Sept. 25, 1945. J. BAER 2,385,395

EXCAVATING TOOTH

Filed Feb. 11, 1944 2 Sheets-Sheet 1

Fig. 1

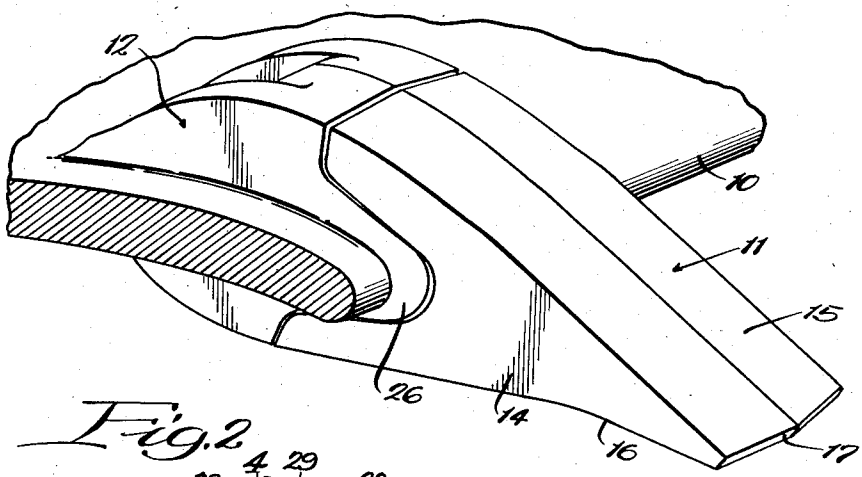


Fig. 2

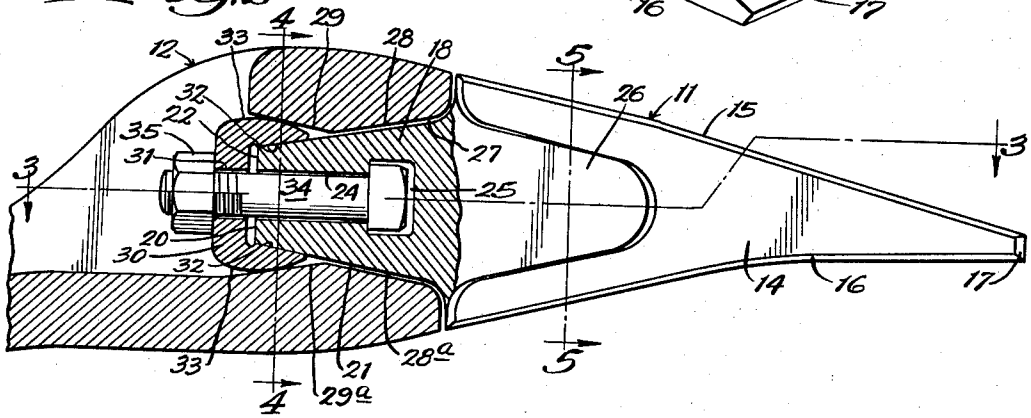
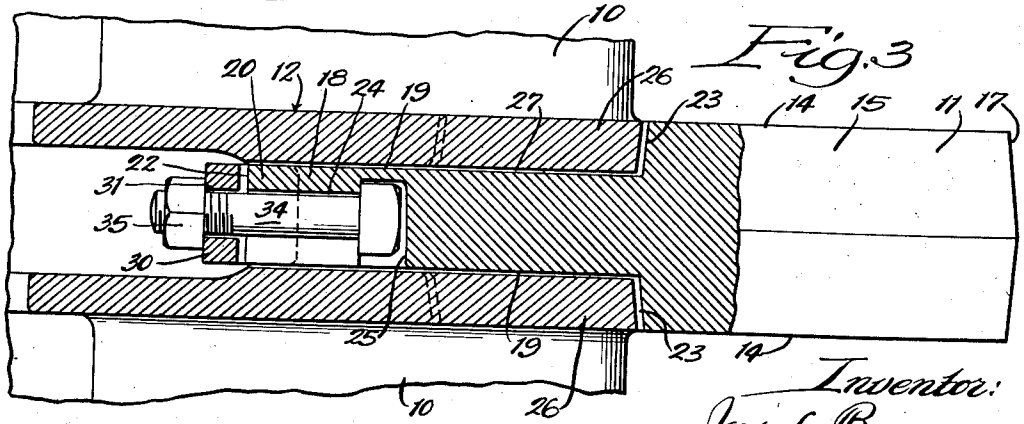


