TRENCHER TOOTH MOUNTING

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Abstract

A trencher tooth is mounted by its shank in a pocket of a supporting member by means of a coiled spring arranged perpendicularly to the longitudinal direction of the tooth with its ends pressing against the tooth shank and the mounting pocket. The coiled spring preferably comprises a lockwasher received in a shallow recess in the tooth shank.

17 Claims, 5 Drawing Figures
TRENCHER TOOTH MOUNTING

BACKGROUND OF THE INVENTION

The present invention relates to a digger tooth and mounting of the type used on excavating equipment such as trenchers for pipe-laying, and coal digging equipment.

It is the usual practice in the trencher field to replace trencher teeth that have become dull, worn or broken through use. Such replaceable teeth usually fit into pockets situated on the leading edges or lip of the buckets of trencher wheels and various means of releasably retaining these teeth in the pockets have been suggested. The present invention relates to such a digger tooth and mounting, and the retaining means for locked placement of the teeth within the mounting. By way of the present invention, the tooth can be locked in its mounting in only a single step. Another advantage apparent in the tooth design is the removal of stress concentrations in the shank. These concentrations form at breaking and wearing points in the teeth and greatly reduce the average usable life span of the teeth.

SUMMARY OF THE INVENTION

According to the present invention, the shank of the digger tooth is mounted within support means on, for example, a trenching machine bucket which has pockets suited for receipt of the tooth shank, and is locked within these support means by a coiled spring acting between a recess in the tooth shank and the pocket on the support means. The opposing force of the spring to any movement by the tooth effectively locks the tooth within the support means. One end of the spring acts in a direction perpendicular to the surface of the recess in the tooth shank and the other end of the spring acts in a direction perpendicular to the surface of the retaining pocket. In other words, the axis of the spring, when in locked placement, is perpendicular to the two surfaces between which the spring acts. When the tooth has been worn or damaged to the extent it is unserviceable, it can easily be removed and replaced by a new or reworked tooth.

Additional protection for the tooth and mounting is provided by having extensions on the tooth, which are so positioned as to cover the edges of the pocket within which the tooth shank is secured. The tooth is formed so that these extensions just cover the edges of the pocket or are so designed to deflect the material being excavated over the leading edge of the pocket. This helps to reduce the loading of this point which might otherwise cause breakage of the tooth shank or edges of the pocket.

It is usual to have the tooth shank conforming in shape to the reception pocket on the supporting means so that the faces of the tooth shank and pocket are in surface contact. It can be advantageous to have the tooth shank tapered towards its rear end so as to provide an additional locking means resulting from the wedging action of mating surfaces on the shank and pocket. A preferred embodiment of the present invention consists in a digger tooth having a shank comprising a pair of longitudinally extending ribs spaced apart along opposite edges of the tooth shank and a longitudinally extending web interconnecting the ribs, the web being of lesser thickness than the ribs. In this embodiment a recess is provided in both the top and bottom surfaces of the web for reception of a coiled spring so that a locking action for the tooth shank within the pocket on the supporting means is provided on both sides of the web. It is preferred to have the ribs shaped so that the top and bottom surfaces are substantially parallel. It is further preferred to have the interconnecting web between the ribs of a length such that the ribs extend rearwardly of the web.

Additional advantages can be achieved by making the inner lateral surfaces extending between the top and bottom surfaces of each rib and the respective top or bottom surface of the web non-parallel, so that in cross-section the ribs taper somewhat from the web to their top and bottom surfaces. This enhances the strength of the tooth shank and gives improved resistance to torsional stresses. If the top and bottom surfaces of the web were squared off at the point of contact between the web and the ribs this would produce noticeable stress concentrations, with the possible result of breakage of the web or tooth shank prong in these areas.

To provide an effective locking means in this embodiment the pocket will be defined by parallel top and bottom flange portions shaped to conform to the upper and lower profiles of the cross-section of the tooth shank. The minimum space between these top and bottom flange portions will be substantially equal to the thickness of the web, and the width of the flange portions of the pocket will be substantially equal to the breadth of the tooth shank. Thus the tooth shank fits in an interlocking manner between the top and bottom flange portions of the pocket.

As the coiled spring for use in locking the tooth shank in the pocket on the supporting means, it is especially preferred, for reasons of both availability and economy, to use a lockwasher, which can be considered as a single turn of a coiled spring. An advantage of utilizing a lockwasher for this purpose is that if either the lockwasher or the recess on the tooth shank in which it is positioned to provide locking action becomes worn down, the lockwasher then in use can be replaced by a thicker lockwasher.

