Sept. 6, 1960 T. A. RATKOWSKI 2,951,300

DIPPER TEETH

Filed Sept. 19, 1956

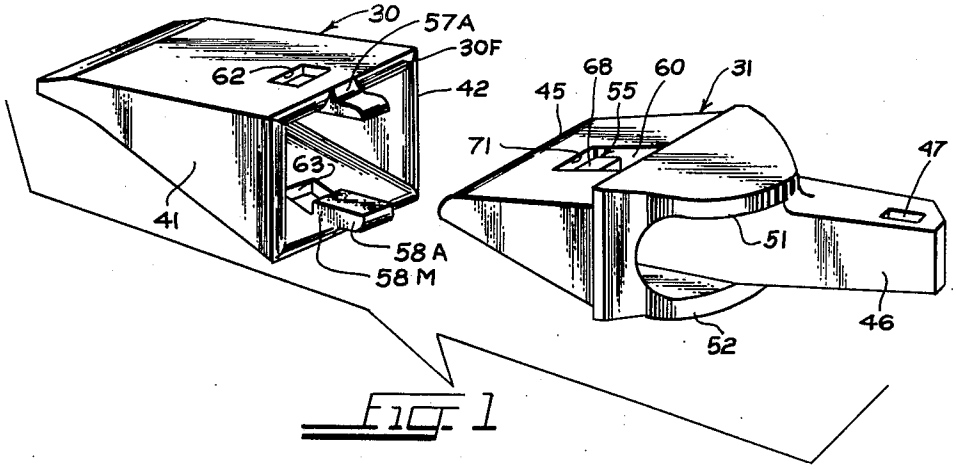

FIG. 1

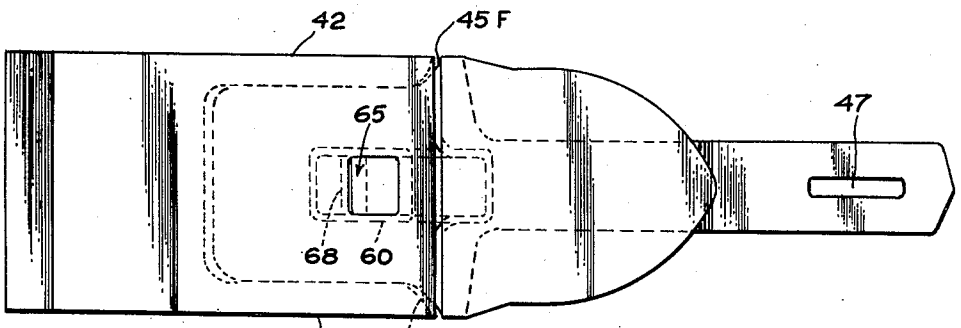

FIG. 2

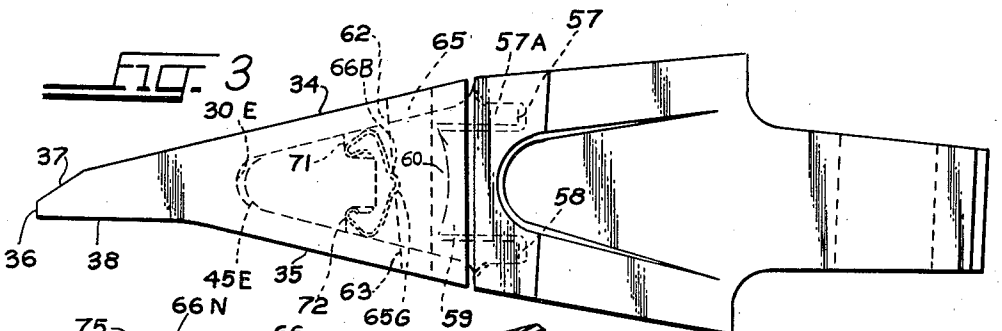

FIG. 3

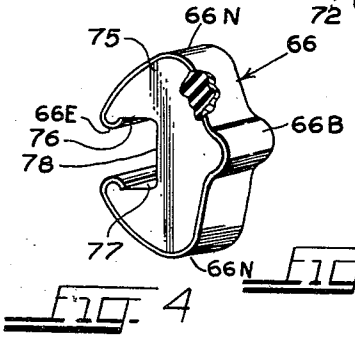

FIG. 4

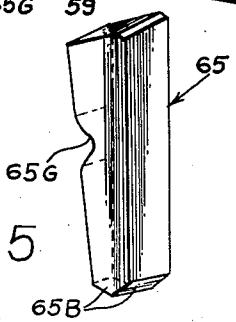

FIG. 5

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DIPPER TEETH

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9 Claims. (Cl. 37—142)

This invention relates to a dipper tooth for excavating equipment.

Dipper teeth such as those which are projectably mounted on the lip of an excavating shovel or the like are sometimes in the form of a hollow cap or so-called point removably mounted on an adapter which in turn includes a shank for attachment to the excavating shovel, this construction enabling the adapter to be repointed when the cap becomes unduly worn. There have been various proposals set forth with respect to the way in which the cap is to be retained on the adapter, inasmuch as it is essential that the point be prevented from shifting or rolling on the adapter during operation of the shovel.

Among the retainers proposed have been pins that are to be passed horizontally transversely through aligned ways in the cap and the adapter. In some instances a coil spring is used to hold the pin in position, and relatively complicated construction is required for housing the spring. Moreover, extensive effort is required to assemble and disassemble the tooth, and for this reason such retainers have not been found altogether satisfactory.

Other proposals for retaining the cap on the adapter have entailed a pin inserted in transverse horizontal grooves afforded respectively in the top of the cap and the top of the adapter which are designed to mate and afford a key-way when the cap is on the adapter, and it has been proposed to afford a resilient element to hold the pin within such a key-way. In an arrangement of this kind, neither the groove in the cap nor the groove in the adapter is closed on all sides, and this accounts for a tendency of the pin to work loose or allow movement of the cap relative to the adapter. Retainers of this kind are not readily permissive of reversible points, whereas it is desirable that the retainer resorted to be of a kind enabling this to be accomplished.