Fig. 3



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Sept. 25, 1945. J. BAER 2,385,395

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Filed Feb. 11, 1944 2 Sheets-Sheet 2

Fig. 4

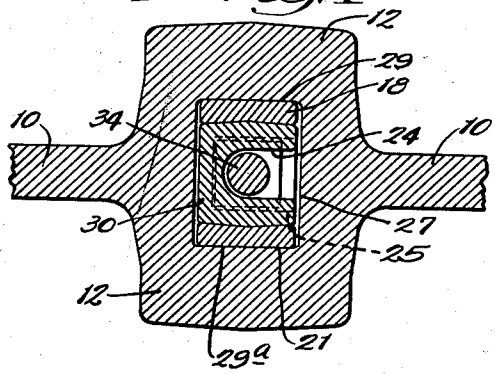


Fig. 5

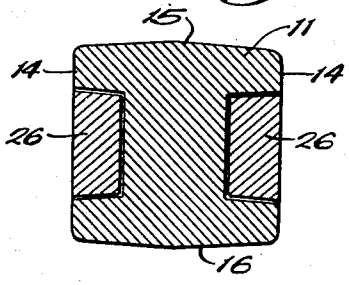


Fig. 6

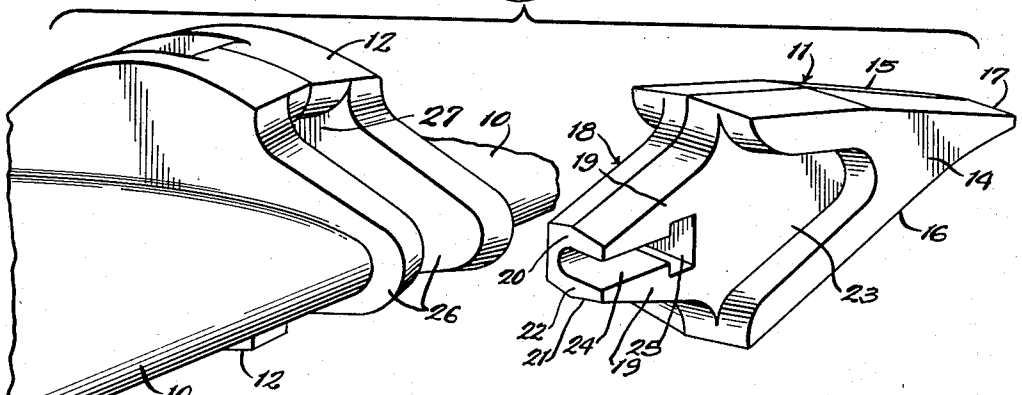


Fig. 7

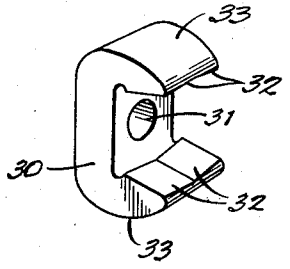
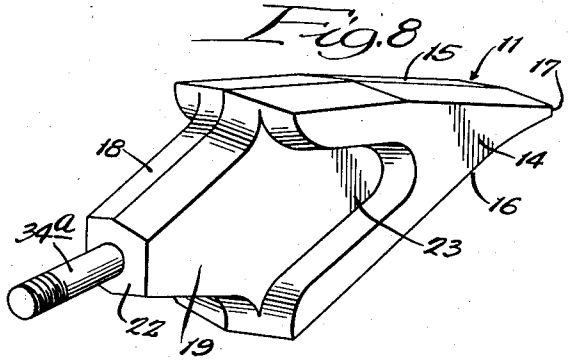


Fig. 8



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Patented Sept. 25, 1945

2,385,395

UNITED STATES PATENT OFFICE

2,385,395

EXCAVATING TOOTH

Josef Baer, Washington County, Oreg., assignor to Electric Steel Foundry, Portland, Oreg., a corporation of Oregon

Application February 11, 1944, Serial No. 521,927

6 Claims. (Cl. 37—142)

My invention relates to excavating teeth and is concerned with improvements in the instrumentalities by which such teeth are detachably secured to the lips of buckets, bucket fronts, shovels, etc.