BRIEF DESCRIPTION OF THE DRAWINGS

In drawings which illustrate embodiments of the invention, FIG. 1 is a perspective view of the tooth mounting in longitudinal section, FIG. 2 is a perspective view of a preferred embodiment of the tooth, FIG. 3 is a cross-section on the line B—B of FIG. 4, of the tooth in its mounting, FIG. 4 is a sectional view taken on the line A—A of FIG. 3, and FIG. 5 is a sectional view taken on the line C—C of FIG. 3, showing the tooth mounting pocket only in section.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a tooth 1 the shank of which is locked into a pocket 2 on mounting means 3, such as a pocket on the edge of a bucket of a trencher wheel. The exposed end of the tooth narrows to a point 4 which can be reinforced with a harder material so as to provide a stronger digging surface where the terrain being trenched is particularly rocky. In this embodiment of the present invention the shank of the tooth 1 is shown tapering rearwardly from the pocket entrance to provide wedged locking action between the shank and the pocket. A shallow circular recess 5 present in the tooth shank 1 receives a coiled spring 6, which is preferably a lockwasher, which acts between the recess 5 and the corresponding surface of the pocket 2 to lock the tooth shank 1 in the pocket 2. The axis of the coiled spring 6, when in locked placement, is perpendicular to the two surfaces between which the spring acts, so that the ends of the spring act in opposite directions, perpendicular to the direction of withdrawal of the tooth shank from the pocket, against the bottom of the recess 5 and the corresponding surface of the pocket 2 respectively.

In the preferred embodiment of the tooth shown in FIGS. 2 to 5 the tooth shank 1a is divided into a pair of longitudinally extending ribs 7 and 8 which are spaced apart at opposite sides of the tooth shank 1a. The ribs 7 and 8 are interconnected by an integral web 9 (see FIG. 4) and extend rearwardly of the web 9 which is of lesser thickness than the prongs (see FIGS. 2 and 5). The top and bottom surface 10 and 11 (see FIG. 3) of the web 9 are recessed at 12 and 13, respectively, and locked placement is effected by means of lockwashers 14 and 15, which act in the same manner as described above in relation to the embodiment of FIG. 1.

Each recess 12, 13 is of shallow circular form, approximately conforming in shape to the lockwasher, so that in the free state the lockwasher extends beyond the surface plane of the
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Tooth Shank. Upon insertion of the tooth Shank 19 within the pocket 20, the lockwasher is compressed to lie within the recess (see FIG. 3), the opposing forces of the lockwasher against the bottom surface of the recess and the surface of the pocket preventing any movement of the tooth. The axis of the lockwasher will thus be perpendicular to the bottom surface of the recess and perpendicular to the pocket surface.

So as to reduce stress concentrations in the tooth Shank at the transition points between the ribs and the web, the top and bottom surface of each prong is connected to the respective top or bottom surface of the web by inclined non-parallel surfaces, as shown in FIG. 3 by surfaces 20 and 21. These stress concentrations are common in known trencher teeth wherein these transition points are squared off and can result in breakage of the web or the ribs at these points.

As shown in FIG. 4, extensions 16 and 17 forward of the tooth Shank 1a provide protection for the edges of the pocket 2a and help remove stress concentrations at the pocket edge and in the tooth Shank, helping minimize breakage of the pocket edge or tooth Shank.

The preferred embodiment of the present invention, as set out above, is retained by means of the lockwashers 12 and 13, in an interlocking position between an upper and lower flange portion 18 and 19 (see FIGS. 3 and 4) of the pocket 2a.

What I claim as my invention is:

1. A digger tooth mounting comprising: a digger tooth having a longitudinal section defined by a substantially triangular frontal portion which blends into a rearwardly extending Shank; supporting means having a pocket receiving said Shank to support the tooth in operative position by interengagement of confronting surfaces of said pocket and said Shank; one of said surfaces of said Shank defining therein a shallow substantially circular recess; and a coiled spring received in said recess in compression between a bottom surface of said recess and the corresponding smooth, nonrecessed, confronting surface of said pocket to retain said tooth Shank in the pocket, said coiled spring being entirely retained in said recess and in that portion of any clearance space between said one surface and said corresponding surface of said pocket which is immediately over said recess, the axis of said coiled spring being substantially perpendicular to said one surface and to said corresponding confronting surface of the pocket.

