

United States Patent [19]

Griffith et al.

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[45] Jan. 9, 1973

[54] REPLACEABLE TOOTH ASSEMBLY

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[73] Assignee: Florida Machine & Foundry Co., Jacksonville, Fla.

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[21] Appl. No.: 32,969

[52] U.S. Cl. 37/142 A, 299/92

[51] Int. Cl. E02f 9/28

[58] Field of Search 37/142; 299/92

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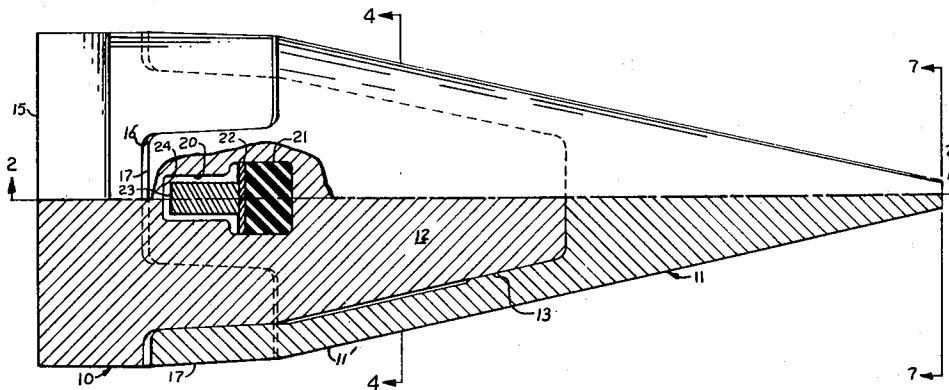
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[57] ABSTRACT

A replacable tooth assembly including a tooth formed with a conical interior opening and flanges extending from the base of the opening. The conical opening is applied to a conical adaptor nose and the flanges hold the tooth against rotation on the nose by coaction with the base of the adaptor. A key in the nose extends into slots in the flanges to lock the tooth on the nose. Limit surfaces of the key coact with surfaces of the tooth adjacent the tooth slots to prevent inadvertent removal of the key except through forcible movement of the key laterally and axially of the nose.

