May 3, 1955 J. BAER 2,707,343

BUCKET TOOTH POINT AND ADAPTER ATTACHMENT

Filed Sept. 27, 1949

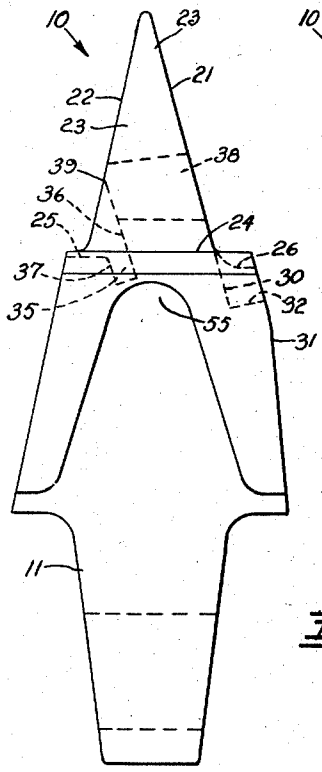


FIG. 2.

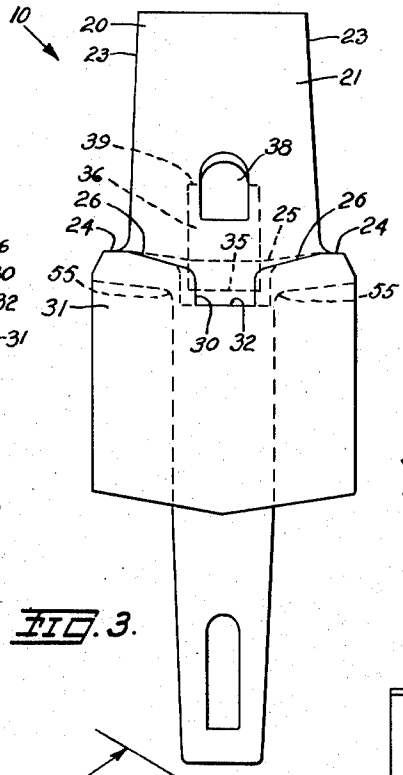


FIG. 3.

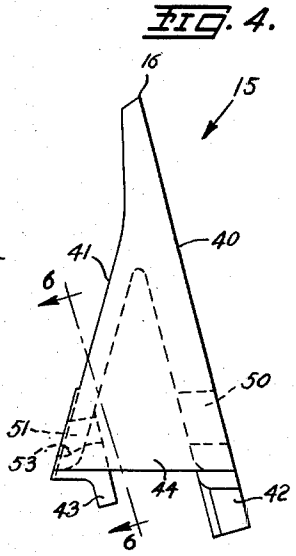


FIG. 4.

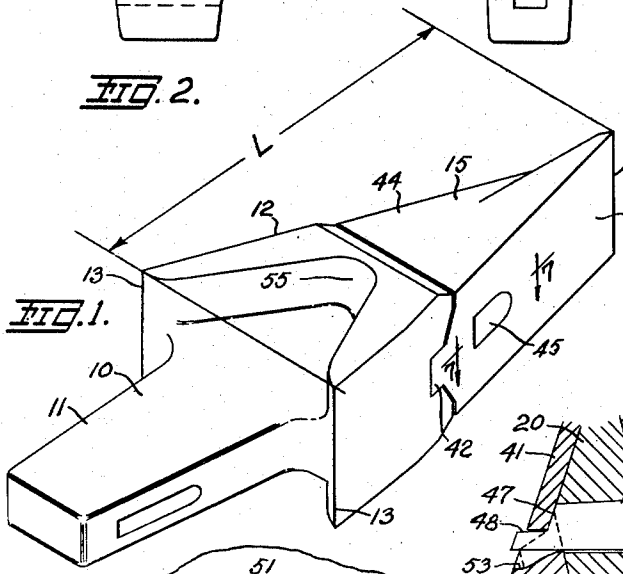


FIG. 1.