The salient object of the invention is to provide a novel and advantageous shank-and-socket connection, between a tooth and the lip that carries it, which normally prevents relative movement between the shank and the socket, provides for readily and effectively taking up any play that develops between shank and socket in the course of excavating operations, and facilitates the replacement of the tooth when it has become worn out or broken.

Other objects are to provide such a shank-and-socket connection that includes an exceptionally sturdy shank and minimizes the amount of metal required to form the socket.

Rocking movement between a tooth and its base part produces destructive abrading action that is particularly onerous in under water excavating operations, due to sand and other abrasive particles being water-carried between the contiguous surfaces of the rocking parts. Wear due to such causes is controlled and largely prevented by the improved shank-and-socket connection of my present invention.

A novel and meritorius feature of my improved shank-and-socket connection is a resilient wedge-shaped member that embraces the tooth shank, presents outwardly facing cam surfaces to cooperating surfaces presented by the socket, presents inwardly facing cam surfaces to cooperating surfaces presented by the shank, and is forced and held to its work by threaded members acting between it and the shank.

These and other objects, features and advantages of my invention will appear from the following detailed description wherein reference is made to the accompanying two sheets of drawings in which:

Figure 1 is a perspective view of the devices of my present invention as they appear upon a fragment of the tooth-carrying lip of a drag line bucket, bucket front, shovel or the like;

Fig. 2 is a side view wherein the major portion of the tooth is shown in elevation and the tooth shank and its cooperating socket appear in section;

Fig. 3 is a view, partly in top plan and partly in section, that may be regarded as taken in the planes of the line 3—3 of Fig. 2 and looking in the direction indicated by the arrows;

Fig. 4 is a vertical sectional view that may be regarded as taken on the line 4—4 of Fig. 2 and looking in the direction indicated by the arrows;

Fig. 5 is a vertical sectional view that may be regarded as taken on the line 5—5 of Fig. 2 and looking in the direction indicated by the arrows;

Fig. 6 is a perspective view of the tooth and the base part thereof as they appear when detached and slightly separated from each other;

Fig. 7 is an isolated perspective view of the resilient wedge member; and

Fig. 8 is a perspective view of a modified form of the tooth.

Similar characters of reference refer to similar parts throughout the several views.

In the drawings, reference numeral 10 indicates a fragment of the teeth-carrying lip of a drag line bucket, bucket front, power shovel or the like. At 11 is depicted an excavating tooth and at 12 the lip-carried base part whereon and wherein the tooth is mounted. While the base part 12 may be detachably secured to the lip 10 as by bolts, it preferably constitutes an integral part of the lip 10 and is related to the leading edge thereof much as an engine nacelle of a modern airplane is related to the leading edge of an airfoil whereof it forms a streamlined enlargement.

The tooth 11 suitably, but not necessarily, is drop-forged or cast in one piece and comprises a body portion having parallel flat sides 14, and having a top 15 and a bottom 16 converging to its forward or incising extremity 17. The tooth also comprises a shank 18 having parallel flat sides 19 and having its top 20 and bottom 21 converging to its terminal face 22. As illustrated, the top 15 and bottom 16 of the tooth body portion 13, the top 20 and bottom 21 of the shank 18, and the incising extremity 17 of the tooth have transverse inclines attributable to the requisite relief (usually approximately 7°) of drop-forge dies.

Formed in the flat sides 14 of the tooth body portion 13 are recesses 23 for the reception of the hereinafter-to-be-mentioned horns of the base part whereon and wherein the tooth is detachably mounted. The margins of these recesses also are depicted as having transverse inclines attributable to requisite die relief.

