Nov. 12, 1968 T. A. RATKOWSKI 3,410,010

DIPPER TOOTH

Filed Oct. 5, 1965 3 Sheets-Sheet 1

FIG. 1

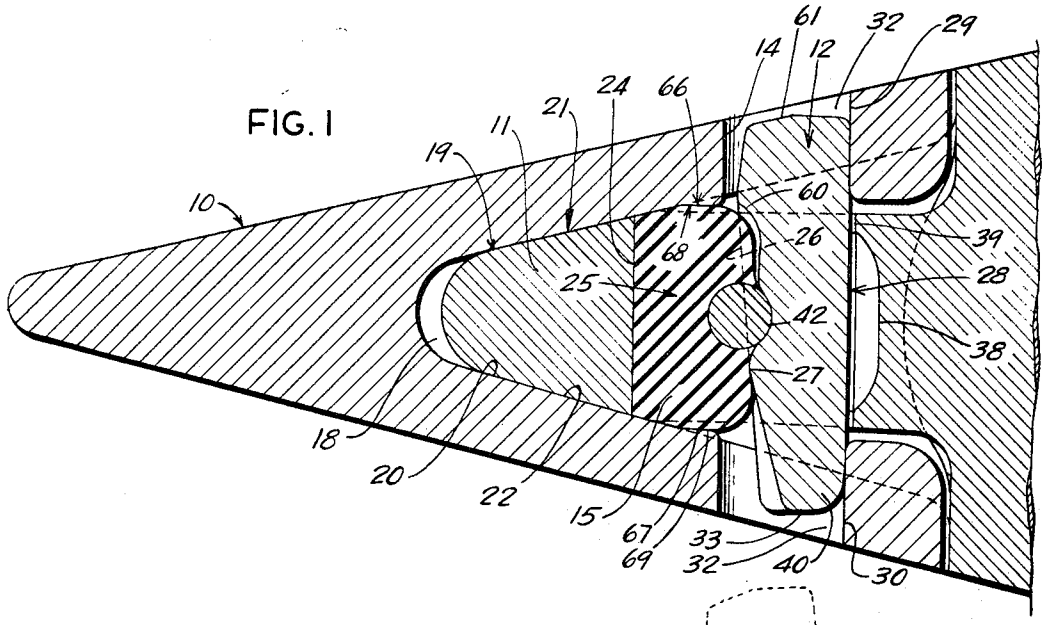
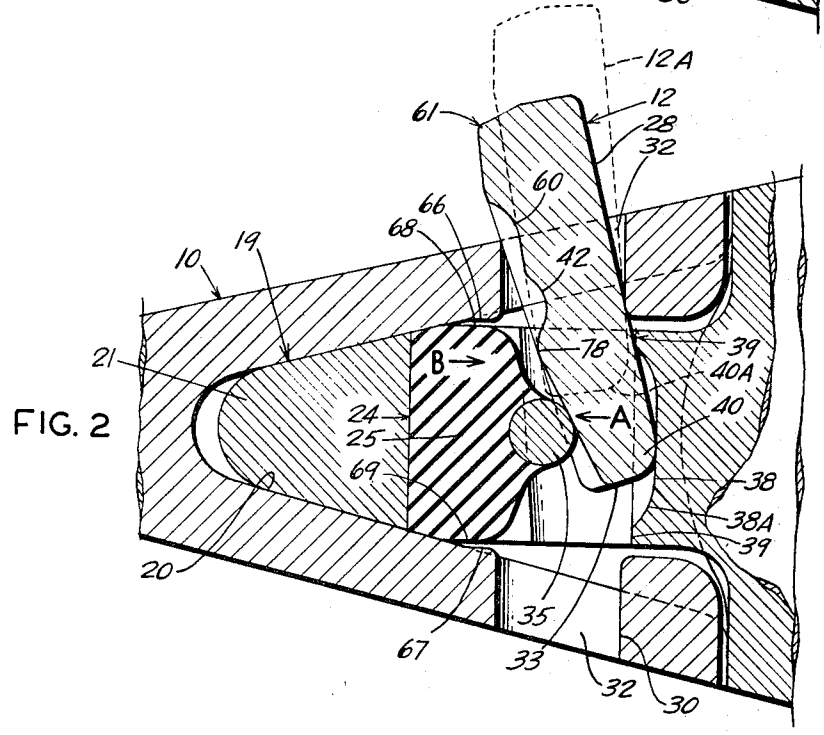


