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(54) Benævnelse: **Sliddel og dens fastgørelse med en kile, plovlegeme og plov omfattende en sådan sliddel**

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The present invention relates to a work tool that is protected from significant wear by a wearing part. Thus, the present invention will apply in agricultural machines, public works vehicles and, generally speaking, in the field of soil-working implements. In particular, the present invention also relates to a plough body with such a work tool as well as a plough comprising at least one plough body equipped with such a work tool according to the invention.

The present invention thus relates to a work tool protected by a wearing part having at least one active portion and one connection portion mounted on the work tool by means of a guiding groove arranged in the work tool.

The repeated contact with the ground creates wear particularly at the front of the work tools, requiring frequent replacement of the work tool. These tool replacements are expensive on one hand and have a relatively long immobilization time on the other hand. Thus, it is in particular known to protect the work tool using a wearing part, which makes it possible to reduce the repair times as well as the maintenance costs considerably. In a known manner, the wearing part is fastened, using bolts, on the work tool in the location where significant wear occurs. Such a fastening method quite often gives rise to dismantling difficulties due to the wear by abrasion of the bolts, in particular the nuts.

Taking these difficulties into consideration, document WO 01/56360 proposes a work tool (share) protected by a wearing part (point). This point is mounted on the share using a guiding groove. This guiding groove is convergent. The point has an active portion that is intended to be worn and a connection portion that is intended to be fastened on the share. In order to mount the point on the share, the connection portion is engaged in the groove in the direction opposite the work direction. A hammer stroke, in the direction opposite the work direction, on the active portion makes it possible to lock the point in the groove. The connection portion and the groove have a complementary V shape, which locks the pivoting of the point around its longitudinal axis when it is mounted on the share. The translation of the point according to the work direction is, for its part, locked by the binding of the connection portion in the converging groove, by the friction of the converging V-shaped surfaces.

To guarantee good fastening and good maintenance, the point and the front portion of the share have a relatively significant thickness. This additional thickness has a detrimental effect on the one hand on the penetration into the soil of the point at halfwear, and on the other hand on the mass ratio of steel available for use relative to the mass

of the new point. Furthermore, the share point is not reversible because the connection portion is arranged in the extension of the active portion. One can see during ploughing that in addition to the wearing of the point, the front portion of the share comprising the groove is also altered by friction with the soil. Furthermore, the locking of the point in the thickness of the share implies a dead zone that is not recovered. The soil then fills in the apparent dead zone and causes a strip of stuck soil, resulting in pronounced wear of the parts.

Another work tool is in particular known from document FR 2 036 688. It is also a plough body with a share that is protected by a point of the bar type. The bar point is mounted in a sleeve and is maintained by means of a wedge with a lug. The sleeve prevents the rotation of the bar point about its longitudinal axis. The translation of the bar point is locked by means of the wedge inserted between the sleeve and the bar point and the lug, which becomes housed in one of the millings arranged in the bar point. The lower portion of the bar point rests on the lower face of the sleeve and the wedge is mounted at the front between the upper part of the bar point and the upper face of the sleeve.

With such a fastening device, it can in particular be observed that the soil discharge during ploughing is disrupted and the parts making up the fastening device (sleeve, wedge) are deteriorated. During ploughing, the wedge and the upper part of the sleeve are subject to significant wear because the position of those parts on the plough body literally opposes the soil discharge. This significant wear gives rise to very difficult dismantling and considerably increases the risk of losing the wedge and/or the point.

The present invention aims to overcome the aforementioned drawbacks. The wearing part must protect the work tool well against wear while favoring the discharge of soil even when the wearing part is more or less worn. The fastening of the wearing part on the work tool must be easy to carry out, quick and effective in terms of holding over time.

To that end, one important feature of the invention consists in that the rotational and translational locking of the wearing part is carried out by means of a locking wedge mounted between the connection portion and the guiding groove.

The invention relates to a plough body in particular comprising a heel and a ploughshare, characterized in that the heel corresponds to the said support and the ploughshare corresponds to the said work tool.

The invention also relates to a plough, characterized in that it comprises at least one plough body of the aforementioned type.

Other features and advantages of the invention will emerge from the claims and description below of one non-limiting example embodiment of the invention with reference to the appended drawings, in which:

- figure 1 shows a plough body whereof the share is equipped with a point according to the invention,
- figure 2 shows an exploded top view of a work tool according to the invention,
- figure 3 is a bottom view of a work tool with a wearing part according to the invention,
- figure 4 shows a front view of figure 1.

