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SPRING RETAINER FOR BUCKET TEETH

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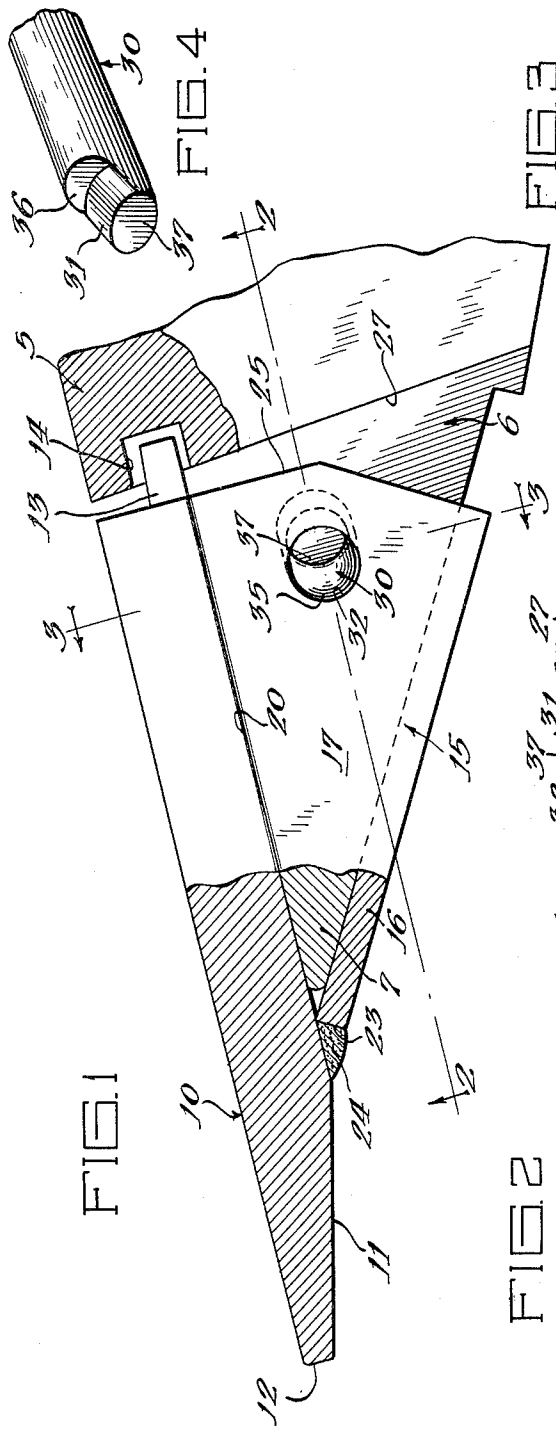