FIG. 2



INVENTOR.
THOMAS A. RATKOWSKI
BY
Wallace Kinzer and Dorn
ATTORNEYS

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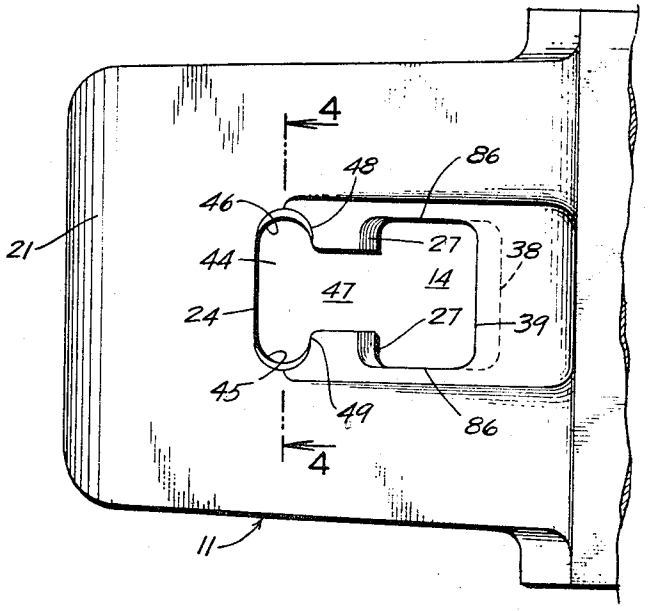

FIG. 3

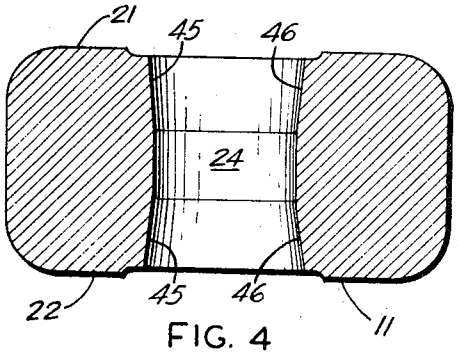

FIG. 4

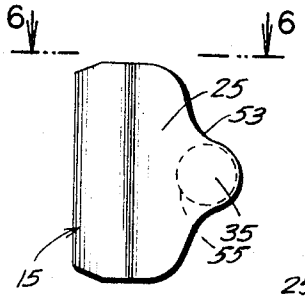

FIG. 5

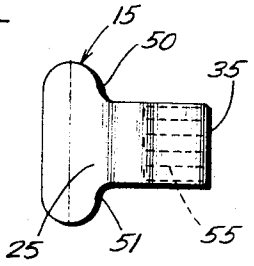

FIG. 6

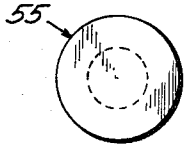

FIG. 7

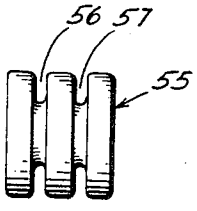

FIG. 8

INVENTOR.
THOMAS A. RATKOWSKI
BY
Wallace Kinzer and Dorn
ATTORNEYS

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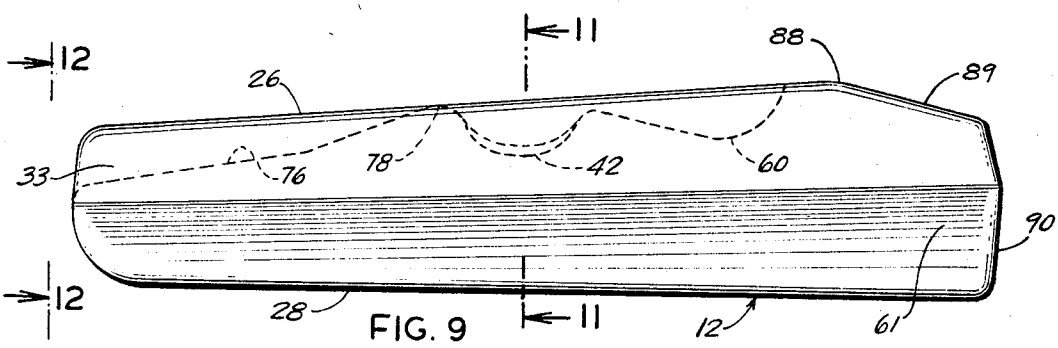