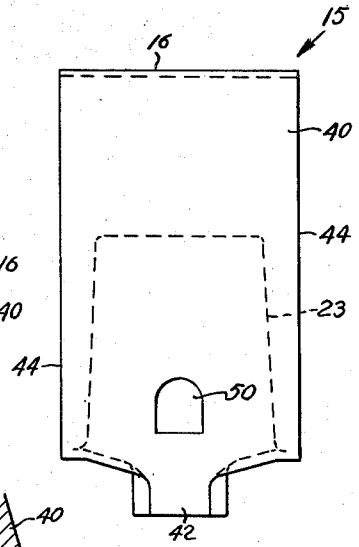


FIG. 5.

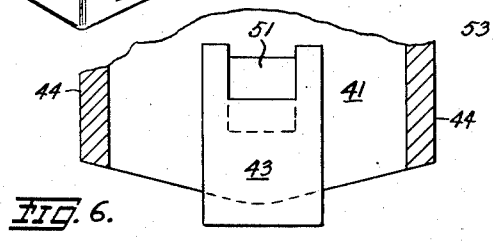


FIG. 6.

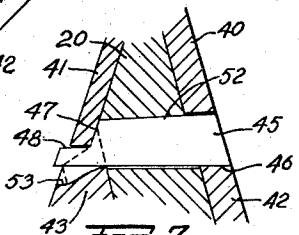


FIG. 7.

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2,707,343

Patented May 3, 1955

2,707,343

BUCKET TOOTH POINT AND ADAPTER ATTACHMENT

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Application September 27, 1949, Serial No. 118,013

4 Claims. (Cl. 37—142)

This invention relates to an improved tooth point and adapter for dipper buckets, dragline buckets and the like used in dredging and excavation work.

Bucket teeth have a relatively short life in such work because of wear and breakage, and many different types of renewable tooth points have heretofore been devised to avoid the expense of replacing an entire tooth when it became unfit for further service. Conventional tooth points for this purpose, however, have numerous shortcomings and disadvantages. Many of them are insecure and tend to work loose in hard service, and attempts to correct this difficulty have frequently resulted in other disadvantages and weaknesses. Some of these disadvantages in conventional renewable tooth points are excessive length, which increases the stresses in certain parts, excessive weight of material required for the tooth points, and design features which complicate manufacture, all of which also tend to increase the cost of the article. Other known tooth points are weak in certain other respects, have inadequate locking means, or have joints which admit the washing through of fine abrasive material to cause internal wear in hydraulic work.

The general objects of the present invention are to provide an improved renewable tooth point and adapter which will overcome the shortcomings and disadvantages of conventional forms of construction. Particular objects are to provide a construction to duplicate a solid tooth as closely as possible, to provide a tooth point and adapter combination which is shorter between the base of the adapter and the end of the tooth point than conventional forms, and to provide such a combination having large, flat, interfitting surfaces which are accessible and easy to machine to insure a close fit between the parts. Another object is to provide improved and more effectively located locking tongues to secure a box-type tooth point to its adapter. Another object is to provide an improved form of key which cannot be driven too tightly in its keyway so as to overstrain the parts, and which is adapted to clamp at least one of the walls of the box point securely against the adapter.

Still further objects and advantages will become apparent to persons skilled in the art, and the invention will be better understood, from the following description with reference to a preferred embodiment of the invention illustrated in the accompanying drawings. The drawing is referred to, however, merely for the purpose of illustrating the principles of the invention and not for the purpose of limiting the invention.

In the drawings:

Figure 1 is a perspective view of the adapter and tooth point in assembled relation;

Figure 2 is a side elevation view of the adapter;

Figure 3 is a top plan view of the adapter;

Figure 4 is a side elevation view of the tooth point;

Figure 5 is a top plan view of the tooth point;

Figure 6 is a sectional view taken on the line 6—6 of Figure 4; and

Figure 7 is a fragmentary sectional view taken on the line 7—7 of Figure 1.

