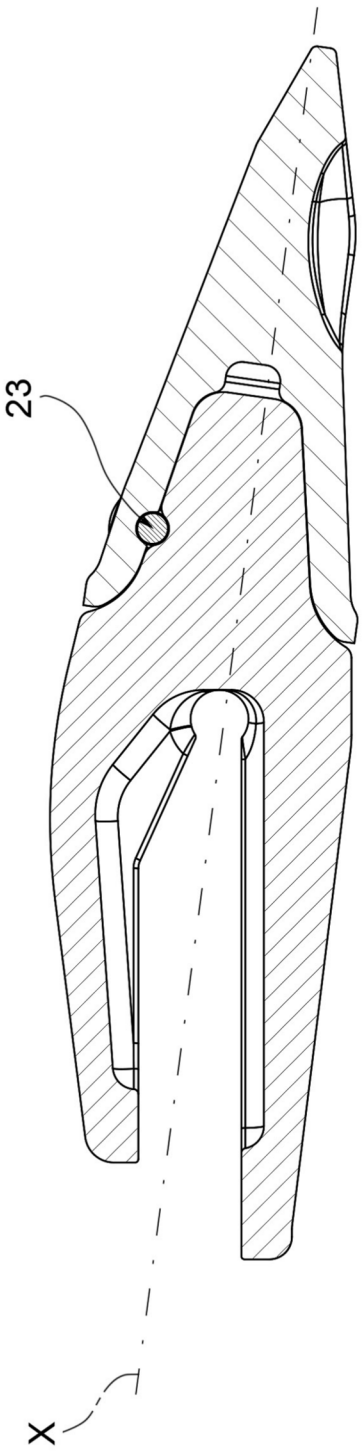


fig.14

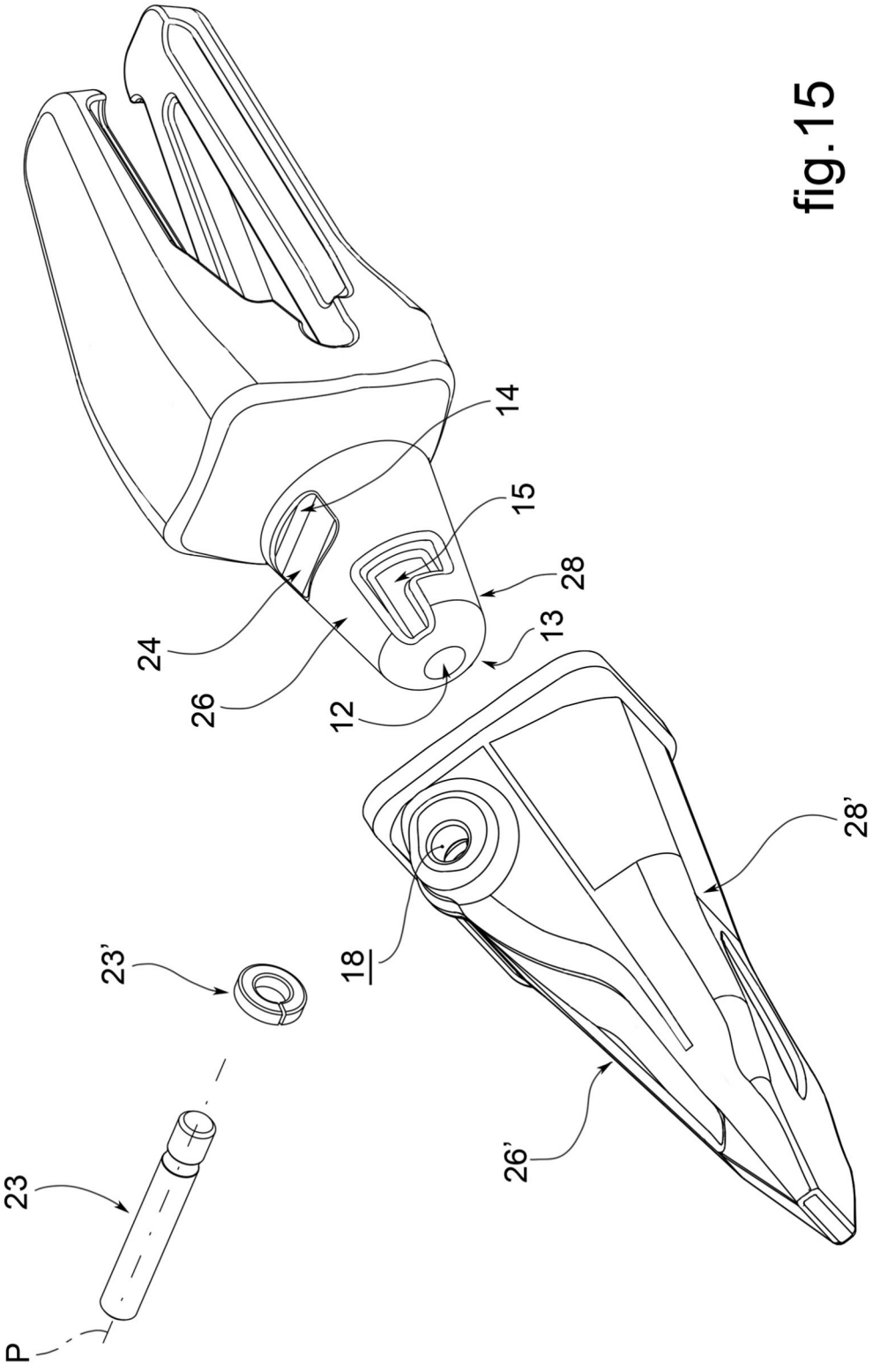


fig.15

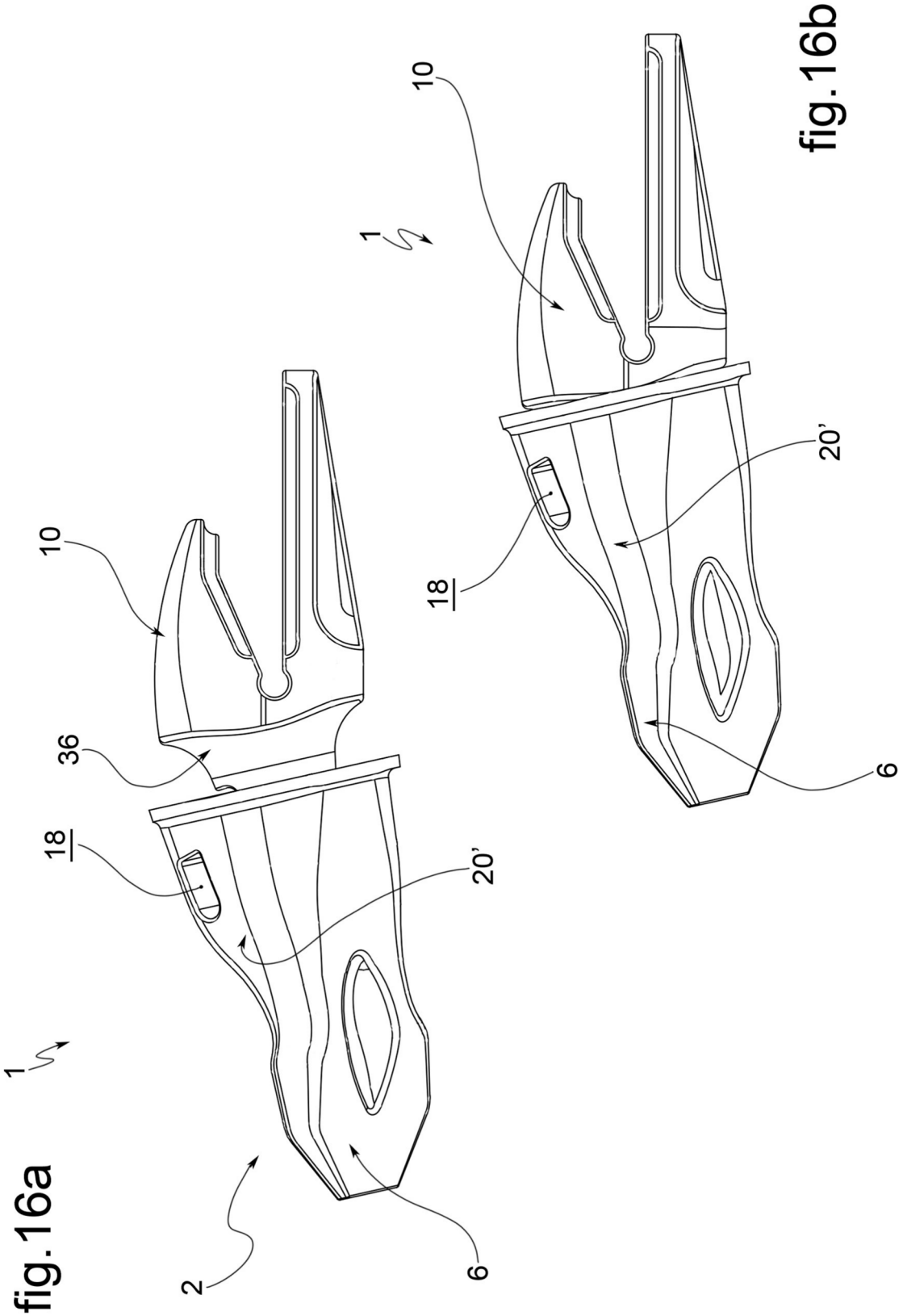


fig.16a

fig.16b

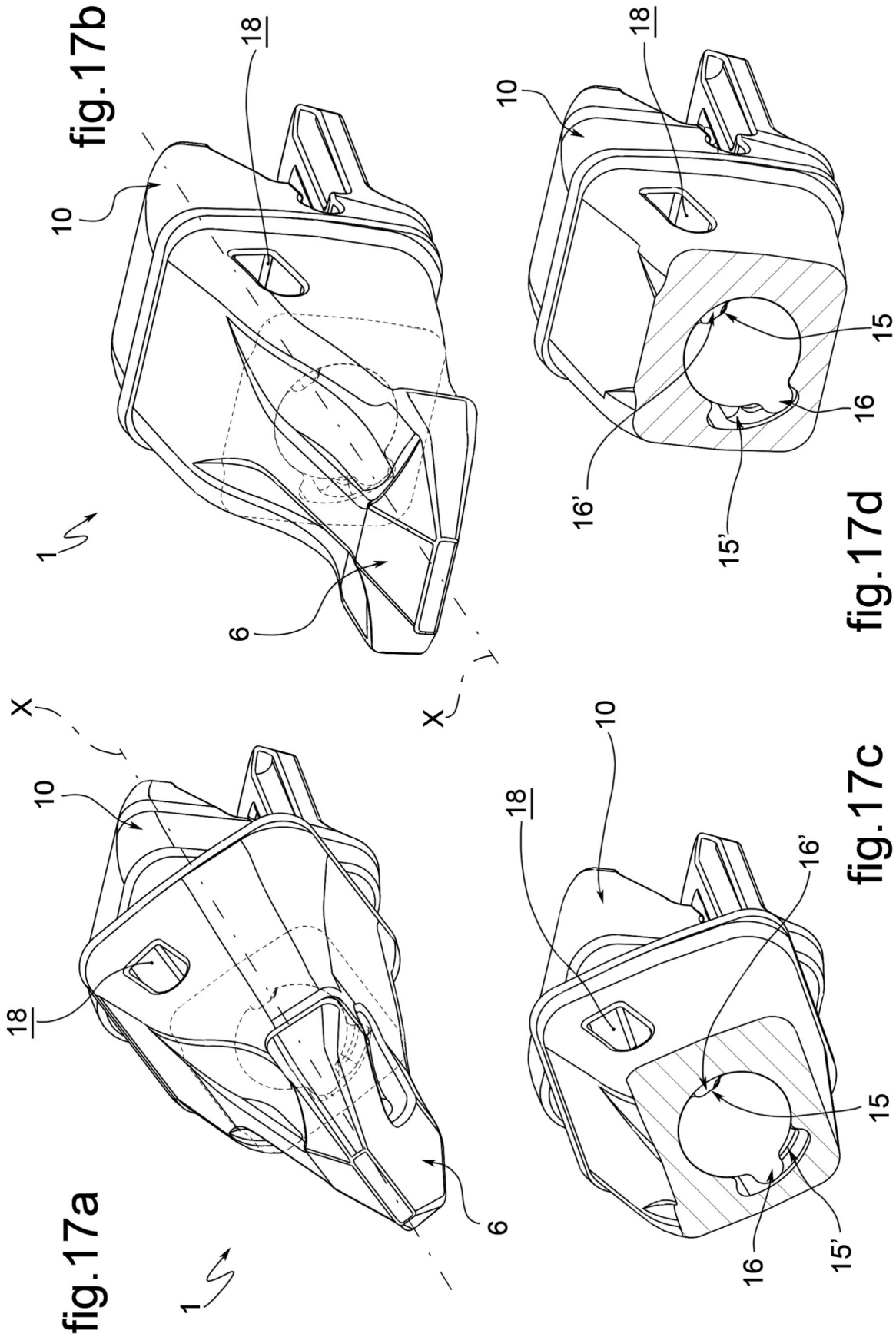


fig.17a
fig.17b
fig.17c
fig.17d
X
X
10
18
6
1
16'
15'
16
15

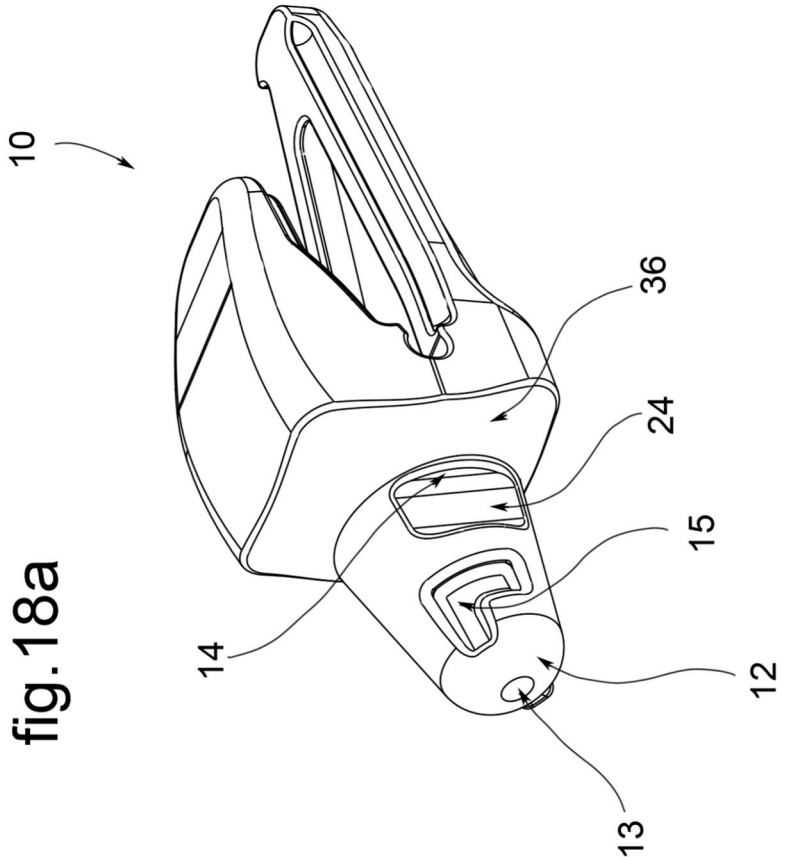


fig.18a

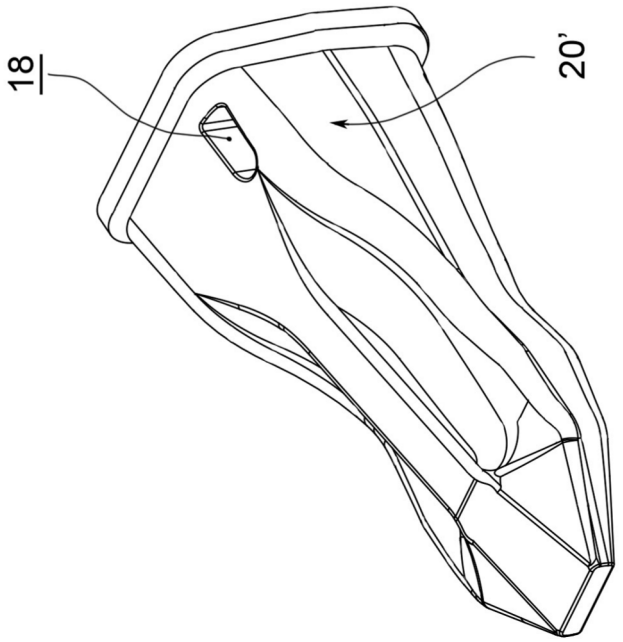


fig.18b

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 25 21 1887

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	US 2 940 191 A (ASKUE ALBERT R) 14 June 1960 (1960-06-14) * column 2, line 42 - column 3, line 14; figures 2,3,4 *	1,2,6,12 7-11, 13-16 3-5	INV. E02F9/28