FIG. 9

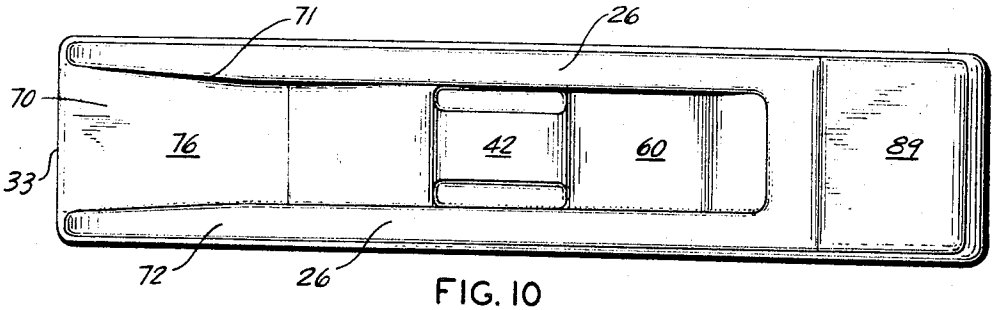

FIG. 10

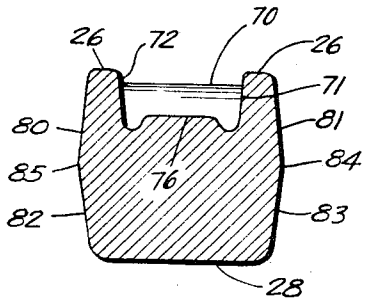

FIG. 11

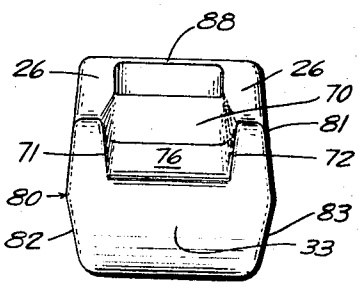

FIG. 12

INVENTOR.
THOMAS A. RATKOWSKI
BY
Wallace Kinzer and Dorn
ATTORNEYS

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3,410,010

DIPPER TOOTH

Thomas A. Ratkowski, Chicago Heights, Ill., assignor to Abex Corporation, a corporation of Delaware

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1 Claim. (Cl. 37—142)

ABSTRACT OF THE DISCLOSURE

Retention of the point on a dipper tooth having an adapter or holder is improved by confining a rubber block or the like in a unique cavity of the adapter and recessing the adapter to enable the retainer key to be wrapped about a portion of the block preliminary to driving the key home.

This invention relates to dipper teeth, and more particularly to dipper teeth employed on digging and excavating equipment.

The present invention is of particular utility in securing a removable point or tip to an adapter or holder by a retainer key or pin. When securing a point to an adapter, a retainer key or pin is driven into a keyway, by repeated hammer blows on the retaining key, into a position to interlock the point on the adapter. In many instances, the point is removed, after wear on one side thereof, and reversed to expose the opposite side of the point to the greatest wearing forces. This reversal of the tooth requires removal of the retaining key and reinsertion of the retaining key to secure the point to the key after the point has been reversed. Usually, the retaining key is held in its interlocking position within the keyway by a resilient detent. The retaining key is driven into and from detenting engagement with its detent element during the installation, reversal and removal of the point. More particularly, for each point, the retaining key is usually driven into the keyway on three different occasions, namely, to secure the point when it is new, to reverse the point a first time, and to reverse the point a second time to return the point to its original orientation.

Since the point is subjected to tremendous forces and extreme environmental conditions, it is essential that the retainer key be properly positioned and held with sufficent detenting force to retain the key in its interlocking relationship during the use of the point. However, it sometimes occurs that the retainer key is not properly seated with a resilient detenting element, and the retainer key eventually works loose. Accordingly, an object of the present invention is to facilitate the proper seating of the detent element in interlocking relationship with a retainer key for a dipper tooth. A more specific object of the invention is to reduce the amount of displacing force on such a resilient detent element in the direction of key movement as the retainer key is being driven through a keyway in the point and adapter. Another object of the invention is to minimize the component of force tending to remove the resilient detent element from its seat in the adapter during insertion of the retainer key.