Still other proposals have involved a pin that is to be passed vertically through openings in the cap and a key-way in the adapter, and in this connection it has been proposed that the pin be engaged by a coil spring or a compressible rubber boss in the adapter tending to apply an unbalanced rearward torque to the end of the pin reposed in the upper opening of the cap. While such serves in some measure to pull the top of the cap up on the adapter, it will be recognized that this force applied at the top of the pin tends at the same time to turn the opposite end of the pin in a forward direction.

In view of the foregoing, the primary object of the present invention is to removably mount the cap of a dipper tooth on the adapter by a pin located in a vertical key-way afforded by aligned openings at the vertical center-line of the cap and adapter, the pin being retained or held in position by a filled leaf spring in such a manner that the action of the spring is equally distributed accounting for uniform forces holding the cap to the adapter. Yet more specifically, objects of the present invention are to assure that the aforementioned spring acts on the pin in such a manner as to pull the cap up on the adapter with equal force at the top and bottom of the cap as afforded

by a rearward compressive force distributed equally with respect to the pin along the horizontal center line of the cap and adapter, and to fill the spring with resilient material such as rubber or the like to assure that the spring will not become clogged and lose its effectiveness.

More specifically, it is an object of the present invention to enable the point of a dipper tooth to be removably and reversibly held on the adapter in an effective manner by a separable pin and rubber filled leaf spring of relatively uncomplicated complemental arrangement so that individual mounting and dismounting of the parts may be accomplished with facility.

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, show preferred embodiments of the present invention and the principles thereof and what I now consider to be the best mode in which I have contemplated 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 an exploded perspective of one form of cap and adapter contemplated by the present invention;

Fig. 2 is a plan view showing the cap and adapter of Fig. 1 in assembled relation;

Fig. 3 is a side elevation of the assembly shown in Fig. 2;

Fig. 4 is a perspective view, partly sectioned, of the filled spring; and

Fig. 5 is a perspective view of the retainer pin.