The tooth shank 18 is provided with a laterally opening longitudinally extending slot 24 having its inner end intersecting at right angles a slot 25 greater transverse cross section.

The base part 12 presents a pair of horns 26 for reception by the tooth recesses 23 and a socket 27 for reception of the tooth shank 18—such socket being open at both of its ends.

The edges of the horns 26 have transverse inclines complementary to the opposed transverse inclines of the margins of the tooth recesses 23. The face angle of each horn 26 is slightly larger (i. e., by a matter of two or three degrees) than the face angle of the recess 23 by which the horn is received. This disparity between face angles assures, initially, (*a*) that the areas of contact between each horn edge and its opposed tooth recess margin will be located away from the tip of the horn, and (*b*) that the butt joints between the tooth and its base part, at their upper and lower surfaces, are slightly open (see Fig. 2).

The side walls of socket 27 are parallel with each other but its top presents a pair of angularly disposed surfaces 28 and 29 and its bottom presents angularly disposed surfaces 28*a* and 29*a*. In other words, the surfaces 28 and 29 define a socket flare to the front and surfaces 28*a* and 29*a* similarly define a socket flare to the rear.

It will be noted, by reference to Fig. 2, that shank 18 extends rearwardly between the flaring socket surfaces 28 and 28*a*, without necessarily contacting either of such surfaces, and that acute angles are defined between the shank 18 and the socket surfaces 29 and 29*a*.

At 30 is the wedge member that cooperates with the upper and lower surfaces of shank 18 and with the opposed surfaces 29 and 29*a* of the socket. Such wedge is generally U-shaped and is provided in its web portion with a bolt hole 31. The legs of the U-shaped wedge are provided with inner surfaces 32, for engagement with the upper and lower surfaces of shank 18, and with outer curved camming surfaces 33 for cooperation with the socket surfaces 29 and 29*a*.

The wedge is formed of suitable resilient ferrous alloy so that its legs when forced toward each other will tend to return to normal.

As a means for forcing and holding the U-shaped wedge 30 to its work, I prefer to employ the bolt 34 and its nut 35, the bolt head lying in the tooth shank slot 25 and the bolt shank lying in tooth shank slot 24 and projecting rearwardly from the shank, through the bolt hole 31 of the wedge for cooperation with the nut.

In Fig. 8 I have illustrated how the bolt 34 may find a substitute in the nature of a threaded stud 34*a* that is welded or formed integral with the tooth shank 18 and projects rearwardly from its terminal face 22.

The U-shaped wedge 30 is so conformed and related to the shank 18 and the socket surfaces 29 and 29*a* that, as the wedge is drawn by bolt-and-nut action to the position of Fig. 2, its outer or curved cam surfaces 33 will engage the socket surfaces 29 and 29*a* before its inner surfaces 32 engage the tooth shank 18. But as the tightening of nut 35 continues to force the legs of the wedge into the angles between the tooth shank 18 and the socket surfaces 29 and 29*a*, the camming action between the wedge surfaces 33 and such socket surfaces 29 and 29*a* causes the inner surface 32 of the wedge legs tightly to embrace the tooth shank 18.

When nut 35 is removed from bolt 34, a tap upon the bolt will release the tooth from the embrace of its base part, but the wedge, by reason of its resilient character, will remain in the rear portion of the base part socket 27 until and unless it is forcibly ejected therefrom as, for instance, by means of a tool inserted into socket 27 through the front end thereof.

In the arrangement of parts just described, the tooth 11 is supported and held upon its base part, by the horns 26 and the U-shaped wedge 30, in such manner that rocking movement between the tooth and its base part can be effectively prevented. In practice the tooth may be battered back upon its base part, so that the tooth recesses 23 are completely or substantially filled by the horns 26, and so that the butt joints at the tooth and its base part at their upper and lower margins are completely or substantially closed; but any resultant play between the tooth and its base part readily may be entirely eliminated on the job by tightening nut 35.