As will be appreciated from the foregoing, the driving of the retainer key in the keyway into detenting relationship with the resilient detent means exerts a force on the resilient detent means tending to displace it from its seat in the adapter. Where the resilient detent means is a rubber element secured within a seat cavity in the adapter, the force of the key on the rubber element has, on some occasions, caused tilting of the resilient detent element within its seat and the displacement of an interlocking node on the rubber element out of position for seating properly within a detent recess in the retainer key. Thus, the retainer key is not always locked in position and works loose while the equipment is in operation. Accordingly, another object of the invention is a novel resilient detent means particularly adapted to resist tilting and displacement of its node portion from a position for interlocking with the retainer key. Another and more specific object of the invention is to resist such tilting by a T-shaped detent element having transverse portions thereof engaging transverse walls in an adapter thereby holding the resilient element against such tilting movement.

In many cases, the resilient detent means has a short life and it is necessary to afford a new resilient detent means for each point replacement or even for each reversal of the key. Manifestly, this short life of resilient detent elements and the replacement of the resilient detent means are costly factors and results in undersirable expense including down time for expensive excavating equipment. Thus, another object of the invention is to reduce the occurrence of replacement of detent elements and the amount of down time caused thereby.

A further object of the invention is to improve the retention of a retainer key by providing an area on the key for expansion of a resilient element into and about a detent seat on said retainer key,

Another object of the invention is to wrap the key partially about the node of the detent element to facilitate the insertion of a key into aligned keyway openings in an adapter and point. A further object of the invention is to foster this wrapping of the retainer key by affording clearance space in the adapter to receive the nose of the key to permit its deeper insertion prior to exerting a downward component of force on the node of the detent element.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, shows preferred embodiments of the present invention and the principles thereof and what is now considered to be the best mode contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIG. 1 is a sectional view showing a point secured to an adapter by a retainer key secured in position in accordance with the preferred embodiment of the invention;

FIG. 2 is a sectional view of the point and adapter with the retainer key being inserted in the keyway prior to being driven into interlocking relationship of FIG. 1;

FIG. 3 is a plan view of the keyway and detent seat in the adapter;

FIG. 4 is a sectional view taken along the lines **4—4** of FIG. 3;

FIG. 5 is an elevational view of a resilient detenting element;

FIG. 6 is a plan view taken along the lines **6—6** of FIG. 5 in the direction of the arrows;

FIG. 7 is a plan view of a metal insert in said detent element;

FIG. 8 is an elevational view of the insert of FIG. 7;

FIG. 9 is an elevational view of a retainer key constructed in accordance with the preferred embodiment of the invention;

FIG. 10 is a plan view of FIG. 9;

FIG. 11 is a sectional view taken along the lines **11—11** of FIG. 9 in the direction of the arrows; and

FIG. 12 is an end view taken along the lines **12—12** of FIG. 9 in the direction of the arrows.

Referring now to the drawings and more particularly to FIG. 1, there is illustrated the assembled relationship of a point **10** secured to an adapter **11** by a retainer key **12** driven through a keyway **14** into engagement with a resilient detenting means **15**. The point or tip **10** has a conventional wedged shaped socket **18** defined by wedged shaped walls **19** and **20** diverging outwardly and rearwardly and disposed for tight engagement with complementary shaped wedged faces **21** and **22** on the adapter **11**.

When the key **12** is driven into the locking position of FIG. 1, a front face **26** on the key **12** is in tight wedging engagement with the opposed and spaced, inclined shoulders **27**, FIGS. 1 and 3, of the adapter **11** and a rear face **28** on the key **12** is in tight wedging engagement with upper and lower bearing surfaces **29** and **30** on the point **10**.

Thus, the key **12** holds the point **10** against sliding leftwardly, as viewed in FIG. 1, along the adapter **11** and keeps the wedge faces **19**, **21** and **20**, **22** in tight engagement. The detent means **15** holds the retainer key **12** in its position against moving out of the keyway **14** with its curved detent portion or node **35** on a main body portion **25** of rubber seated in a complementary detent seat **42** on the key **12**.

While the point or tip **10** is described as being attached to an adapter **11**, it is to be understood that the point **10** could be the sole element of the tooth and could be directly attached to a lip of an excavating bucket or the like having a suitable keyway for receiving a retainer key **12** for a detent means **15**. Thus, the present invention is not limited only to a point and adapter arrangement constituting a tooth; but also is applicable to other arrangements wherein a tooth is afforded by a single element directly connected to the lip of an excavating bucket or the like.

