

CUTTING TOOTH

The invention relates to a cutting tooth for working the soil in accordance with the preamble of claim 1.

A cutting tooth of such type comprises a base area for arrangement in a cutting tooth holder and a head area with at least one cutter for removing soil material.

Cutting teeth of the stated type are used in particular in special foundation engineering in cutting devices, especially trench wall cutters, for soil removal or for the production of a cut trench in the soil. For this purpose, the cutting teeth are inserted into appropriate cutting tooth holders on the outer circumference of a cutting wheel. For the production of a trench the cutting wheels are set into rotation and lowered into the soil, whereby the cutting teeth remove in-situ soil material on the cutting wheels so that it can be sucked off using a pump and/or processed to a hardening trench wall element for example.

A cutting tooth and a corresponding holder of a cutting wheel are described in DE 87 15 141 U1. The cutting teeth are flush-mounted with the cutting tooth holders so that between individual cutting tooth rows stationary stripper plates can engage that serve as counter-holders to break up stones or smaller boulders by the cutting teeth.

In EP 1 780 375 B1 a cutting tooth is disclosed which is especially suitable for harder soil geologies. The cutting tooth has a main cutting element and post-cutting elements in the shape of round shank chisels that are positioned behind the main cutting element.

A cutting tooth for a trench wall cutter, which can be employed for different directions of rotation of a cutting wheel, is described in DE 20 2009 001 814

U1. This cutting tooth is provided in particular for a method for producing a trench wall element, in which cut-off soil material is mixed in the trench with a binding agent so as to produce a trench wall element. The alternating direction of rotation of the cutting wheel permits an intensive crushing of the soil material and a good mixing with the binding agent.

US 4,326,347 discloses a device for producing a trench in the ground with a rotatably supported cutting wheel, on the outer circumference of which removal devices are supported. The removal devices are fixed in notches of the cutting wheel and comprise a radially extending spoke and a curved plate fixed thereon, on which a curved cutter is designed.

The invention is based on the **o b j e c t** to provide a cutting tooth which has a good cutting effect especially in the case of cohesive soil types.

In accordance with the invention the object is achieved by a cutting tooth having the features of claim 1. Preferred embodiments of the invention are stated in the dependent claims.

The head area of the cutting tooth has a plate-shaped cutting wing arrangement, the wings of which project laterally with respect to the base area.

The plate-shaped cutting wing arrangement comprises at least one cutting edge that extends along a front edge of the cutting wing arrangement transversely to a cutting direction of the cutting tooth. Due to the cutting wings, which project laterally with respect to the base area and each comprise a part of the cutting edge, a large cutting width is provided that ensures an efficient soil removal especially in the case of soft and/or cohesive soils. By preference, the cutting tooth is symmetrical in the transverse direction.

According to the invention the cutting wing arrangement has laterally projecting cutting wings in the transverse direction of the cutting tooth, i.e. transversely to the cutting direction of the cutting tooth, that serve for cutting or loosening soil material. Hence, in a direction transverse to the cutting direction of the cutting tooth the wings of the plate-shaped cutting wing arrangement project laterally with respect to the base area of the cutting tooth, thus leading to a cutting tooth width that is enlarged with respect to the width of the base area. By preference, the cutting wing arrangement is at least twice as wide, more preferably at least three times as wide, most preferably at least four times as wide as the base area. With an increasing width of the cutting wing arrangement, the efficiency of soil removal increases, while the mechanical stress of the tooth grows at the same time.

The cutting edge running transversely to the cutting direction enables stripping of the soil along a defined cutting width. Particularly in the case of soft and/or cohesive soils the stripping removal of soil proves to be an efficient method. The cutting wings of the cutting wing arrangement, which project laterally with respect to the base area, allow for an economical cutting width along with a small width of the tooth base and thus a small width of a tooth holder. The cutting edge of the plate-shaped cutting wing arrangement preferably extends across the entire width of the cutting tooth.

Furthermore, the wings of the cutting wing arrangement provide a free space underneath the cutting wings, into which removed or loosened soil material can be led and from where it can be sucked off, where necessary.