Figure 1 illustrates how closely the present tooth point and adapter duplicate a solid tooth. The adapter 10 has a shank 11 and head 12 which exactly duplicate the corresponding parts of a conventional solid tooth so as to be interchangeable therewith. For the purpose of comparison, the top and bottom edges at the base of the head are designated by the numeral 13. The renewable box type point 15 has a digging end 16. The tooth point and adapter combination shown, designed to replace a solid 49½ pound tooth, weighs 51½ pounds, whereas two of the best tooth point and adapter combinations heretofore known in the art weigh 60 and 62 pounds, respectively, without attaining any greater strength or other advantages. The length of the tooth, L, measured between the end 16 and a straight edge laid across the lower edges 13 of the adapter head, is exactly the same as the length of the solid tooth it is intended to replace. Conventional renewable tooth points are all longer in this dimension in order to obtain sufficient bearing upon the adapter, with the result that higher stresses are imposed on certain parts of the tooth point, as well as the adapter, rendering the conventional tooth combination more susceptible to breakage, and also heavier and more costly. Features of the present interlocking fit between the tooth point and adapter provide adequate bearing between the parts without excessive length, resulting in a stronger and lighter weight tooth.

Figures 2 and 3 illustrate the construction of the adapter 10. The adapter has a tapered nose 20 with sloping top and bottom flat faces 21 and 22, respectively. These top and bottom faces are so designated with reference to the position of the tooth in its bucket, inasmuch as the present tooth is not reversible. The bottom side of the tooth is on the outside of the bucket, which is its bottom side when it rests on the ground in working position. The top side of the tooth faces the inside of the bucket and is turned upwardly when the bucket is horizontal. The other two sides of the nose comprise flat, slightly inclined, surfaces 23 terminating at shoulders 24.

These shoulders are part of a continuous shoulder surface extending substantially around the nose 20, there being a shoulder on the bottom side of the head indicated at 25 and two separated shoulder surfaces on the top side of the head indicated at 26, the construction being symmetrical on opposite sides of a longitudinal medial plane. The bottom shoulder surface 25 dips slightly in its central portion, and the top shoulder surfaces 26 are either curved or inclined in straight lines toward a central dovetail slot 30. The slot 30 has greater width on the nose surface 21 than on the head surface 31 and terminates at a shoulder surface 32, as shown in Figure 3.

The bottom nose surface 22 is interrupted by the opening for a rectangular socket 35. Socket 35 has a long back wall 36 extending parallel with the top nose surface 21, and a short front wall 37 also parallel with the surface 21 but extending only from the bottom of the socket up to the level of shoulder 25, as shown in Figure 2. A tapered keyway 38 extends through the nose 20 between its top and bottom faces and having its large end opening through the top face 21. One wall of this keyway is arched and intersects the bottom face 22, and an opposite flat wall of the keyway intersects the back wall 36 of the socket 35, so that most of the width of the keyway opens through the wall 36. The socket 35 is wider than the keyway, as viewed in Figure 3, whereby wall 36 terminates at a line 39 where it intersects the flat surface 22.

The tooth point 15 is of box type construction, as shown in Figures 4 and 5, formed to fit snugly on the nose 20 of the adapter. It has a thick top wall 40 constituting the principal wearing surface and a relatively

thinner bottom wall **41** making an angle with the top wall corresponding to the angle between the nose surfaces **21** and **22**. It is desirable that the point box be made of tough steel with the end hardened some distance back from the edge **16** and the parts shaped as shown in Figure 4 so as to be self-sharpening until the entire end is worn away. The top wall **40** has a dovetail tongue **42** to fit the dovetail slot **30**, and the back wall **41** has a rectangular tongue **43** extending parallel with the top wall to fit the rectangular socket **35**. These tongues **42** and **43** serve to clamp the top and bottom walls of the box point to the adapter to prevent deformation of the walls away from the adapter under severe bending stresses. The box is closed by a pair of side walls **44** spaced to fit the inclined side surfaces **23** of the adapter nose.