The dipper tooth illustrated in Figs. 1 to 3 includes a wedge-shaped cap or so-called point **30** that is to be removably and reversibly mounted on an adapter **31**. As shown in Fig. 3, the cap **30** includes spaced apart flat upper and lower walls **34** and **35** that converge in a forward direction to afford a digger point **36** and in this instance the digger point is provided with a chamfered upper edge **37** and an opposed lower edge portion **38** inclined downwardly at an angle to the plane of the lower wall **35** as shown in Fig. 3. Such construction of the lower edge portion of the digging point of the tooth affords in effect what constitutes surplusage metal so that as the digging point becomes worn the cap may be removed from the adapter and reversed face for face as is well known in the art.

The cap **30** in the present instance also includes parallel spaced apart side walls **41** and **42**, Figs. 1 and 2, of triangular shape cast integral with the upper and lower walls **34** and **35**. The divergent spacing between the inner faces of the upper and lower walls **34** and **35** affords a forwardly tapered rearwardly opening socket enabling the cap to be mounted tightly on a complementary wedge-shaped nose **45** of the usual kind projecting forwardly at the front of the adapter **31**, the depth of the socket in the cap **30** included between the walls **34** and **35** corresponding substantially to the length of the adapter nose. The base of the adapter nose **45** is filleted at **45F**, Fig. 2, and the base of the cap is likewise filleted at **30F**. These filleted surfaces are normally in spaced relation when the cap is on the adapter as shown in Figs. 2 and 3 for a purpose to be described.

The adapter **31** includes an elongated rearwardly extending shank **46** formed with a vertical opening **47** utilized for mounting the dipper tooth on the dipper in the usual manner, and intermediate the nose **45** and the shank **46** are spaced apart upper and lower overhanging flanges **51** and **52** which when the tooth is mounted in

operative position fit around edge portions of the dipper lip.

It will be recognized that both the cap and adapter are one-piece castings of manganese steel or like ferrous alloy having high resistance to wear and impact, and during the casting operation the nose of the adapter in accordance with the present invention is cored to provide an enlarged recess **55**, Fig. 1, extending vertically therethrough from one face to the other. Opening into the recess **55** are a pair of spaced apart upper and lower rearwardly extending sockets **57** and **58**, Fig. 3, having dead ends within the body of the adapter, and these sockets are adapted to receive rearwardly projecting tangs or lugs **57A** and **58A** cast medially at the rear edges of the upper and lower walls **34** and **35** of the cap **30**. These lugs include portions as **58M**, Fig. 1, that extend inwardly of the inner faces of the upper and lower walls of the cap and where lugs of this kind are provided such assure rigidity between the point and the adapter, but lugs not inclusive of rearwardly projecting portions may be used for this purpose as described in application Ser. No. 522,050, filed July 14, 1955, now Patent No. 2,904,908.

As shown in Fig. 3, the lugs **57A** and **58A** when the cap is on the adapter extend back into the sockets **57** and **58** and normally terminate short of the dead ends thereof. This relation is attained by dimensioning the parts so that when the cap is on the adapter the forward rounded apex **45E** of the nose **45** is normally spaced from the forward rounded apex **30E** of the socket in the cap as shown in Fig. 3, enabling take-up or creep to occur during extended use of the tooth to the extent that the filleted surfaces **30F** and **45F** finally mate.

Projecting forwardly medially between the mounting sockets **57** and **58** is a relatively large boss **59**, Fig. 3, and the end of this boss defines the rear wall of a vertical key-way **60**, Figs. 1 and 3, within the nose of the adapter. The cap **30** includes openings **62** and **63** in the upper and lower walls thereof, respectively, which when the cap is on the adapter register with the key-way **60** as shown in Fig. 3. The lugs **57A** and **58A** extend forwardly into the socket in the cap **30** to the extent that the forward ends of these lugs are common to the rear walls of the openings **62** and **63** as is apparent in Figs. 1 and 3.