X A	CN 105 625 498 B (TIANJIN DONGDA WEIYE LOCOMOTIVE VEHICLE CO LTD) 29 September 2017 (2017-09-29) * the whole document *	1-3,5-16 4	
Y	US 6 047 487 A (CLENDENNING CHARLES [US]) 11 April 2000 (2000-04-11) * column 16, line 40 - columns 17-24; figures 20,21 * * column 15, line 55 - column 16, line 49; figures 18,19 *	7-11, 13-16	
Y	US 2017/051475 A1 (PEREZ SORIA FRANCISCO [ES] ET AL) 23 February 2017 (2017-02-23) * abstract; figure 1 *	7-11	TECHNICAL FIELDS SEARCHED (IPC)
A	CN 118 727 874 A (UNIV TAIYUAN TECHNOLOGY) 1 October 2024 (2024-10-01) * abstract; figures 3,4 *	1-16	E02F
A	CN 116 356 913 A (JIANGXI KEWANG PREC MANUFACTURING CO LTD) 30 June 2023 (2023-06-30) * abstract; figures 1,2 *	1-16	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 March 2026	Clarke, Alister

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 25 21 1887

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

19-03-2026

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2940191 A	14-06-1960	NONE	
CN 105625498 B	29-09-2017	NONE	
US 6047487 A	11-04-2000	AU 753118 B2	10-10-2002
		BR 9912422 A	20-11-2001
		CA 2336824 A1	27-01-2000
		CN 1314965 A	26-09-2001
		EP 1121495 A1	08-08-2001