Due to the cutting wings that project laterally with respect to the base area of the cutting tooth, the latter is especially suitable for insertion into cutting wheels with cutting tooth holders that are spaced from each other in a direction transverse to the cutting direction. With comparatively few cutting teeth a large cutting cross-section can thus be achieved. Moreover, the cutting teeth

according to the invention can be used with cutting wheels that are also employed for narrow cutting teeth for cutting hard rock formations. The cutting wing arrangement that is of greater width as compared to such narrow teeth enables a so-called full cut, in which soil material is substantially removed across the entire width of a cutting wheel.

Together with the base area of the cutting tooth, the cutting wing arrangement preferably forms a T-shape. The T-shape, which can be recognized in particular when viewed from the front or rear of the cutting tooth, provides a large free space below the cutting wings.

For lateral displacement of removed soil material a guide surface is preferably designed below the cutting wing arrangement. By preference, the guide surface has a curved shape that displaces the soil material loosened by the plate-shaped cutting wing arrangement in the downward direction towards the tooth base and into a lateral area, in particular laterally of the tooth base. The guide surface, that is of wedge-shaped design in particular, prevents a clogging of cohesive soils on the cutting tooth.

For the removal of soft and/or cohesive soils it is preferred in accordance with the invention that the cutting wing arrangement has a linear cutting edge. Especially in contrast to a point-shaped cutter, such as a chisel, the linear cutting edge brings about a stripping removal of soil. The linear cutting edge can run along a straight line or also along a curved and/or jagged line.

According to the invention a particularly good cutting effect is provided in that the cutting wing arrangement has an arrow-shaped or V-shaped cutting edge. The arrow-shaped or V-shaped cutting edge comprises a central apex positioned in front in the cutting direction and cutting edges extending sideways from the apex and obliquely rearwards along the wings of the cutting wing arrangement.

By preference, the cutting edge is curved at least in sections and slopes down in lateral directions of the cutting tooth towards the tooth base. It is especially preferred that an apex of the arrow-shaped or V-shaped cutting edge forms an uppermost and/or foremost point of the cutting tooth. This reduces the resistance during cutting and also permits, especially in connection with the guide surface designed below the cutting wing arrangement, a reliable transport of the removed soil material.

A further improved cutting effect can be achieved in that in a center area of the cutting tooth a central cutting edge is arranged that runs transversely to the cutting edge of the cutting wing arrangement. In particular, the central cutting edge runs along a longitudinal direction of the cutting tooth, which corresponds to a direction of insertion of the cutting tooth into a cutting tooth holder. The central cutting edge preferably runs on a front edge of the cutting tooth along a center plane of the cutting tooth. By preference, the central cutting edge extends from a center point or apex of the cutting edge of the cutting wing arrangement in the direction of the base area of the cutting tooth.

A clogging of the cutting tooth can be prevented in accordance with the invention in that the wings slope down rearwards from the cutting edge. Thus, the cutting edge constitutes in each case an uppermost or highest point of the cutting tooth in the cutting direction.

According to the invention it is furthermore preferred that the wings have a bent or curved upper side. The bent or curved upper side can contribute to the avoidance of soil material sticking to the wings.

It is especially preferred that an upper side of the wings slopes laterally downwards in the direction of the base area. The laterally sloping upper side or surface of the cutting wing arrangement with the correspondingly curved cutting

edge leads to an increased soil removal in a center area of the cutting tooth as compared to the side areas. The curvature of the upper side of the wings in the transverse direction can also be referred to as a convex curvature.

Furthermore, it is preferred that an upper side of the wings has a concave or tub-shaped curvature in the cutting direction. This inwardly curved shape of the upper side of the wings in the cutting direction quite easily enables a cutting edge directed obliquely upwards and thus a particularly efficient soil removal.

By preference, the cutting edge projects upwards with respect to the upper side of the wings. In this, the cutting edge preferably forms a front terminal edge of the upper side of the wings that is of concave shape in particular. This brings about an especially good soil removal.