The box point is secured to the adapter by a single tapered key **45** driven from the top side of the tooth, as shown in Figure 7. Key **45** has a sloping shoulder **47** adjacent its small end which terminates in a deformable portion **48**. Referring again to Figure 4, the box point **15** has a large keyhole **50** in its top wall **40** and a small keyhole **51** in its bottom wall **41**. The bottom keyhole **51**, which extends through the additional thickness of material afforded by the tongue **43**, is provided with a recess **53** into which the small end portion **48** of the key may be bent, as shown in broken lines in Figure 7. To insure proper positioning of the key in the keyhole when it is inserted for driving, the back edge **46** is made flat and the front edge **52** is rounded so that the key cannot be turned over.

The key **45** is dimensioned to fit snugly before the shoulder **47** arrives at the back wall **41**. Then, when the key is driven in, the parts are put under strain to hold them tight by the wedging action of the taper of the key. The purpose of the shoulder **47** is to prevent the key from being driven too hard to overstrain the parts. When shoulder **47** meets back wall **41**, further driving will have no effect, whereby the correct strain is assured in every tooth point installation. When the end **48** is bent down against the wall of recess **53**, it holds the box wall **41** tightly against the bottom of the nose and locks the key in place without the use of any deteriorating materials. It may easily be removed, when necessary, by prying up or burning off the end portion **48**.

A feature of the present construction which enables the tooth point **15** to be shortened without impairing the security of its attachment to the adapter **10** resides in the location of tongues **42** and **43** in line with the keyholes in the top and bottom walls of the tooth point box. The dovetail tongue **42** fits snugly into its dovetail slot **30** and extends the bearing of the box point **15** down toward the shank of the adapter on the top side of the tooth. Tongue **42** also extends the box wall **40** well beyond the keyhole **50** to strengthen this wall around the keyhole. On the bottom side of the tooth, the rectangular tongue **43** serves a similar dual purpose, seating snugly in the socket **35** to extend the bearing of the wall **41** toward the shank of the adapter, and providing increased metal thickness around the keyhole **51**. By making the tongues **42** and **43** of less width than the tooth, the dovetail slot **30** and socket **35** are walled in with a substantial thickness of metal at the side edges of the adapter so that this slot and socket do not weaken the adapter.

It will be appreciated that locking tongues cannot be placed as far down on the sides of the adapter as on its top and bottom faces because of the side recesses **55** in the head **12** which must be left open to fit standard bucket construction. In the present construction the tongues **42** and **43** are placed in the most advantageous positions to resist bending stresses and lock the top and bottom walls of the box point to the adapter. Also, the extension and strengthening of the box walls afforded by these tongues permits the key to be located well down in the thick part of the adapter nose. In prior art adapters it has been necessary to extend the length of the tapered

nose to strengthen the keyway therein because the key could not be located near the shank end of the box. A short nose permits a short tooth which reduces the lever arm of the bending moments produced by forces acting at the end of the tooth.

Another feature of the present construction is that the interfitting surfaces are broad and flat and easily accessible to ordinary grinding and chipping tools. The inside surfaces of keyhole slot **30** are accessible, both from the end and from the top side of the nose. All of socket **35** is easily accessible by virtue of its inclination with the bottom face surface **22**. The interior surfaces of walls **40** and **44** of the box point are perfectly flat and unobstructed. Bottom wall **41** carries the tongue **43** which has three easily accessible flat surfaces near the edge of the box. The tongue **43** does not obstruct access to the inside surface of wall **41**.