Figure 1 shows a plough body (7) according to one preferred example embodiment. This plough body (7) comprises a heel (8) on which a mouldboard (9), a landside (10) and a share (11) are fastened. The heel (8) is the central part of the plough body (7), since it is the part on which the other main parts fasten: the mouldboard (9), the landside (10) and the share (11). The landside (10) slides on the bottom of the furrow and along the furrow wall when the plough moves forward and the share (11) cuts the soil horizontally. The cut strip is then lifted by the share (11) and turned over by the mouldboard (9). The vertical part of the strip of soil is for its part cut by a wing coulter (not shown).

The share (11) cuts or slices a strip of soil that is next turned over by the mouldboard (9) during the movement of a plough (not shown). In a known manner, the share (11) is cambered to make the lifting of the strip of soil easier. It may be made in one or more parts. Being in contact with the soil, it is therefore subjected to considerable wear. The relative movement of the soil on the share (11) and the significant pressure of the soil on the share (11) generate wear by abrasion. To avoid this phenomenon, the share (11) is protected by a share point (12). This share point (12) is removable and interchangeable. The point (12) allows the plough body (7) to penetrate the ground, this operation cuts up the soil in front of the share (11) in a work direction (A) and protects the share (11) from the abrasion effect in the zone where it is subject to the most significant and quickest wear. This point (12) extends the lifetime of the share (11). In a generally known manner, the point (12) is slightly twisted and cambered to respect the characteristic work angles.

The point (12) comprises an active portion (3) that advantageously has two cutting edges (13, 14) intended to cut the soil. The active portion (3) is exposed to a wearing action by contact with the ground during the performance of a work operation on the ground in the direction of advance (A). A front cutting edge (13) is arranged on the front edge and a side cutting edge (14) is arranged on the side edge. These two cutting edges (13, 14) form an angle of approximately 80° relative to one another. The point (12) is mounted such that the side cutting edge (14) is parallel to the furrow wall of the ploughed furrow. When the active portion (3) of the point (12) is worn, the worn point must be replaced with a new point. The point (12), shown in figure 1, is not reversible.

Figure 2 is an exploded illustration of a share (11) and point (12) in top view. The point (12) comprises, in addition to the active portion (3), a connection portion (4) that makes it possible to fasten it on the share (11). The share (11) to that end has a guiding groove (15) intended to receive the connection portion (4). The groove (15) has a longitudinal axis. In figure 3, illustrating the fastening device in bottom view, the groove (15) is arranged in the front portion of the share (11), it has two faces (16, 17). The groove (15) converges in the longitudinal direction, it narrows as it moves away from the end of the share (11). The groove (15) has a first reference face (16) and a second face (17). The two faces (16, 17) are oriented by a first angle (α) comprised between 5° and 15°. The converging shape of the groove (15) as well as the length difference of the two faces (16, 17) make the engagement of the connection portion (4) easier. The length of the first face (60) is greater than the length of the second face (17).

According to one significant feature, the rotational and translational locking of the point (12) on the share (11) is carried out by means of a locking wedge (18) mounted between the connection portion (4) and the guiding groove (15). The point (12) is inserted into the groove (15) via its connection portion (4) and is locked by the wedge (18) on the share (11). The mounting direction and sense of the point (12) and the wedge (18) are identical. To that end, the connection portion (4) is guided by the first reference face (16) of the groove (15). The wedge (18), for its part, is guided between the connection portion (4) and the second face (17). The connection portion (4) below the point (12) is shown in dotted lines in figure 2. In this way, the point (12) is gripped on the share (11) as the connection portion (4) and the wedge (18) become inserted into the converging groove (15). This fastening device is therefore easy to carry out.

Figure 3 shows the point (12) fastened on the share (11) in bottom view. The translation and rotation along the longitudinal axis of the point (12) are eliminated by the insertion of the wedge (18) between the groove (15) of the share (11) and the connection portion (4) of the point (12). The translation and rotation along the other two axes (transverse axis and normal axis) are limited by the shape of the groove (15).