The removal effect can be improved further in that the cutting edge projects at least in sections with respect to the base area in the cutting direction. In particular a center area of the cutting edge can project with respect to the base area, forming a front ending of the cutting tooth. The side areas of the cutting edge can be offset rearwards with respect to the tooth base.

A reliable insertion into a cutting tooth holder can be provided in that the base area of the cutting tooth has a U-shaped holding groove. The holding groove preferably runs in a center plane of the cutting tooth, in particular transversely to the cutting edge of the cutting wing arrangement and/or in a plane of the cutting direction.

A good support of the cutting tooth can be provided in that the holding groove extends into a rearward area of the plate-shaped cutting wing arrangement. By preference, the holding groove extends along a rear of the cutting tooth through the cutting wing arrangement.

In the following the invention is described further by way of the accompanying schematic drawings, wherein shows:

Fig. 1 a perspective view of a cutting tooth according to the invention shown from a front angle;

Fig. 2 a perspective view of a cutting tooth according to the invention shown from a rear angle;

Fig. 3 a view of a cutting tooth according to the invention from the front;

Fig. 4 a view of a cutting tooth according to the invention from the rear;

Fig. 5 a view of a cutting tooth according to the invention from the top;

Fig. 6 a view of a cutting tooth according to the invention from the below;
and

Fig. 7 a side view of a cutting tooth according to the invention.

Identical components are designated in all Figures with the same reference signs.

A cutting tooth 10 according to the invention comprises an upper side 14, an opposite lying underside 15, a front side 16 and an opposite lying rear side 17. The front side 16 is located in the front in the cutting direction 12, along which the cutting tooth 10 is moved during operation. The underside 16 extends in the direction of a cutting tooth holder, in which the cutting tooth 10 can be fixed. A longitudinal axis 11 of the cutting tooth 10 is defined by a direction of insertion into a cutting tooth holder and/or a direction lying perpendicularly to the cutting direction 12.

In the illustrated embodiment a base area 20 of the cutting tooth 10 is of U-shaped design with two parallel side surfaces and a rounded lower end. Between the parallel side surfaces a U-shaped holding groove 22 is designed. The base area 20 is provided for insertion into a cutting tooth holder with a holding spring corresponding to the holding groove 22.

The base area 20 comprises a first transverse hole 24 that intersects both the holding groove 22 and an adjacent solid part of the base area 20. The transverse hole 24 serves to accommodate a shear pin so as to secure the cutting tooth 10 in the cutting tooth holder. Adjacent thereto a further transverse hole 26 is present in the base area 20, which can serve for insertion of a tool during extraction of the cutting tooth 10 from a cutting tooth holder.

At an end lying opposite the base area 20, which is the head area 30 of the cutting tooth 10, a plate-shaped cutting wing arrangement 32 with two lateral wings 34 is formed. The wings 34 project laterally with respect to the base area 20 and together with the said base area 20 they form a T-shape. On a front edge of the cutting wing arrangement 32 a cutting surface 41 with a cutting edge 40 is designed that extends over both wings 34. The cutting edge 40 is located on an upper side of the cutting surface 41, projecting both in the cutting direction 12 as well as upwards with respect to the cutting surface 41.

The linear cutting edge 40 extends in the transverse direction of the cutting tooth 10 across its entire width. When viewed from the front side 16, the cutting edge 40 is curved in such a manner that side areas of the cutting edge 40 slope down with respect to a center area or center point in the direction of the base area 20. The center point of the cutting edge 40 forms an uppermost point of the cutting tooth 10 in relation to the longitudinal axis 11 of the said cutting tooth 10.

Especially when viewing the cutting tooth 10 from above, the cutting edge 40 has a V-shape or arrow shape (Fig. 5). The center point or apex 42 of the cutting edge 40 forms a foremost point of the cutting tooth 10 in relation to the cutting direction 12. The cutting tooth 10 is constructed mirror-symmetrically in the transverse direction.