Initially, the retainer key **12** is inserted through the upper one of the keyway slots **32** in the point **10** with the lower end or nose **33** of the key disposed beneath the surface of a node portion **35** of the detent means **15**, as best seen in FIG. 2. The retainer key **12** can be moved under simple hand pressure into the approximate position illustrated in FIG. 2, prior to driving the key by a suitable hammer. Heretofore, the retainer key of the prior art arrangements would be oriented in a much higher position and in a more generally vertical orientation as illustrated by the dotted outline of a key **12A**, FIG. 2.

An important aspect of the present invention is the shape of the key **12** and the forming of an interior or recess wall **38** on the adapter between upper and lower shoulder walls **39** to receive a rounded portion **40** of the lower end **33** of the key **12** such that the driving of the key **12** downwardly by a hammer causes the key **12** to exert much of its force on the node **35** in the direction of the arrow A to compress the resilient body **25** toward the rear wall **24**. By this construction, a smaller component of force is exerted in the generally downward direction on the node **35** tending to force the node **35** downwardly and to rotate the upper portion of the resilient body member in the direction of the arrow B. Thus, the key **12** of the present invention is so related to the adapter **11** and detent means **15** that is is initially wrapped about the node **35** without applying a large force tending to unseat the detent means **15** as heretofore encountered when using an arrangement, such as exemplified by the driving key **12A**, as will be explained immediately hereinafter.

The usual prior art practice is to afford a rear adapter wall **38A** extending in the same plane as the shoulder wall **39**, FIG. 2, for engagement by the nose **40A** on the lower portion of the key **12A**. It will be noted that the position of the key **12A** is much higher and in a more vertical relationship above the node **35**. Thus, the driving of the key **12A** exerts a much greater downward force on the node **35** of the resilient detent means **15** tending to rotate the resilient detent means to rotate the upper portion thereof in the direction of the arrow B while driving the node portion **35** downwardly. In some instances, the node **35** was lowered sufficiently so that the node **35** would not properly seat within a detent seat **42** in a key **12A**. When this happened, the detenting relationship would not be established and the node **35** would actually be exerting a force tending to lift the key **12A** outwardly of the keyway **14**. Then vibrations and forces applied to the point **10** would work the key **12** loose.

Another important aspect of the present invention is that the resilient detent means **15** is of a design and is related to a seat **44**, FIG. 3, to resist the rotation in the downward movement of the node portion **35** when engaged and during the driving of the key **12** into position. More particularly, the seat **44** in the adapter **11** is of a generally T-shaped configuration having a throat **47** leading to curved, transverse seat portions **45** and **46** with rearward transverse wall **48** and **49** for engaging the complementary transverse wall **50** and **51** formed on the main body portion **25**, FIG. 6, of the resilient detent means **15**.

As best seen in FIG. 4, the curved transverse seat portions **45** and **46** are considerably wider at the upper and lower wedge surfaces **21** and **22** than at the medial portion therebetween.

Because the body portion **25** of the detent means **15** is a resilient material, it will tend to stretch and become of a lesser thickness across the throat **47** and to slide from the seat **44** and into the main keyway **14** when a large force is applied downwardly on the upper surface **53**, FIG. 5, of its node portion **35**. However, the transverse walls **50** and **51** of the present detent means **15** are sufficiently wide and of sufficient strength to prevent the sliding of the upper portion of the detent means **15** rearwardly through the throat **47** into the keyway **14** during the driving of the key **12**.

The node or detenting portion **35** of the resilient detent means **15** has a metallic reinforcing insert **55**, FIGS. 6 and 8, which is a generally cylindrical body having a pair of spaced annular grooves **56** and **57**. The insert **55** is disposed at the node portion **35** with the rubber body material completely encasing the node portion as is readily apparent from FIG. 6. The metallic insert **55** serves as a reinforcing member for the node portion **35** and is configured to seat within the detent notch **42** in the retainer key **12**.