In light of figure 4, it will be noted that the groove (15) has a substantially dovetail-shaped section. The faces (16, 17) of the groove (15) are inclined relative to the horizontal. Each face (16, 17) has a different slope. The first face (16) is inclined by a second angle (β) relative to the horizontal, while the second face (17) is inclined by a third angle (δ) relative to the horizontal. The faces (16, 17) together form a V-shape, the ends of which come together beyond the share (11). The said guiding groove (15) is therefore not symmetrical relative to its longitudinal axis. The second angle (β) is advantageously comprised between 50° and 65°. The third angle (δ) is, for its part, advantageously comprised between 70° and 80°. The third angle (δ) is larger than the second angle (β). Owing to these two different slopes, untimely dismantling of the point (12) is avoided because the said wedge (18) cannot separate, and consequently it will not be lost during the work. These inclined faces (16, 17) of the groove (15) also provide a good distribution of the contact pressures. Furthermore, it will be noted that the groove (15) is not symmetrical and the length of the wedge (18) is substantially equal to the length of the connection portion (4) of the point (12).

For the fastening of the point (12), the connection portion (4) is guided by the first reference face (16) of the groove (15). The connection portion (4) has third and fourth faces (19, 20). At least one of the faces (19, 20) of the connection portion (4) is intended to cooperate with the first face (16), that face (19, 20) is therefore oriented by the second angle (β). Advantageously, the orientation of the connection portion (4) is substantially parallel to the lateral cutting edge (14) of the active portion (3) of the point (12). In the example embodiment of the invention shown in figure 4, the two faces (19, 20) are each oriented by the second angle (β). Thus, the connection portion (4) is symmetrical relative to its median plane. The wedge (18) for its part has a particular shape that is advantageously complementary to the groove (15) and the connection portion (4). The wedge (18) thus has a shape converging by the first angle (α). This converging shape makes the engagement of the wedge (18) in the space between the groove (15) and the connection portion (4) easier. It comprises two faces (21, 22), a fifth face (21) and a sixth face (22). The fifth face (21) and the sixth face (22) are

oriented by the first angle (α) relative to one another. The fifth face (21) is intended to cooperate with the third face (19) or the fourth face (20) of the connection portion (4). The fifth face (21) is therefore oriented by the second angle (β). The sixth face (22) cooperates with the second face (17) of the groove (15), it is oriented by the third angle (δ).

In the example embodiment shown in the figures, the first face (16) of the groove (15) constitutes the reference direction for guiding the connection portion (4). This reference direction is, advantageously, substantially parallel to the work direction (A).

The wedge (18), in addition to the groove (15) and the connection portion (4), locks all of the rotational and translational movement along the three reference axes (x, y, z) of the point (12). To lock the fastening device well, it is recommended to provide a hammer stroke on the point (12) in the mounting direction. This locking will be increased during work because the advance of the plough produces stresses acting in the mounting direction. The mounting direction substantially corresponds to the direction opposite the work direction (A). The mounting direction corresponds to the direction of the first face (16). Thus, the wedge (18) is inserted from the wide portion toward the narrow portion of the converging groove (15).

The presence of a dead zone (23) at the converging end of the groove (15) will also be noted. This dead zone (23) corresponds to an empty space. Owing to the dead zone (23), the end of the wedge (18) does not come into contact with the converging end of the groove (15). The dead zone (23) also allows effective locking of the wedge (18) in the groove (15), and consequently of the point (12) on the share (11). When the point (12) is thus locked, the fastening device can withstand the work stresses, as well as the various impacts that may be generated by elements such as stones.

The more difficult the ploughing conditions are, the more important it is to maintain the parts well. These difficult conditions (heavy soil, large number of stones, impacts, etc.) result in significant stresses on the plough bodies (7) and the wearing parts (2). A significant portion of these stresses is used to lock the point (12) on the share (11).

Particularly advantageously, the binding of the point (12) on the share (11) is further increased by the work stresses during the ploughing. Since the first face (16) of the groove (15) is substantially parallel to the work direction (A), the stresses on the point (12) are oriented in the direction opposite the work direction (A). These stresses are therefore oriented in the direction of the binding of the point (12) in the groove (15) of the share (11).

With a fastening of the point (12) on the share (11) according to the invention, it is possible to put the point (12) in a well-defined position on the share (11) by means of the wedge (18). In fact, according to the distance on which the wedge (18) is placed along the fourth face (20) of the connection portion (4), the binding of the point (12) takes place earlier or later in the converging groove (15). The initial position of the wedge (18) determines the final position of the point (12) on the share (11). This adjustment therefore makes it possible on one hand to modify the penetration depth of the point (12), and on the other hand to regulate and adjust the position of all of the points at the same distance. Thus, for a plough for example comprising four plough bodies (7), the plough depth is identical over the entire working width of the plough. To improve the adjustment, it can be envisaged to index the locking wedge (18) on the point (12) by means of millings and a tenon at the wedge/point connection.