While I have illustrated and described a preferred tooth 11 that is formed in one piece, I contemplate that the tooth may be a fabrication of two or more pieces of metal. The word "bucket" in the appended claims is used in its broad sense and is generic to buckets, dippers, shovels, etc., used in various kinds of power excavating equipment.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A tooth support having a socket therein, a tooth having a shank extending rearwardly into the socket, a generally U-shaped resilient wedge member embracing the rear end of the shank, a hole in the web portion of the wedge member, a threaded member extending rearwardly from the shank and through said hole, and a nut cooperating with the threaded member and acting against the rear face of the wedge member to force the arms of the latter into spaces between the shank and opposed surfaces of the tooth support, said wedge member having its arms provided with outer camming surfaces adapted to engage the aforesaid opposed surfaces of the tooth support to distort said arms toward each other and thereby carry inner surfaces thereof into tight gripping engagement with the shank.

2. A tooth support having a socket therein, spaced-apart tooth embracing horns extending forwardly from the sides of the socket, a tooth having a shank extending rearwardly into the socket and lateral recesses receiving said extensions, a resilient wedge member lying adjacent to the rear end of the shank and having spaced-apart portions adapted to be forced into spaces between the top and bottom of the shank and opposed surfaces of the socket, force-multiplying means acting between the shank and the wedge for forcing the aforesaid spaced-apart portions into the aforesaid spaces, the upper and lower surfaces of the shank converging to the rear and the opposed surfaces of the socket flaring to the rear, and cam surfaces on the wedge arm extensions adapted to cooperate with the said flaring surfaces of the socket to squeeze the inner surfaces of said wedge arms into gripping engagement with the tooth shank.

3. A tooth support having a socket therein, spaced-apart horns projecting forwardly from the sides of the socket, a tooth having a shank extending rearwardly into the socket and lateral recesses for receiving said horns, a generally U-shaped resilient wedge member embracing the rear end of the shank, a hole in the web portion of the wedge member, a threaded member extending rearwardly from the shank and through said hole, a nut cooperating with the threaded member and acting against the wedge member to force the arms of the latter into spaces between the top and bottom of the shank and opposed surfaces of the socket, the upper and lower surfaces of the shank converging rearwardly and

the opposed surfaces of the socket flaring to the rear, and cams on the wedge arm exteriorly adapted to cooperate with said flaring surfaces of the socket to squeeze the inner surfaces of the wedge arms into gripping engagement with the tooth shank when said nut is tightened upon said threaded member.

4. A tooth support having a socket therein, the upper and lower walls of the socket flaring to both the front and the rear, spaced-apart horns projecting forwardly from the sides of the socket, a tooth having lateral recesses for the reception of said horns and a shank projecting freely through the forward flare of the upper and lower walls of the socket, said tooth shank tapering to the rear and extending into the rearward flare of the upper and lower walls of the socket, a threaded member extending rearwardly from the tooth shank, a resilient wedge member apertured to pass the threaded member, a nut on the threaded member, and spaced-apart arms on the wedge member having exterior cams cooperating with the upper and lower walls of the socket at their rearward flare to squeeze the inner surfaces of said arms into gripping engagement with the rearwardly tapering tooth shank when the nut is tightened upon said threaded member.

5. A tooth support having a socket therein, a tooth having a shank extending rearwardly into the socket, a resilient wedge member having spaced-apart arms embracing the rear end of the shank, and force-multiplying means acting between the shank and the wedge member for forcing the arms of the latter into spaces between the shank and opposed surfaces of the tooth support, said wedge member having its arms provided with outer camming surfaces adapted to engage the aforesaid opposed surfaces of the tooth support to distort said arms toward each other and thereby carry inner surfaces thereof into tight gripping engagement with the shank.

6. A tooth support having a socket therein, a tooth having a shank extending rearwardly into the socket, a resilient wedge member having spaced-apart arms embracing the rear end of the shank, and force-multiplying means acting between the shank and the wedge member for forcing the arms of the latter into spaces between the shank and opposed surfaces of the tooth support, opposed surfaces of the wedge member and the tooth support being so conformed and related as to distort the wedge member to squeeze the tooth shank between the arms of the wedge member.

JOSEF BAER.