An important aspect of the present invention is an improved interlocking relationship between the detent means **15** and the retainer key **12**. For this purpose, the retainer key **12** is provided with an upper groove or notch area **60**, FIG. 9, disposed towards the head portion **61** of the retainer key **12** to receive a portion, FIG. 1, of the detent means **15**. That is, the compression of the resilient body **25** of the detent means **15** at the node **35** forces the body **25** to assume the shape of FIG. 1, with a portion expanded into the groove **60**. Compression of resilient body **25** of the detent means **15** by the node portion **35** being moved inwardly into the body **25**, also causes the resilient body **25** to expand in a vertical direction, as viewed in FIGS. 1 and 2, to engage specially formed shoulder surfaces **66** and **67** formed along the interior wedge faces **19** and **20** of the point **10**. More particularly, as seen in FIG. 2, the resilient body **25** in its unexpanded state has its upper and lower faces **68** and **69** aligned with but spaced from the respective surfaces **66** and **67** of the point **10**. However, when the node **35** is driven forwardly by the retainer key **12** to the position shown in FIG. 1, the upper and lower faces **68** and **69** of the resilient detent means move vertically and engage the respectively associated tooth faces **66** and **67** to provide additional holding force against the tilting or displacement of the detent retaining means **15**.

The retaining key **12** is provided with a channel **70** for receiving the node portion **35** of the detent means **15**. The channel **70** is formed by side walls **71** and **72**, FIGS.

10 and 11 extending from the front face **26** downwardly to a bottom wall **76**. The bottom wall **76** is inclined from the end **33** of key **12** to curved portion **78**, FIG. 9, just prior to the detent receiving seat **42**. Thus, when the retaining key **12** is inserted into the keyway **14**, as viewed in FIG. 2, the node portion **35** is forced inwardly as the inclined surface **76** slides therepast. After repeated hammer blows the key **12** is driven deeper into keyway **14** to move the point **78** across the node **35**, whereupon the rubber body **25**, which is now under compression, is free to expand the node portion **35** rightwardly into the detent seat **42**. Thus, the node portion **35** with the metallic insert **55** is seated in detenting relationship in the socket **42** of the key **12**, as best seen in FIG. 1.

During driving of the key **12** into the keyway **14**, the inclined front face **26** of the key **12** slides along rearwardly inclined shoulders **27**, FIG. 3, on the adapter **11**. The front face **26** of the key **12** is sufficiently wide between upper sloped side walls **80** and **81**, FIG. 11, of key **12** to engage simultaneously both of the shoulders **27** on the opposite sides of the throat **47** on the adapter **11**. The upper sloped side walls **80** and **81**, FIG. 11, of the key **12** are inclined to meet the lower side walls **82** and **83** at intersections **84** and **85** defining the maximum width of the key **12**. The maximum width of the key **12** between the points **84** and **85** is less than the dimensional width between the opposed keyway walls **86**, FIG. 3, in the keyway **14** of the adapter **11**. The maximum transverse width of the key **12** is from a point **88**, FIG. 9, to a point opposite on the rearward wall **28**. From the point **88** an inclined surface **89** leads to the upper surface **90**, which is adapted to receive the hammer thrust when driving the key into position.

From the foregoing, it will be seen that the present invention affords a novel manner of securing a point to an adapter. The detent element includes a transverse portion holding the detent element against tilting or rotational movement when a force is exerted thereon by a retaining key being driven into its position within the keyway. Also the adapter has a novel construction oriented to the key relative to the detent element to reduce the amount of displacing force on the resilient detent element as the key is being driven through the keyway. The retainer key is adapted to move into detenting engagement with the resilient detent element and is adapted to receive portions of the detent element which have expanded due to the compressing of the resilient detent element.

Hence, while preferred embodiments of the invention have been described and illustrated, it is to be understood that they are capable of variation and modification.

I claim:

1. A dipper tooth comprising: an adapter having a forwardly tapered nose portion, a replaceable and reversible point having a forwardly tapered cavity for receiving said tapered nose portion of said adapter, removable key means for locking said point on said adapter, spaced walls on said point having aligned apertures therein for receiving said key means, bearing surfaces in said point at said apertures for engagement with said key means, said adapter having a keyway opening for receiving said key means, said keyway having a recessed area permitting the end portion of said key means to move downwardly, said adapter having a substantially T-shaped cavity opening extending through said adapter into said keyway, said T-shaped cavity presenting a narrow throat portion opening into said keyway and an enlarged portion bounded by a pair of curved walls which are of narrowing width progressively from opposed outer ends of the T-shaped cavity, resilient means of complementary T-shaped cross-section disposed in said T-shaped cavity, said resilient means having a node portion extending into said keyway, a cooperating seat on said key means for seating engagement with said node portion of said key means, and said recessed area of said adapter being alignable with said node portion of said resilient means to permit said end portion to wrap around said node portion.

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ABRAHAM G. STONE, *Primary Examiner.*

A. E. KOPECKI, *Assistant Examiner.*