Figure 2 illustrates a reversible wearing part (2). In this example embodiment, this is a reversible point because it can be mounted on the share (11) according to two orientations lying at 180° from one another. This reversible point has two opposite active portions (3, 3'), it has a parallelepipedic shape. In this manner, when the first active portion (3) is worn, the reversible point is reversed so as to be able to use the second active portion (3'). With such a reversible point, a mass ratio of steel available for use on the total steel mass of a new point greater than 50% is obtained. With a reversible point, the covering of the dead zone (23), by the active portion (3, 3') that is not in use, is optimal and prevents the soil from penetrating the dead zone (23) between the wedge (18) and the groove (15). With a connection portion (4) symmetrical with regard to its longitudinal axis, it is possible to engage the point (12) in both orientations lying at 180° from one another in the groove (15).

According to another significant feature of the invention, the connection portion (4) extends substantially below the active portion (3) of the point (12). In this way, the fastening of the point (12) is protected from direct contact with the soil, and therefore from wear. Good resistance over time is therefore provided with such a fastening device. The connection portion (4) is arranged below the point (12) so as to keep a relatively significant usable zone on the active portion (3; 3'). In the example embodiment of the nonreversible point shown in figure 1, the connection portion (4) is situated substantially at the opposite end of the front cutting edge (13). For a reversible point, the connection portion (4) is arranged substantially at the center of the point (12) between the two active portions (3, 3').

According to figure 4, showing a simplified front view, one can see that the connection, produced by the groove (15), the connection portion (4) and the wedge (18), remains substantially in the thickness of the share (11). As a result, the connection will not be worn by the friction from the soil and the contact between the groove (15), the connection portion (4) and the wedge (18) will not be altered. Furthermore, the point (12) will not lose its soil penetration capacities because the thickness of the active portion (3) remains constant, even after halfwear. With such a point (12), the operational life of the share (11) is much greater and the use of the implement (point (12) - share (11)) is much better. In a known manner, the point (12) is also made to protect the landside (10) so that its wear is slower and more regular. The point (12) is therefore mounted, laterally offset, so that the lateral cutting edge (14) protects the landside nose.

In light of figure 1, one can see that neither the point (12) nor the groove (15) - connection portion (4) – wedge (18) connection hinders the discharge of soil during ploughing. Furthermore, this connection below the active portion (3) being protected from wear, the fastening device holds well over time.

It is further possible to envisage other forms for the section of the connection, a stair-stepped shape, a triangle shape, etc.

According to another example embodiment that is not shown, the first reference face (16) of the groove (15) is arranged indifferently on the share (11) with regard to the work direction (A). It is not substantially parallel to the direction of advance (A).

In a manner generally known by those skilled in the art, ploughs comprise several plough bodies (7) that are arranged behind one another and the plough body (7), via the heel (8), is fastened to the frame of a plough by means of a leg. Such a share (11) may be fastened on any type of plough, i.e., in particular a single plough or a reversible plough, which is trailed, mounted or semi-mounted. The share point (12) is replaced when it is worn or damaged.

Different example embodiments of a plough body of a plough comprising a share (11) and a point (12) according to the invention have been described in the present description. More generally, this invention is also applicable for other implements intended to work the soil for public works or for agricultural machines for seed bed preparation, etc.

We are therefore not limited to the designation of a share (11) and a point (12), but more generally that of a work tool (1) and a wearing part (2). The work tool (1) is in-

tended to work in the ground and is protected from significant wear by a wearing part (2) according to the present invention.

It is obvious that the invention is not limited to the example embodiment described above and shown in the appended drawings. Modifications remain possible, in particular regarding the composition or number of the various elements or by substituting technical equivalents, without departing from the scope of protection.

PATENTKRAV

1. Arbejdsredskab (1,11) beskyttet af en sliddel (2, 12), der har mindst en aktiv del (3) og en forbindelsesdel (4) monteret på arbejdsredskabet (1,11) ved hjælp af en føringsnot (15) anbragt i arbejdsredskabet (1, 11), **kendetegnet ved, at** den roterende og forskydelige låsning af nævnte sliddel (2, 12) udføres ved hjælp af en bremsekile (18) monteret mellem forbindelsesdelen (4) og nævnte føringsnot (15).