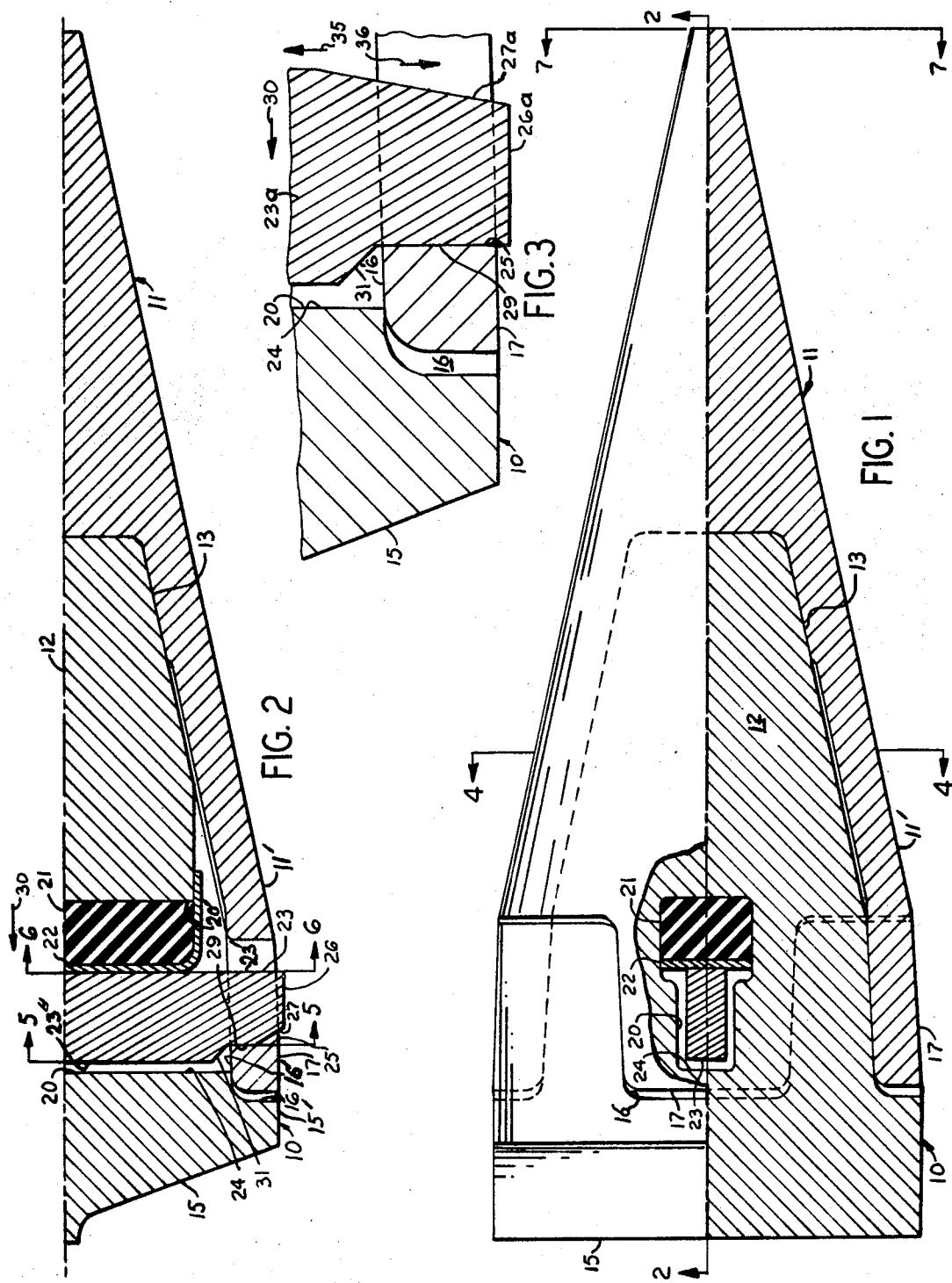
7 Claims, 7 Drawing Figures



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SHEET 1 OF 2



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SHEET 2 OF 2

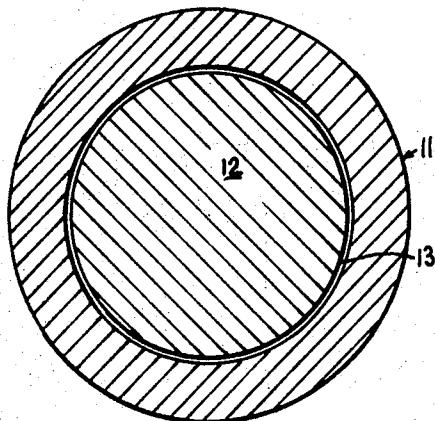


FIG. 4

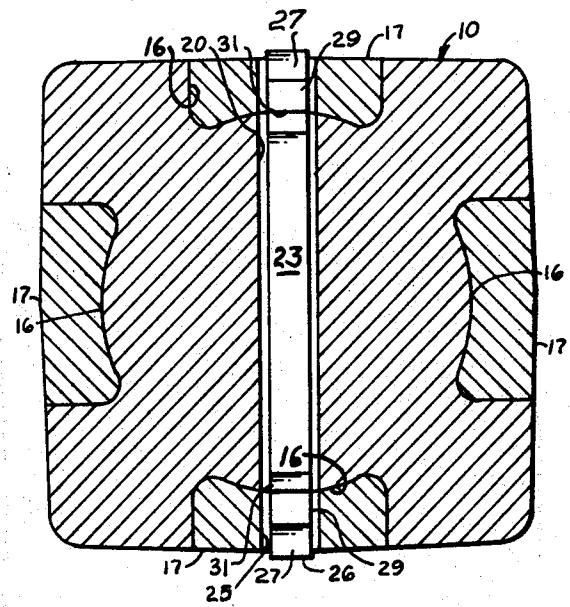


FIG. 5

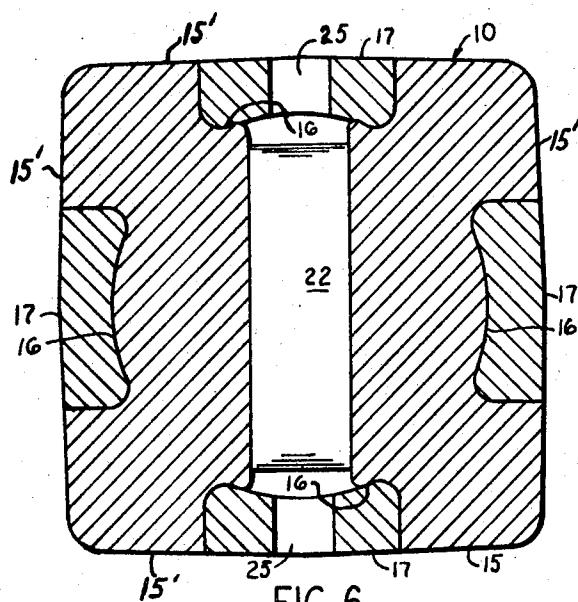


FIG. 6

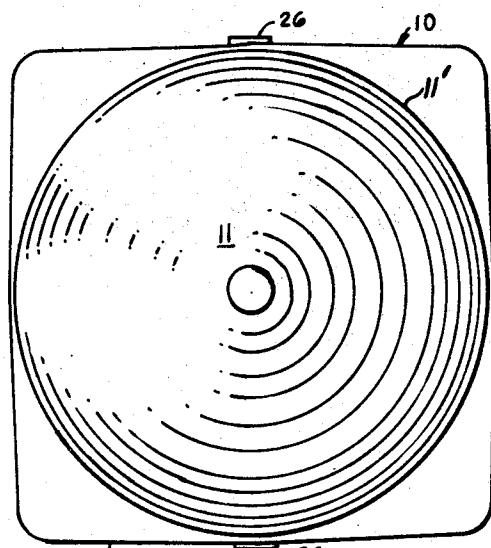


FIG. 7

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REPLACEABLE TOOTH ASSEMBLY

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

This invention relates to a replaceable tooth assembly that is adapted for heavy duty cutting such as in a chain driven excavating cutter. Such a tooth of the class to which this invention relates wears rapidly, and for that reason, must be so constructed as to be readily replaceable. Further, the tooth together with the adaptor on which it is mounted for ready removal and replacement, must be formed so that the tooth will be held firmly and effectively in proper working position to minimize wear thereof.