FIG. 1

FIG. 4

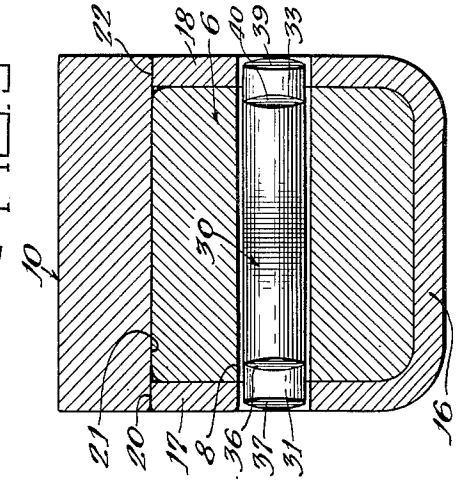


FIG. 3

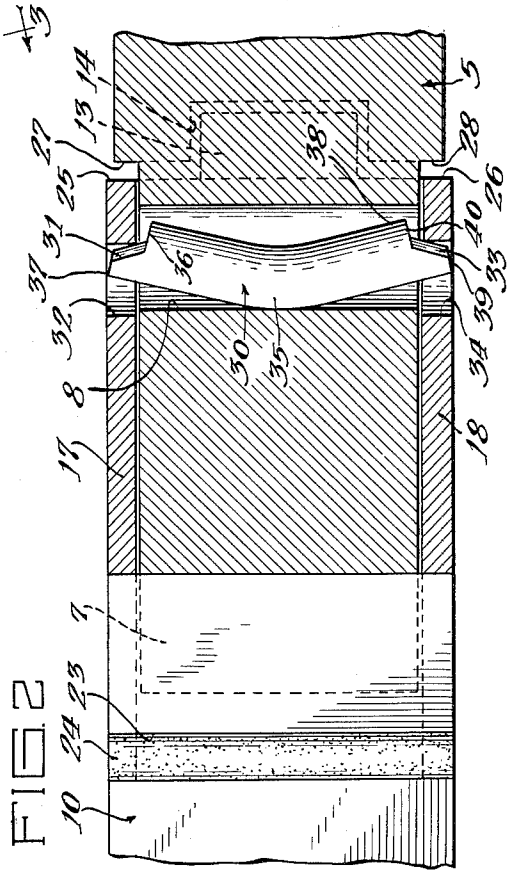


FIG. 2

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SPRING RETAINER FOR BUCKET TEETH

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This invention relates to earth digging teeth such as may be used on buckets, augers, shovels or other heavy duty excavating or earth moving equipment. More specifically, the invention has to do with the replaceable feature of a tooth cap and the means for holding the cap on a base support.

Buckets and similar digging tools used on earth moving machinery are often equipped with spaced teeth to loosen the soil, rock or other material. The teeth take the brunt of impact, abrasion and wear. Ordinarily, steel is used as the material for the teeth and gradually wears away in use requiring replacement. The replaceable part of such earth digging teeth should be held quite tightly to its supporting base to promote the longest possible life. At the same time, the teeth should be readily replaceable for the convenience of maintenance personnel. The extreme conditions of use of such equipment is conducive to rapid wearing particularly should the teeth become loose so that it is important that they be retained tightly on the base at all times. The retainer of the present invention provides a structure capable of fulfilling all of the foregoing requirements.

It is therefore the primary object of this invention to provide a new and improved retainer for earth digging teeth.

Another feature is to provide a retainer of the character described which by its structure is particularly simple to apply and remove, permitting ready change of new teeth for those that are worn.

A further feature is to provide a retainer of one-piece all metal construction which operates to hold the replaceable teeth caps tightly on their base support under all operating conditions.

Other objects, features and advantages of the present invention will be apparent from the following description of a preferred embodiment illustrated in the accompanying drawings, in which:

FIGURE 1 is a fragmentary side elevational view partly in section of a replaceable tooth cap on a supporting base and having the retainer of the present invention therein;

FIGURE 2 is a fragmentary sectional view through the structure shown in FIGURE 1, taken substantially along line 2—2 therein;

FIGURE 3 is a transverse sectional view through the replaceable cap structure shown in FIGURE 1, taken substantially along line 3—3 therein, and

FIGURE 4 is a fragmentary perspective view of one end of the retainer illustrated in FIGURES 1 through 3.

The replaceable tooth point chosen to illustrate the invention is typically one used on an earth digging bucket of the type used with draglines, hoes or trenching machinery. The digging bucket generally is provided with a forward lip or cutting edge formed of an abrasion resistant material and having thereon spaced locations for the support of digging teeth. In some instances, the supports are integrally formed with the bucket lip referred to and in other instances, the support for the tooth is a separate cast metal member. The separate tooth supports are sometimes referred to as adapters.

In the drawings, an adapter or tooth support is illustrated, the adapter being a cast metal member 5 having an end for attachment to a bucket (neither shown). The

base supports for the teeth have generally a forward extending nose portion 6, terminating in a relatively narrow front portion 7 so that the nose forms a relatively wedge shaped projection at the front of the base support. This nose portion is provided with a cross bore 8 intermediate its ends but closer to the enlarged base than the narrow outer end 7. The cross bore is intended to serve as a menas by which the wear surface cap of the tooth is secured to the digging bucket.