To hold the cap on the adapter in accordance with the present invention, a pin **65** of the kind shown in Fig. 5 is to be passed downwardly through the upper of the openings in the cap **30** aligned with key-way **60** to the extent that the upper and lower ends of the pin **65** repose in the upper and lower openings **62** and **63** in the cap **30**, and a generally **C**-shaped leaf spring **66** of the kind shown in Fig. 4 is disposed within the recess **55** in the adapter to act between the forward face of the pin and a vertical portion within the adapter forwardly thereof to hold the cap on the adapter as will be described.

To enable the foregoing to be achieved in accordance with the present invention, a rearwardly projecting mounting boss **68** is cast medially on the front wall of the recess **55** within the adapter at the center line thereof thus defining in effect the front wall of the key-way **60**. The boss **68**, as shown in Fig. 3 is of reduced thickness relative to the depth of the recess **55** such as to afford a rearwardly facing vertical portion within the adapter in the form of identical upper and lower shoulders **71** and **72** forwardly of the pin **65** in the key-way. The leaf spring **66** is of relatively strong characteristics insofar as compressive strength is concerned, and this spring is preferably formed to include reversely inwardly bent end portions as **66E**, Fig. 4, intermediate or medial outwardly curved nodal portions as **66N** and a rearwardly curved arcuate back portion or rear node **66B**, the relation being such that the spring is symmetrical in shape. The shoulders **71** and **72** are exposed at either face of the nose of the adapter, and the ends **66E** of the spring **66** are spaced apart sufficiently to enable the spring to be mounted on the boss **68** with the free end portions thereof abutting these vertical portions **71** and **72** as shown in Fig. 3.

The spring **66** is first mounted in this manner on the boss **68** within the recess **55** of the adapter independently of the pin **65** and when so positioned the arcuate back **66B** thereof projects rearwardly beyond the boss **68** well into the key-way **60**. The cap is next positioned on the adapter with the openings **62** and **63** thereof registered with the key-way **60**, whereupon the pin **65** which is a separable part with respect to the spring **66** is driven downwardly through the upper opening **62** in the cap **30** with sufficient impact to drive the pin **65** past the portion **66B** of the spring **66** projecting into the key-way. The end of the pin **65** opposite the end to be impacted may be provided with beveled edges as **65B** which facilitate positioning and insertion of the pin.

It is of course important that the spring **66** retain its resiliency throughout its life, and to this end the interior space enclosed by the spring is filled with a rubber core **75**, Fig. 4. The rubber core or filler **75** is a solid block having an outer side complemental at all areas to the inner periphery of the spring **66** as shown in Fig. 4 so as to fill the interior of the spring with resilient material except for the portion between the spaced ends **66E** of the spring and the portion inwardly thereof. Thus, the rubber block **75** used to fill the spring is provided with a medial recess at the forward face thereof defined by upper and lower spaced walls **76** and **77** and a rear wall **78** rearward of ends **66E** of the spring. The recess thus defined in outline is of slightly larger dimension than the boss **68** formed in the nose of the adapter **31** to facilitate mounting of the filled spring on the boss **68**, but when the pin **65** is wedged in place the rubber block **75** in part flows about the boss **68**. In this manner, the rigid or metal parts of the spring **66** that are spaced from the boss **68** of the adapter are effectively filled interiorly with resilient material which prevents accumulation of debris between the spring **66** and the boss **68** of the adapter, thereby assuring that the spring maintains its effectiveness throughout its life.

As shown in Fig. 5, the pin **65** in the forward face thereof is formed with a transverse groove **65G**, and when the pin **65** is first positioned for insertion into the key-way **60**, the groove **65G** is faced in a forward direction. Accordingly, impact delivered to the pin **65** forces the pin downwardly through the key-way to the extent that the arcuate back **66B** of the spring **66** seats in the groove **65G**, and this accurately positions the pin **65** with the upper and lower ends thereof reposed, respectively, in the upper and lower openings **62** and **63** in the cap **30**. When the spring **65** has thus been operatively compressed between the forward face of the pin and the vertical portion in the adapter afforded by the aligned shoulders **71** and **72** forwardly of the pin, the spring **66** assumes the entire load of retention and is placed under high compression, and a portion of the resultant force in this instance is exerted rearwardly against the medial portion of the pin **65** defined by the groove **65G** therein such that the opposite ends of the pin are held with equal force against the rear walls of the respective openings **62** and **63** in the tooth cap. At the same time, the end portions **66E** of the leaf spring exert a resultant forward force against the correspondingly paired shoulders **71** and **72** within the adapter thus serving to pull the cap **30** fully up on the nose **45**.