		ES 2197788 A1	01-01-2004
		GB 2356000 A	09-05-2001
		HU 226503 B1	02-03-2009
		JP 4469501 B2	26-05-2010
		JP 2002520524 A	09-07-2002
		KR 20010083121 A	31-08-2001
		TR 200100199 T2	22-10-2001
		US 6047487 A	11-04-2000
		US 6247255 B1	19-06-2001
		WO 0004244 A1	27-01-2000
US 2017051475 A1	23-02-2017	AR 100212 A1	21-09-2016
		AU 2014392255 A1	08-12-2016
		BR 112016025268 A2	15-08-2017
		CA 2947342 A1	05-11-2015
		CL 2016002742 A1	27-01-2017
		CN 107002391 A	01-08-2017
		DK 3137690 T3	27-08-2018
		EP 3137690 A1	08-03-2017
		ES 2682194 T3	19-09-2018
		JP 6412634 B2	24-10-2018
		JP 2017514050 A	01-06-2017
		KR 20160147865 A	23-12-2016
		MX 380548 B	12-03-2025
		NZ 726391 A	26-04-2019
		PE 20161425 A1	08-01-2017
		PL 3137690 T3	31-12-2018
		PT 3137690 T	30-07-2018
		RU 2638385 C1	13-12-2017
		UA 116843 C2	10-05-2018
		US 2017051475 A1	23-02-2017
		WO 2015165504 A1	05-11-2015
		ZA 201608226 B	25-04-2018
CN 118727874 A	01-10-2024	NONE	
CN 116356913 A	30-06-2023	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

EP 25 21 1887

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

19-03-2026

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
----------			

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82