2. Arbejdsredskab ifølge krav 1, **kendetegnet ved, at** arbejdsredskabets (1, 11) nævnte føringsnot (15) er konvergent og har en første side (16) og en anden side (17), der skråner med en første vinkel (α) i forhold til hinanden.

3. Arbejdsredskab ifølge krav 1 eller 2, **kendetegnet ved, at** nævnte forbindelsesdel (4) er symmetrisk og omfatter en tredje side (19) og en fjerde side (20), der hver især skråner ifølge en anden vinkel (β) i forhold til den vandrette linje.

4. Arbejdsredskab ifølge et hvilket som helst af kravene 1-3, **kendetegnet ved, at** nævnte bremsekile (18) er konvergent og har en femte side (21) og en sjette side (22), der skråner med den første vinkel (α) i forhold til hinanden.

5. Arbejdsredskab ifølge et hvilket som helst af kravene 1-4, **kendetegnet ved, at** nævnte føringsnot (15) ikke er symmetrisk.

6. Arbejdsredskab ifølge et hvilket som helst af kravene 1-5, **kendetegnet ved, at** nævnte sliddel (2, 12) kan anbringes i en vel afgrænset position på arbejdsredskabet (1, 11) ved hjælp af nævnte bremsekile (18).

7. Arbejdsredskab ifølge et hvilket som helst af kravene 1-6, **kendetegnet ved, at** nævnte forbindelsesdel (4) anbringes tilnærmelsesvis under nævnte aktive del (3).

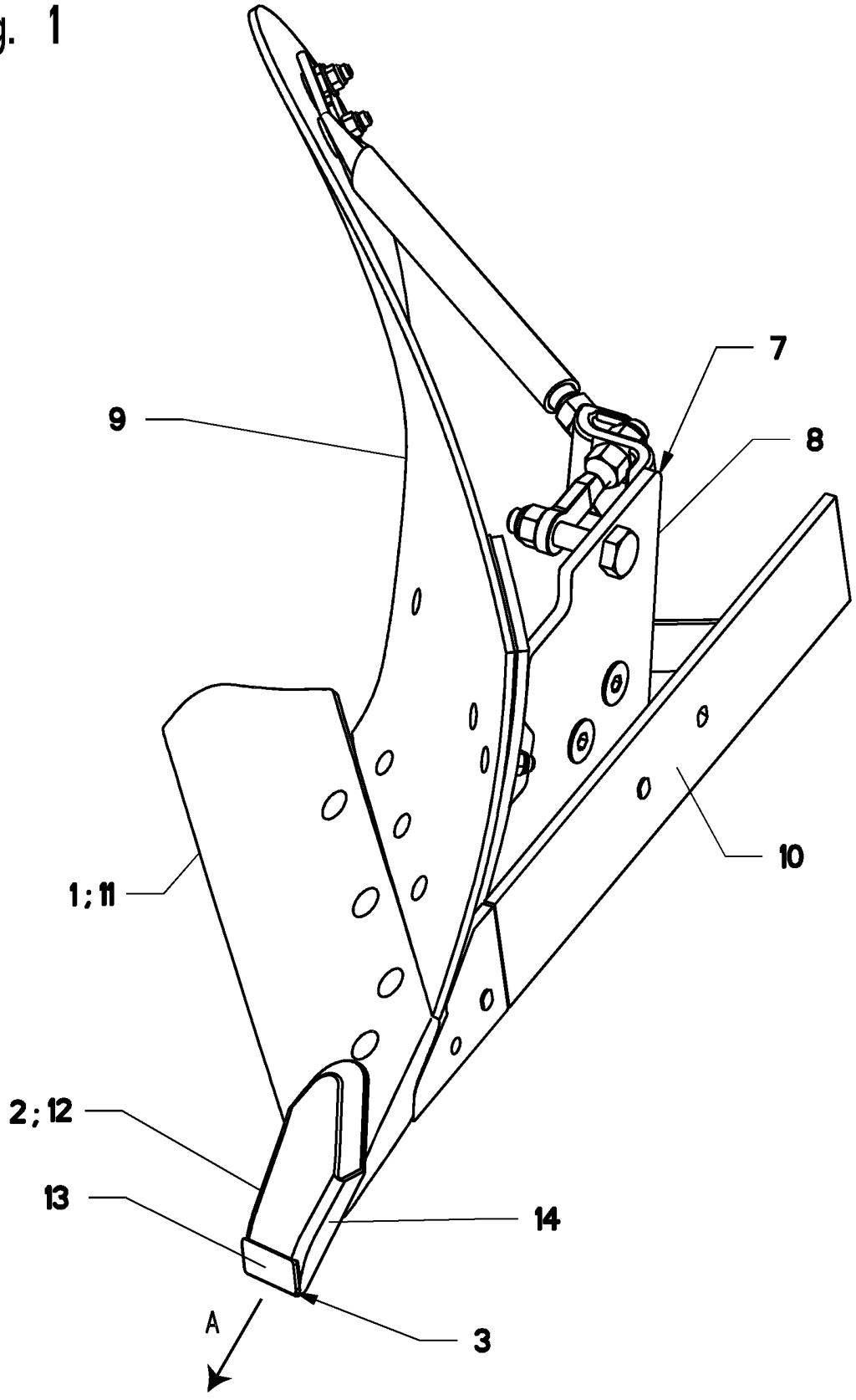
8. Arbejdsredskab ifølge et hvilket som helst af kravene 1-7, **kendetegnet ved, at** nævnte bremsekile (18) har en længde, der er tilnærmelsesvis lig med længden af nævnte forbindelsesdel (4) af sliddelen (2, 12) og en tykkelse, der er tilnærmelsesvis lig med tykkelsen af nævnte forbindelsesdel (4).