It is also to be noted that when the spring **66** is thus placed under compression by the pin **65** as aforesaid, the nodal portions **66N** are expanded outwardly against the portions of the upper and lower walls of the cap **30** that overlie these nodal portions of the spring **66**. Accordingly, it will be seen that under and in accordance with the present invention, the main force of the spring is applied against the pin along the horizontal center line of the cap and the adapter, such being effective with respect to said center line to equally distribute retaining forces

of substantial magnitude against the pin, the adapter and the cap.

To release the pin, it is merely necessary to punch sharply the lower end thereof, and in this connection it will be noted that the pin **65** is preferably wedge-shaped as best shown in Fig. 3 to aid in accurate insertion from top to bottom within the key-way **60**.

The cap **30** is fully reversible in that all parts are symmetrical enabling the cap to be removed from the adapter **31** and reversed face for face to present a new digging point when the lower edge **38** becomes dull. Such is attained by arranging the openings **62** and **63** on a true vertical line correspondingly as the key-way **60**, and by having the nose of the adapter and the socket in the cap or point in the form of an isosceles triangle with the boss **68** located along the center line or perpendicular thereof.

Hence, while I have illustrated and described the preferred embodiment of my invention, it is to be understood that this is capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A dipper tooth for excavating equipment comprising an adapter, a forwardly projecting portion on the adapter, a removable wear cap including spaced apart walls affording a rearwardly opening socket mating with said portion of the adapter when the cap is mounted on the adapter, a key-way through said portion of the adapter, openings in the walls of said cap adapted to register with open ends of said key-way, a pin for the key-way including end portions adapted to engage portions of the walls of said cap, and an arcuate leaf spring having an arcuate back forcefully bearing against one face of the pin and having ends forcefully bearing against a vertical solid portion within the adapter spaced from said arcuate back to hold the ends of the pin forcefully rearwardly against said portions of the walls of the cap and thereby releasably hold the cap on the adapter, the interior of said leaf spring being filled with resilient material.

2. A dipper tooth for excavating equipment comprising an adapter, a forwardly projecting nose on the adapter, a removable wear cap including spaced apart walls affording a rearwardly opening socket mating with said nose when the cap is mounted on said adapter, a key-way through the nose of the adapter, openings in the walls of said cap adapted to register with open ends of said key-way, a pin for the key-way including end portions adapted to bear against portions of the walls of said cap adjacent the openings therein, and an arcuately shaped leaf spring under compression between the pin and a solid portion within the adapter forwardly thereof to hold the ends of the pin against said portions of the cap adjacent the openings therein with a rearward force equally distributed with respect to the center line of the cap and the adapter, said spring being under compression as aforesaid by having an arcuate back thereof bearing forcefully on said pin and free ends thereof bearing forcefully on said solid portion of the adapter, the interior of said leaf spring being filled with resilient material.

3. A dipper tooth for excavating equipment comprising an adapter including a forwardly tapered nose portion, a removable wear cap including rearwardly diverging upper and lower walls adapted to mate with the nose of the adapter when the cap is mounted thereon, a vertical key-way through the nose of the adapter, openings at the top and bottom of said cap adapted to register with ends of said key-way when the cap is on the adapter, a pin for the key-way including end portions adapted to repose in the openings in said cap, shoulders in the adapter forwardly of the key-way, and a substantially C-shaped leaf spring acting between the pin and said shoulders in the adapter forwardly thereof with forces equally distributed with respect to the center line of the tooth, the interior of said leaf spring being filled with resilient material.