The replaceable tooth is in the form of a cap adapted to fit over the wedge shaped nose portion of the supporting base referred to above. The cap is provided with a relatively heavy top blade portion 10 formed of a steel selected for its particular ability to resist either impact or abrasion or both. The choice of the particular steel of which the blade 10 is formed depends upon the service to which the particular earth moving machinery is to be subjected.

The physical form of the replaceable cap blade 10 is generally rectangular and elongated with an under sloping surface 11 providing the outer end 12 of relatively sharpened configuration as compared with the remainder of the tooth cap. The upper surface of the blade 10 is the surface in contact with the material being dug and, therefore, receives the wear resulting from the digging operation. A tongue 13 at the rearward portion of the blade 10 is intended for reception within a socket 14 formed in the base support. The socket is somewhat larger than the tongue to insure the reception of the latter therein and yet is chosen to prevent undue movement of the replaceable cap relative to the base.

The replaceable cap is provided with a housing adapted to fit on to the projecting nose portion of the base support. Herein the housing of the replaceable cap is formed of a carbon steel sheet or plate 15, so formed as to have a bottom wall 16 and a pair of sidewalls 17 and 18. The sheet is so formed that the upper edge 20 on the wall 17 may be welded to the underside 21 of the heavy metal blade 10, forming the upper side of the cap. The upper edge 22 of the wall 18 is likewise welded to the underside of the blade 10. The lower wall 16 forming a part of the socket is held at an angle to the underside of the blade 10 and is attached at its forward edge 23 to the underside of the blade 10 as by welding 24. The carbon steel sheet 15 is subjected to very little wear as it is on the underside of the replaceable cap and the heavy blade 10 receives the brunt of all impact and abrasion. The function of the housing formed by the sheet 15 is to support the heavy blade 10 in proper position on the base support. The sides 17 and 18 have rear edges 25 and 26 so positioned as to avoid contact with opposite shoulders 27 and 28, formed on the base support 5. It is known that some movement of the replaceable cap on to the base support during use may occur and the cap edges should be spaced from the base support shoulders a sufficient distance to permit such movement without interference.

In order to assure proper operation and maximum life of a replaceable tooth cap, the cap should be retained tightly on the base support. There should be no looseness since the bucket teeth are often subjected to impact and looseness may promote breakage. In the present structure a retainer is used which will always urge the cap on to the base support. Referring to the drawings, a spring steel pin 30 of generally round configuration is bent intermediate its ends into the form of a wide angled V. The pin is shown in FIGURES 1, 2 and 3 in the position which it occupies, holding the cap on the base. In this position, it is sprung toward straightness from its at rest position. A wedge surface 31 at one end of the pin engages the side 17 of the cap within an opening 32

therein. A similar wedge surface 33 on the opposite end of the pin engages the side 18 of the cap in a similar opening 34 formed therein. The base 35 of the pin engages within the bore 8 of the adapter or base support. Since the pin is sprung in the position shown and the central portion of the pin engages only the base support and the ends of the pin engage only the cap, the pin resiliently urges the cap upon the base. It will be noted that the bore in the base support is sufficiently large in that direction of movement on to the base as to avoid any contact with the ends of the pin.

The formation of the wedge surfaces referred to may best be seen in FIGURE 4. The wedge surface is cylindrical in nature and extends from a radial shoulder 36 cut into the stock from which the pin is made. The shoulder is generally crescent shaped. The end surface 37 of the pin is also radial to the pin stock. The wedge surface, in addition to being cylindrical, is angled relative to the axis of the adjacent pin leg so as to extend thereacross and face the end of the pin. Each wedge surface is similarly formed and is produced by eccentrically supporting the pin stock and cutting the shoulder 36, wedge surface 31 and end surface 37 while so supporting the stock.