By thus facilitating the machining of the interfitting surfaces, better and more uniform joints are obtained in production, thereby improving the quality and reducing the cost of the article, in addition to the saving in cost afforded by the reduction in weight of steel. It will be apparent also that the strength and life of the tooth will be increased when the tooth point fits the adapter snugly so that there is no looseness to produce excessive shock loads in hard digging such as rock digging. In digging out boulders, a dipper bucket or drag bucket advances with a jerky movement which subjects all the parts, and particularly loose parts, to a severe pounding action involving complex stresses far beyond the calculated values for a steady pull.

Having now described my invention and in what manner the same may be used, what I claim as new and desire to protect by Letters Patent is:

1. A bucket tooth comprising an adapter and renewable box-type tooth point, said adapter having flat mutually inclined top and bottom surfaces, a socket in one of said surfaces having walls parallel with the opposite surface of the adapter, a keyway extending through the top and bottom surfaces of the adapter and emerging through one of said socket walls, said tooth point having top and bottom box walls to fit the top and bottom surfaces of said adapter, keyholes in said box walls to register with said keyway, a locking tongue on one of said box walls partially surrounding one of said keyholes and adapted to fit said socket, a locking tongue on the other box wall adjacent said other keyhole, engaging said adapter, a tapered key in said keyway and keyholes having a shoulder on its small end engaging one of said box walls to limit the driving of the key, and a deformable end portion on the small end of said key to clamp the bottom wall of said tooth point to the bottom surface of the adapter.

2. A bucket tooth comprising an adapter and a box-type renewable tooth point, said adapter having a shank and a tapered nose with flat mutually inclined top and bottom surfaces to fit said tooth point, a dovetail slot on one side of said adapter having a surface extending toward said shank in common with one of said flat surfaces, a socket in the other side of said adapter extending toward said shank and parallel with said common surface, said tooth point having a wall with a flat interior surface and a dovetail tongue to fit said dovetail slot, said tooth point having an opposite wall with a flat interior surface and a tongue extending parallel with said dovetail tongue to fit said socket, a keyway extending through the top and bottom surfaces of the adapter and emerging in said socket, keyholes in said box walls to register with said keyway, a tapered key in said keyway and keyholes having a shoulder on its small end engaging one of said box walls to limit the driving of the key, and a deformable end portion on the small end of said key to clamp the bottom wall of said tooth point to the bottom surface of the adapter.

3. A bucket tooth comprising an adapter and a box-

type tooth point, said adapter having a shank and a tapered nose with flat mutually inclined top and bottom surfaces to fit said box point, the top surface of said nose extending beyond the base of said nose toward said shank and forming one wall of a dovetail slot in said adapter, a socket in the bottom side of said nose extending toward said shank and parallel with said dovetail slot, said box point having a top wall with a dovetail tongue to fit said dovetail slot and a bottom wall equipped with a tongue parallel with said dovetail tongue to fit said socket, a keyway extending through the top and bottom surfaces of the adapter and emerging in said socket, keyholes in said box walls to register with said keyway, a tapered key in said keyway and keyholes having a shoulder on its small end engaging one of said box walls to limit the driving of the key, and a deformable end portion on the small end of said key to clamp the bottom wall of said tooth point to the bottom surface of the adapter.

4. A bucket tooth comprising an adapter and a box-type tooth point, said adapter having a shank and a tapered nose with flat mutually inclined top and bottom surfaces, a dovetail slot in said adapter extending toward said shank having a wall formed by said top surface, a socket on the bottom side of said adapter extending toward said shank and parallel with said wall, a keyway through said nose, said tooth point having a top wall with a flat interior surface and a dovetail tongue to fit said slot, said tooth point having a bottom wall with a flat interior surface and a tongue to fit said socket, keyholes in said top and bottom walls adjacent said tongues, a tapered key in said keyway and keyholes, said key having a shoulder engaging said bottom wall to limit the driving of the key and a deformable small end to clamp said bottom wall of the tooth point against the bottom surface of the adapter.

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