2. A digger tooth mounting as claimed in claim 1, wherein said Shank has lateral extensions at a location between the frontal cutting portion and the Shank, said lateral extensions being effective to protect the supporting means from abrasive wear due to cutting erosion when tooth and supporting means are in working operation.

3. A digger tooth mounting as claimed in claim 1 wherein the digger Shank comprises a pair of longitudinally extending ribs spaced apart along opposite side edges of the Shank and a longitudinally extending web interconnecting the ribs, the web being of lesser thickness than the ribs, and said recess being provided in a surface of the web.

4. A digger tooth mounting as claimed in claim 3, wherein a second substantially circular recess is present in an opposite surface of the web and receives a second coiled spring in similar manner to said first mentioned coiled spring.

5. A digger tooth mounting as claimed in claim 3, wherein the upper and lower surfaces of each rib are connected to the respective upper and lower surface of the web by an oblique surface which makes an obtuse angle with contiguous upper or lower web and rib surfaces.

6. A digger tooth mounting as claimed in claim 1, wherein said confronting surfaces of the Shank and pocket slope rearwardly to provide a wedging engagement of the Shank in the Pocket.

7. A digger tooth mounting as claimed in claim 1, wherein said confronting surfaces of the Shank and pocket slope rearwardly at an included angle of approximately 5° to provide a wedging engagement of the Shank in the Pocket.

8. A digger tooth mounting as claimed in claim 1 wherein the coiled spring is a lockwasher.

9. A digger tooth comprising: a frontal cutting portion, which is substantially triangular in longitudinal section and rectangular in lateral section; a Shank which is joined to said cutting portion and extends rearwardly therefrom, said Shank having a surface in which is defined a substantially circular recess; and a coiled spring received in said recess, the axis of said spring being substantially perpendicular to said surface of said Shank, whereby, when said Shank is mounted in a Pocket in a supporting means, said spring being in compression acts to retain said Shank in said Pocket by engagement of its opposite ends with a bottom surface of the recess and the corresponding, smooth, nonrecessed, confronting surface of said Pocket and said spring being entirely retained in said recess and in that portion of any clearance space between said surface of said Shank and said Pocket which is immediately over said recess.

10. A digger tooth as claimed in claim 9 further comprising lateral extensions between said frontal portion and said Shank, in said lateral extensions being effective to protect said supporting means from abrasive wear due to cutting erosion.

11. A digger tooth as claimed in claim 9 wherein the digger Shank comprises a pair of longitudinally extending ribs spaced apart along opposite side edges of the Shank and a longitudinally extending web interconnecting the ribs, the web being of lesser thickness than the ribs and said recess being provided in a surface of the web.

12. A digger tooth as claimed in claim 11, wherein a second such recess is present in an opposite surface of the web.

13. A digger tooth as claimed in claim 11, wherein the upper and lower surface of each rib are connected to the respective upper and lower surface of the web by an oblique surface which makes an obtuse angle of approximately 115° with contiguous upper or lower web and rib surfaces.

14. A digger tooth as claimed in claim 9, wherein said confronting Shank surfaces slope rearwardly so that in use said Shank has a wedging engagement in said Pocket.

15. A digger tooth for mounting in a Pocket in a supporting means, comprising a Shank having surfaces for engagement with confronting surfaces of said Pocket, a shallow substantially circular recess in one said Shank surface, and a coiled spring received in said recess, said coiled spring being in compression when in operation between a bottom surface of said recess and the corresponding smooth, nonrecessed, confronting surface of said Pocket to retain said Shank in said Pocket, said coiled spring being entirely retained in said recess and in that portion of any clearance space between said one surface and said corresponding surface of said Pocket which is immediately over said recess, and the axis of said spring being substantially perpendicular to said one Shank surface and said one confronting surface.

16. The arrangement of claim 15 wherein said Shank comprises a pair of longitudinally extending ribs spaced apart along opposite side edges of the Shank and a longitudinally extending web interconnecting the ribs, the web being of lesser thickness than the ribs, and said recess being provided in a surface of the web.

17. The arrangement of claim 15 wherein said Shank surfaces slope rearwardly of the Shank to provide in use a wedging engagement of said Shank in the Pocket.

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