The wings 34 of the cutting wing arrangement 32 comprise an upper side 36 lying opposite the base area 20 and an underside 38 directed towards the base area 20. The upper side 36 is curved on the one hand in the transverse direction of the cutting tooth 10 and on the other hand in the cutting direction 12. The curvature of the upper side 36 in the transverse direction runs from a center line in a laterally sloping manner. The curvature in the cutting direction 12 is of tub-shaped design with an uppermost point located on the front edge. The lowermost point in relation to the longitudinal axis 11 can be situated on the rear edge of the cutting tooth 10 (Fig. 7).

Below the wings 34 a guide surface 50 is designed which has the approximate shape of a wedge with curved surfaces so as to displace stripped off soil material in the direction of the base area 20 and/or in lateral directions. The guide surface 50 has the approximate shape of a bow, similar to the bow of a ship.

In a central longitudinal plane of the cutting tooth 10 between the apex 42 of the cutting edge 40 and the holding groove 22 a central cutting edge 46 is present. The central cutting edge 46 runs along the longitudinal direction 11 of the cutting tooth 10 and transversely to the cutting edge 40 of the cutting wing arrangement 32. During an intended rotation of the cutting tooth 10 on a cutting wheel the central cutting edge 46 runs in a radial direction of the cutting wheel. The central cutting edge 46 cuts in-situ soil material which is then displaced by means of the guide surface 50 towards both sides of the cutting tooth 10. The combination of the transversely running cutting edge 40 with the longitudinally

running central cutting edge 46 leads to an especially efficient soil removal in the case of soft and/or cohesive soils.

The cutting tooth according to the invention, which can also be referred to as a winged cutting tooth, is especially suitable for cutting cohesive soils, such as those which prevail, for example, in dam pilings. The tooth has a base body with a preferably dovetailed guide (holding groove), which can be pressed into a tooth holder and secured by means of pins made of a resilient material. The cutting surfaces or cutting edges consist of two cutters, joined together in an arrow-shaped manner similar to a ploughshare, that serve to strip off the soil and deliver it to a feed pump for example. The cutters are arranged such that the cutting edges project, whereby a clogging of the cut off material is prevented both in the cutting direction and on the lateral ends of both cutting surfaces.

CLAIMS

1. Cutting tooth for working the soil having

- a base area for arrangement in a cutting tooth holder and
- a head area with at least one cutter for removing soil material,
- wherein the head area has a plate-shaped cutting wing arrangement, the wings of which project laterally with respect to the base area,

wherein

- the cutting wing arrangement has a V-shaped cutting edge, from the apex of which a central cutting edge which runs in a center area of the cutting tooth transversely to the cutting edge extends in the direction of the base area and
- in that below the cutting wing arrangement and laterally of the central cutting edge a curved guide surface is designed for displacing soil material in the direction of the base area and into a lateral area.

2. Cutting tooth according to claim 1,

wherein

together with the base area the cutting wing arrangement forms a T-shape.

3. Cutting tooth according to claim 1,

wherein

the cutting edge has a linear-shaped design.

4. Cutting tooth according to claim 1,

wherein

the cutting edge has an arrow-shaped design.

5. Cutting tooth according to claim 4,
wherein
the apex of the cutting edge forms an uppermost point of the cutting tooth.
6. Cutting tooth according to claim 4,
wherein
starting from the cutting edge the wings slope down rearwards.
7. Cutting tooth according to claim 1,
wherein
the wings have a curved upper side.
8. Cutting tooth according to claim 1,
wherein
an upper side of the wings slopes laterally downwards in the direction of
the base area.
9. Cutting tooth according to claim 1,
wherein
an upper side of the wings has a concave curvature in the cutting direction.
10. Cutting tooth according to claim 1,
wherein
the cutting edge projects upwards with respect to an upper side of the
wings.
11. Cutting tooth according to claim 1,
wherein
the cutting edge projects with respect to the base area in the cutting
direction.
12. Cutting tooth according to claim 1,
wherein
the base area has a U-shaped holding groove.

13. Cutting tooth according to claim 12,
wherein
the holding groove extends into a rearward area of the plate-shaped cutting
wing arrangement.