9. Arbejdsredskab ifølge et hvilket som helst af kravene 1-8, **kendetegnet ved, at** retningen af nævnte første side (16) er tilnærmelsesvis parallel med arbejdsretningen (A).

10. Plovlegeme (7) omfattende især et plovskær (11) beskyttet af en spids (12), **kendetegnet ved, at** skæret (11) svarer til nævnte arbejdsredskab (1), og at spidsen (12) svarer til nævnte sliddel (2) ifølge et hvilket som helst af kravene 1-9.

11. Plov **kendetegnet ved, at** den omfatter mindst et plovlegeme (7) ifølge krav 10.

Fig. 1



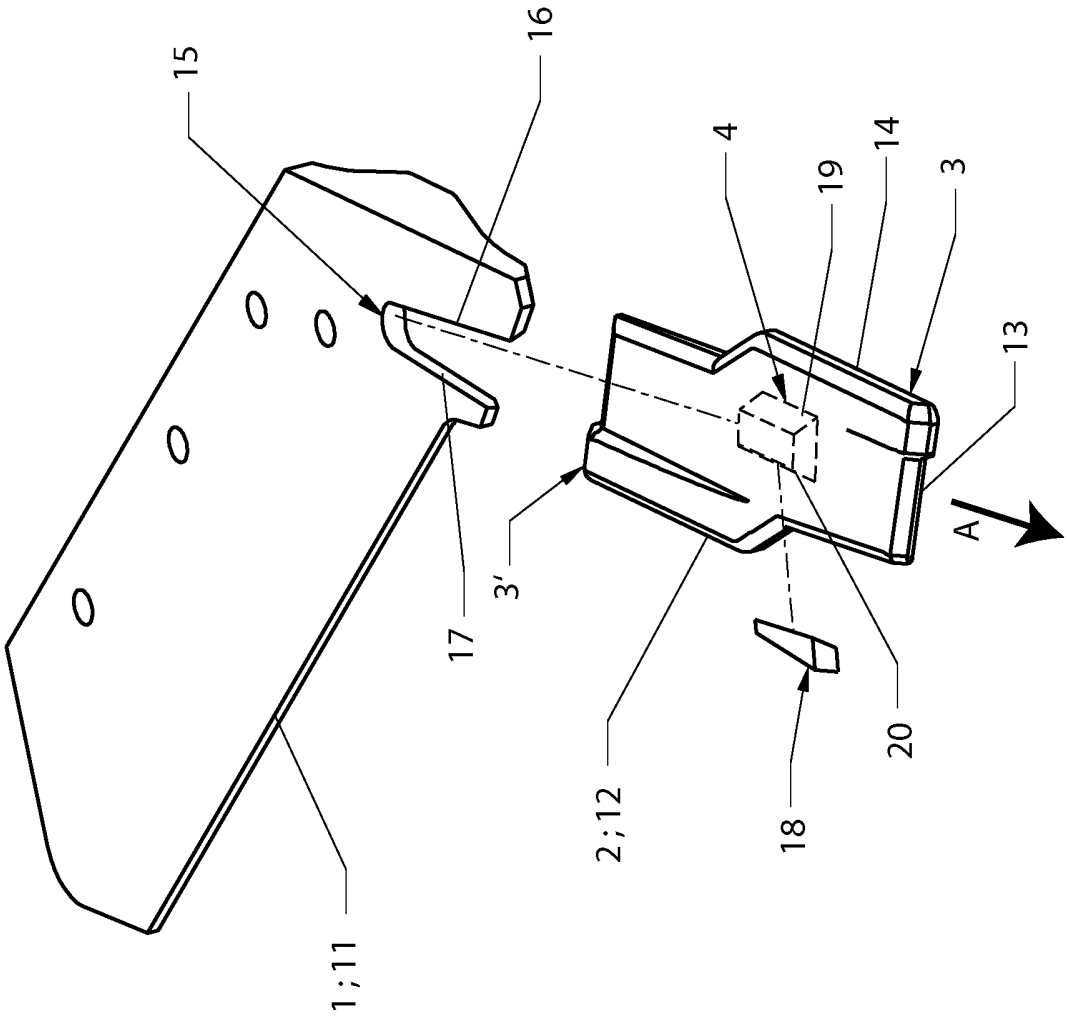
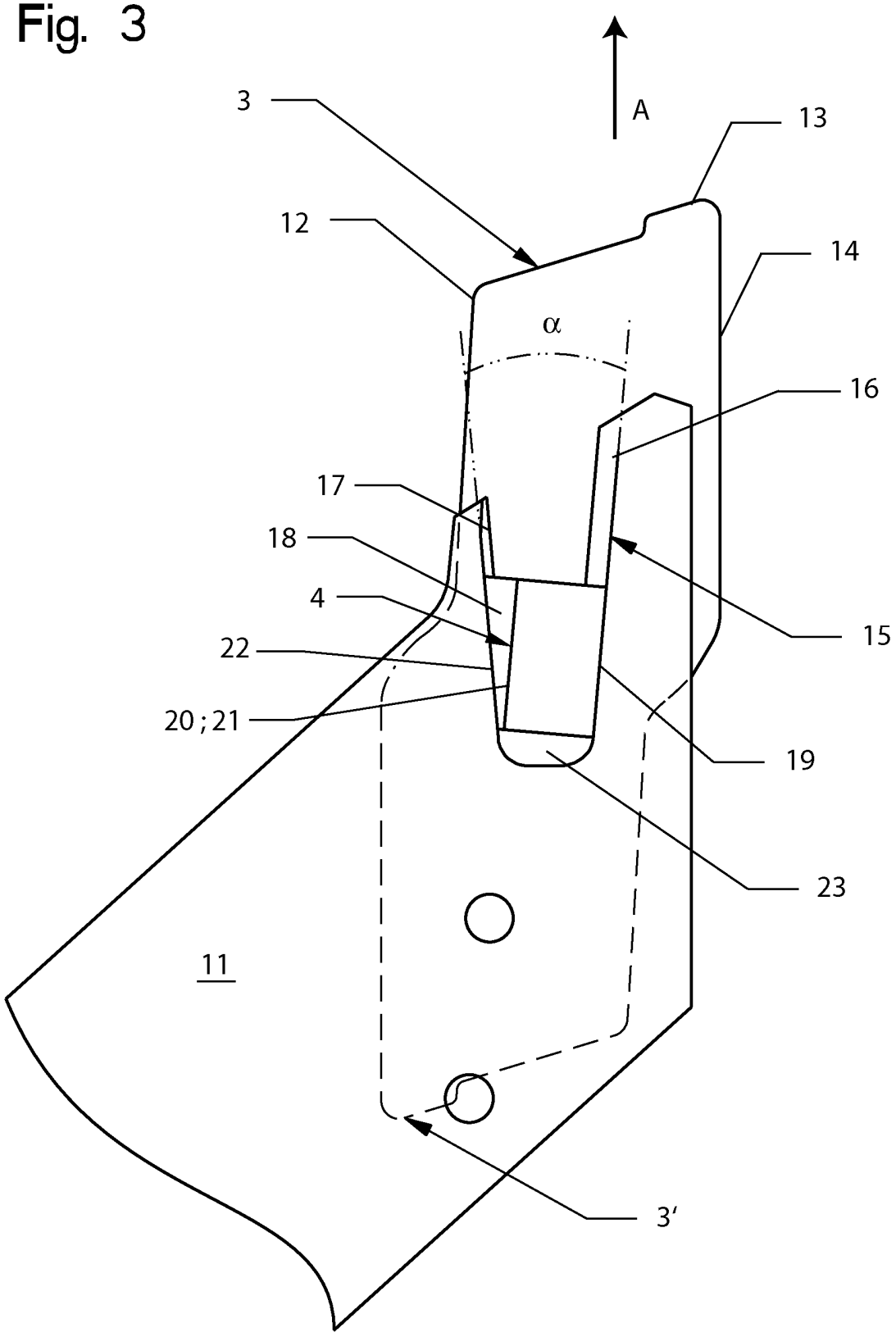