The wedge surfaces and shoulders referred to are important in the operation of the insertion and removal of the retainer pin. When a cap is first placed on the nose of the base support, it may be manually shoved thereon to within about ⅛ of an inch of its final position. At this point, the side openings 32 and 34 will be generally aligned with the cross bore 8. The pin is inserted manually until the end 37 engages the inside of the cap socket wall 17. By manipulation, the wedge surface 31 should engage in the opening 32. At this point, the pin is not properly seated, as the end 37 merely touches the opening 32 in the cap wall 17 and the opposite end of the pin extends outwardly of the cap opening 34. The pin must be sprung to force the portion 38 of the pin past the opening 34. A blow of a hammer or a maul against the end 39 of the pin will cause it to spring and allow the pin to move into the aligned openings so that the shoulder 40 passes through the opening 34, allowing the wedge surface 33 to engage in the opening. The wedge surface 31 or 33 will provide a wedging means to spring the pin against the side openings in the cap allowing an endwise delivered blow to spring the pin in place. Once sprung in place, the shoulders 36 and 40 keep the pin from accidentally moving out of the aligned openings and bore by engaging against the inner surface of the cap side walls.

The removal of the pin is accomplished by driving it lengthwise out of position shown in FIGURES 1, 2 and 3. The end of the pin can be contacted by a punch or short rod and by hitting the same with a hammer, the shoulder 36 on the opposite end will spring the pin further to permit it to be driven out. Since the shoulders 36 and 40 were formed radially to the pin stock, and thereafter the stock bent into the wide angled V shape, the shoulders end up at an acute angle to the inside of the cap side walls. This provides a wedge for springing the pin to remove it. The inside surfaces about the cap openings should be flame hardened to withstand the impact, and also to stand up during use of the tooth in digging operations.

The present pin is shown as round and in some instances, top and bottom flats may be provided to mate or match with corresponding flats in the side openings 32 and 34. It is possible to place the pin in the openings turned 180° from its proper position. Under such circumstances, the workman is immediately apprised of this error in that the pin, when driven in, will not be tight but exceedingly loose. When properly positioned, considerable force is necessary to insert the pin and it is exceedingly tight once inserted.

It is preferred to form the pin of a spring steel which is hardened after the wedge surfaces, shoulders and end surfaces are cut from the stock. A carbon and manganese steel is preferred which can be heat treated following the cutting of the surfaces so as to stand up under the conditions of usage. A Rockwell C Scale hardness of from 52 to 53 has been found satisfactory, permitting a single retaining pin to be used to retain successive replacement caps on an earth digging base support. The flame hardening on the edges of the cap is preferably done to an extent to produce a hardness greater than that of the pin so that the edges of the opening of the cap will not be damaged by the insertion or removal of the retaining pin.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, for some modifications will be obvious to those skilled in the art.

We claim:

1. An earth digging replaceable tooth cap retainer for securing a cap having aligned side openings upon a base having a cross bore, comprising: a spring steel elongated pin bent intermediate its ends forming a wide angle V to permit resilient yielding of the pin upon movement of the legs thereof toward endwise alignment, a wedge surface formed on each end of the pin for engaging the replaceable tooth cap within said side openings permitting springing of the pin within the adapter bore by endwise insertion, and a shoulder on the pin at the base of the wedge surface for retaining the pin within the adapter bore against accidental removal, said pin resiliently urging the cap on said base when the pin is sprung in the cross bore and cap side openings with the central pin portion engaging said bore and the ends of the pin engaging said cap.

2. An earth digging replaceable tooth retainer for securing a removable cap having aligned side openings upon a base having a cross bore, comprising: a spring metal pin having a cross-sectional shape and size to enter said side openings and cross bore freely, each end portion of said pin having a flat end surface generally normal to the longitudinal extent of the adjacent pin portion, a shoulder extending inwardly from the periphery of the pin and positioned in spaced relation to said flat end surface and a cylindrical surface extending from the shoulder to said flat end surface with the cylindrical surface being angled relative to the longitudinal extent of the adjacent pin portion, said pin being bent centrally to form a wide angle V with the outer base side of the V facing away from said angled cylindrical surfaces to permit the angled surfaces to engage the removable tooth cap in said side openings and the base of the pin to engage the base within said cross bore resiliently urging the cap onto the base.