4. A dipper tooth comprising an adapter having a forwardly projecting nose portion, a removable wear cap having upper and lower rearwardly diverging walls mating with the nose of the adapter when the cap is mounted thereon, a vertical key-way through the nose of the adapter, a boss of reduced dimensions within the nose of the adapter adjacent said key-way affording a vertical portion within the adapter serving to back up the respective ends of a generally arcuate C-shaped leaf spring with the arcuate back of the spring normally expanded beyond the boss part way into said key-way along the horizontal center line of the adapter, and upper and lower openings formed in said walls of the cap adapted to register with the ends of the key-way to enable a pin to be driven into the key-way past said spring with the upper and lower ends thereof reposed respectively in the upper and lower openings of the cap, the spring being effective on the medial portion of the pin thus inserted in the key-way to hold the pin against the rear walls of the openings in the cap with a force applied rearwardly along the center line of the adapter, and the interior of said leaf spring being filled with resilient material.

5. A dipper tooth comprising an adapter having a forwardly tapered nose portion, a removable wear cap including rearwardly diverging upper and lower walls fitting over said nose when the cap is mounted on the adapter, a vertical key-way extending through said nose portion, a boss within the nose of the adapter inwardly of the forward end of he nose and being of reduced dimension with respect to said nose so as to afford a vertical portion within the adapter forwardly of the key-way serving as a reaction surface for a generally arcuate C-shaped leaf spring mounted on said boss with the arcuate back of the spring expanded beyond the boss part way into said key-way, the interior of said leaf spring being filled with resilient material, and upper and lower openings in said cap adapted to register with said key-way to enable the ends of a pin driven past the back of said spring into said key-way to repose in the upper and lower openings of the cap, the spring being effective on the medial portion of the pin thus inserted in the key-way to hold the pin with substantially equal force against the rear walls of the openings in the cap and reacting in a forward direction with substantially equal force against said vertical portion in the nose of the adapter.

6. In a retainer element for a dipper tooth comprising a removable wear cap and an adapter for the cap together having registered openings therein defining a mounting socket, a generally C-shaped one-piece leaf spring insertable in said mounting socket and including an arcuate back portion, said spring having spaced apart rounded end portions forwardly of said back that are substantially centered with respect to the back of the spring, and the interior only of said spring being filled with resilient material which does not project beyond the boundaries of said spring.

7. In a retainer element for a dipper tooth comprising a removable wear cap and an adapter for the cap together having registered openings formed therein defining a mounting socket, a leaf spring insertable in said mounting socket and including an arcuate back portion having a more sharply rounded node element medially thereof, said spring having spaced apart sharply rounded end portions substantially centered on either side of the node element at the back of the spring, the sharply rounded end portions of the spring being engageable with portions of the adapter adjacent the opening therein, and the interior of said leaf spring being filled with resilient material.

8. A dipper tooth comprising, a removable wear cap and an adapter for the cap having registered openings

which together define a mounting socket, a pin and an associated arcuate leaf spring under compression in said mounting socket, said spring including an arcuate back portion having a more sharply rounded node element medially thereof seated in a recess in the pin, said spring having spaced apart rounded end portions substantially centered with respect to the node element of the back of the spring and bearing on shoulders of the adapter forwardly of the said pin, and the interior of said leaf spring being filled with resilient material.

9. A dipper tooth for excavating equipment comprising an adapter including a forwardly projecting nose portion, a removable wear cap including a rearwardly opening socket mating with the nose of the adapter when the cap is mounted thereon, a vertical key-way through the nose of the adapter, openings at the top and bottom of said cap adapted to register with ends of said key-way when the cap is on the adapter, a pin for the key-way including end portions adapted to repose in the openings in said cap, and an arcuate one-piece leaf spring

mounted under compression within said adapter independently of said pin and having an arcuate portion forcefully engaging the forward face of said pin and having end portions thereof engaged with a solid portion of the adapter to hold the cap on the adapter with forces equally distributed with respect to the center line of the tooth, the interior of said leaf spring being filled with resilient material.

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