Fig. 2

Fig. 3



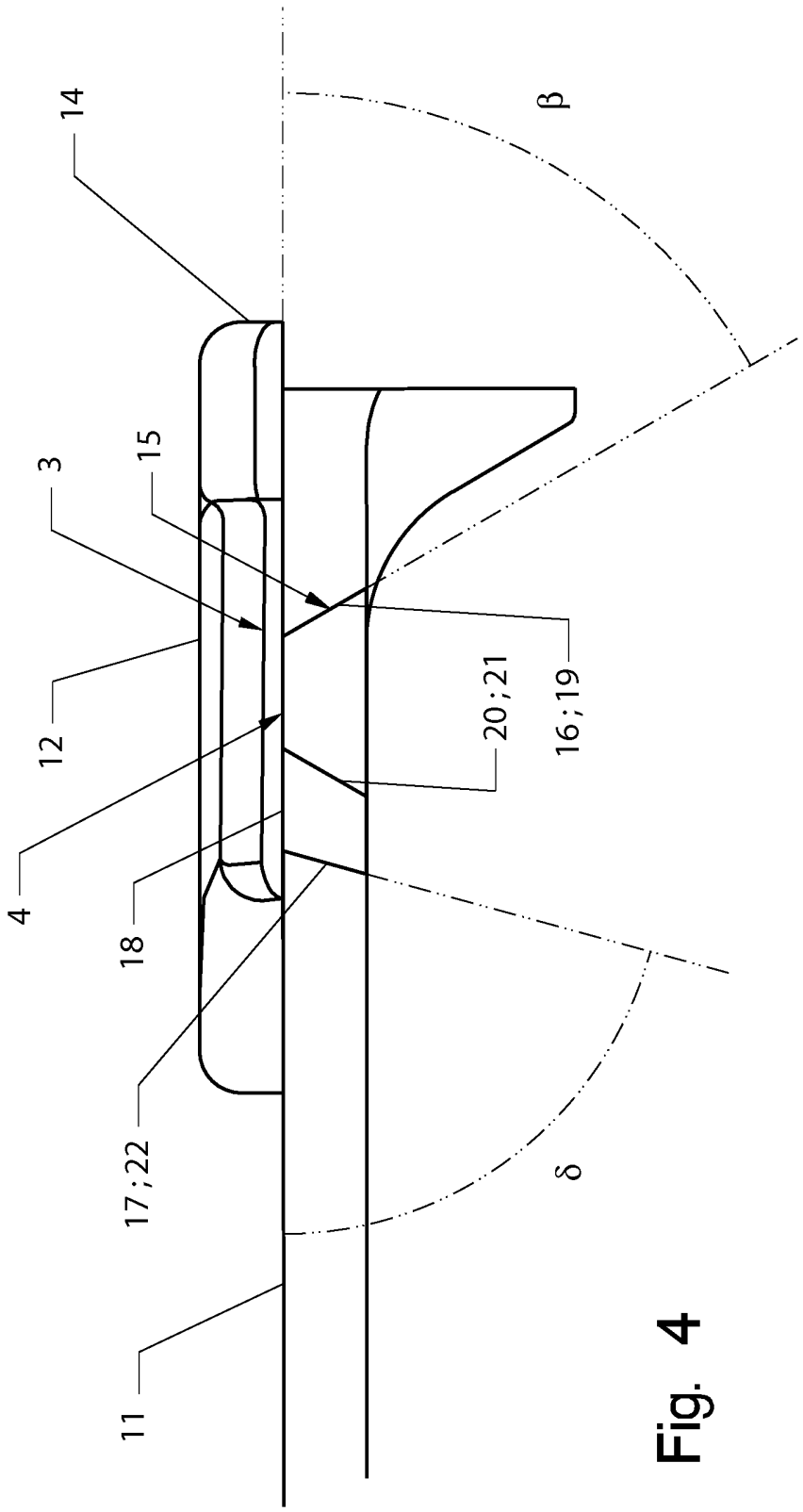


Fig. 4