3. In an earth digging tooth having a replaceable cap with opposite aligned openings for register with a bore through a supporting base, a retainer for securing the replaceable cap on the base, comprising: an elongated steel spring pin bent intermediate its ends to form a pair of legs arranged at a wide angle V in plan, means forming a shoulder adjacent each end of the pin on the interior side of the V, a wedge surface extending from the base of each shoulder to the adjacent end of said pin with said surface being oriented in a direction to extend across the longitudinal extent of the adjacent pin leg at an angle thereto and face the adjacent end of said pin leg, said wedge surfaces permitting springing of the pin when driven endwise into said cap openings and base bore to bring the same into register, said shoulders being spaced to abut the inside of the cap about said openings to retain the pin in said openings and bore and maintain the cap and base assembled.

4. In an earth digging tooth as specified in claim 3 wherein said shoulder is oriented substantially normal to the longitudinal extent of the adjacent pin leg so as to extend at an acute angle to the inside surface of said cap about said opening permitting camming of said pin

shoulder into said opening upon forced endwise driving of the pin out of the aligned openings and bore.

5. In an earth digging tooth having a replaceable cap with opposite aligned openings for register with a bore through a supporting base, a retainer for securing the replaceable cap on the base, comprising: an elongated steel spring pin having its end portions offset relative to its central portion to permit resilient flexing of the pin between said offset relation and a position aligning said end portions and central portion, a wedge surface on said pin at each end extending across and angled relative to the longitudinal extent of the adjacent pin portion and facing the adjacent end of the pin for engaging said cap opening to spring said pin into said openings and bore upon endwise driving of the pin therein, a shoulder at the inner end of each wedge surface for abutting the inner surface of the cap to retain said pin within the aligned openings and bore, said shoulder extending at at angle to a straight line through said openings and bore and at an acute angle to the interior surface of said cap about said opening to cam said pin past the cap opening when forceably driven endwise out of the cap and base.

6. An earth digging replaceable tooth cap retainer for securing a cap having aligned side openings upon a base having a cross bore, comprising: an elongate one piece spring steel pin of generally round configuration having a bend intermediate its ends forming the pin into a wide angle V-shape and permitting springing resiliently from said V-shape toward straightness, a wedge surface at each end of the pin for engaging the cap in said side opening, with the intermediate portion of said V-shape bearing against the base within said cross bore so that the resiliency of the pin urges the cap onto the base, and shoulder means integral with the pin, one shoulder adjacent to and facing each end of the pin, said shoulder extending at an angle to a straight line through said openings and bore and at an acute angle to the interior surface of said cap about said opening to cam said pin past the cap opening when forcibly driven endwise out of the cap and base.

7. In an earth digging tooth having a replaceable cap with aligned openings for register with a bore through a supporting base, a retainer for securing the replaceable cap on the base, comprising: a spring steel one-piece pin

of elongate form having its end portions offset relative to its central portion to permit resilient flexing of the pin between said offset relation and a position aligning said end portions and central portion, said end portions having a reduced thickness portion with a shoulder between said reduced thickness portion and the remainder of the pin, said shoulder facing the adjacent end of the pin, said pin being insertable endwise into said cap openings and supporting base bore with said end portions bearing only against said cap in opposition to said central portion bearing only against said base so that flexure of the pin resiliently holds the cap on said base, said pin having generally the same cross-sectional shape through the majority of its length, and said shoulders being spaced apart on the pin to be positioned between said cap openings so as to engage the interior of the cap about said openings retaining the pin in assembly with the cap and base.

8. In an earth digging tooth having a replaceable cap with opposite aligned openings for register with a bore through a supporting base, a retainer for securing the replaceable cap on the base, comprising: an elongated steel spring pin having its end portions offset relative to its central portion to permit resilient flexing of the pin between said offset relation and a position aligning said end portions and central portion, a wedge surface on said pin at each end extending across the longitudinal extent of the adjacent pin portion and facing the adjacent end of the pin for engaging said cap opening and bore upon endwise driving of the pin therein, said pin having a shoulder at the inner end of each wedge surface for retaining the pin in said openings and bore by engaging the inner surface of said cap about said openings.

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