2. DESCRIPTION OF THE PRIOR ART

Excavating or cutting teeth are very old in the art, and many patents have issued covering many constructions, among which are U.S. Pat. Nos. 1,205,969; 2,427,651; 2,483,032; 2,846,790; 2,870,667; 2,919,506; 2,982,035; 2,984,028; 3,012,346; 3,026,947; 3,079,710; 3,117,386, and 3,126,654. In general, a tooth having an inner opening is assembled to an adaptor having a nose on to which the tooth is fitted. A wedging key or the like is utilized to hold the tooth assembled to the adaptor, the key passing through portions of the tooth and the adaptor.

The key for holding the tooth in position on the adaptor is retained by a part of the adaptor. This part may be an integral portion of the adaptor, but in many patents of the prior art, the key is actually retained by a resilient corrugated construction assembled to the adaptor. A construction of the particular class is well illustrated in the U.S. Pat. No. 3,126,654.

SUMMARY OF THE INVENTION

A feature of this invention resides in the utilization of a tooth having an inner opening that is in the shape of a cone with the cross section circular. The adaptor is formed with a nose that is also conical with a circular cross section. The conical nose portion of the adaptor extends from a base, the base being preferably rectangular, although it may have any other form in which its periphery will be outlined by surfaces having a particular relation to the replaceable tooth.

The tooth has extending from the base of its conical portion a series of flanges that are adapted to fit on the outlining surfaces of the base, or preferably in depressions formed in said surfaces. Through the utilization of the particular construction, it is possible to obtain an extremely close fit between the tooth and the nose because of the coaction of the conical surfaces of the tooth and the nose. It is further possible, to obtain extremely effective mounting of the nose on the base through the flanges of the nose fitting against the outlining surfaces or depressions in those surfaces, to prevent wobbling or turning movement of the tooth with respect to the adaptor.

In accord with one aspect of the invention, a key is passed through a key slot that extends transversely through the adaptor, and fits into at least one retaining slot formed in one of the opposed flanges of the tooth. Therefore, the key is located to effectively stabilize the tooth and hold it in position on the base, since the flanges held by the key are themselves maintained against lateral movement relatively to the base.

As a further feature of the invention, the key is adapted to be retained within the nose and tooth by surfaces of the tooth, rather than by surfaces of the adaptor or parts carried by the adaptor. An important result follows from this construction, since each time a tooth is replaced, a new holding surface is provided for holding the key in position. In prior art constructions, where the key is held by surfaces of the adaptor, it is obvious that those surfaces will wear each time a key is removed for the replacement of a tooth, and that gradually the adaptor will be worn to a point where it will not be usable, or will require replacement of portions of such adaptors thus greatly increasing the costs and down time of the equipment.

More particularly, the key of this invention utilizes a pair of limiting surfaces preferably positioned on the retaining opposed ends of the key that fit into slots in opposed flanges of the tooth. These limiting surfaces are preferably formed inwardly of the ends of the key, for preventing movement of the key linearly thereof in either of opposed directions out of the key slot, unless the key is moved bodily axially of the tooth and the adaptor. For yieldingly holding the tooth against such axial movement, while still permitting axial movement in order to permit insertion of the key into retaining position or removal thereof, the locking slot of the adaptor is equipped with a yielding member, preferably including a rubber plug covered by a metal contact surface. Thus, the key in moving into retaining position will compress the yielding member, and once it moves into retaining position will be held yieldingly in that position by the yielding member. However, the yielding member need not thereafter accept the forces required to hold the key against linear movement in its axis, those forces being accepted by the surfaces of the slots of the tooth body itself.

A general object of this invention is to provide an improved replaceable tooth assembly.

A particular object of the invention is the provision of an improved key having at least one limit surface engaging a limit surface on the tooth to prevent inadvertent removal thereof in at least one direction laterally of the adaptor and tooth.

A related particular object is to provide an improved replaceable tooth having a retaining slot with a limit surface adjacent thereto adapted for coaction with a limit surface on the key whereby a new limit surface on the tooth is provided when the old tooth is replaced by the new tooth.

A specific object is to provide an improved replaceable tooth assembly wherein the tooth is provided with a plurality of flanges which fit into depressions on the adaptor to prevent relative rotative movement therebetween.

Other objects include the relative ease in construction of the assembly at an inexpensive cost, ready replacement of a worn tooth, and sturdy and reliable in construction and use.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features which are believed to be characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof,

may best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a horizontal plan view partially in section of the replaceable tooth assembly in accordance with this invention;

FIG. 2 is a vertical sectional view of the assembly taken along line 2-2 of FIG. 1, and showing only one half of the assembly as the other half is identical;

FIG. 3 is an enlarged partial view similar to FIG. 2 showing another embodiment of the replaceable tooth assembly in accordance with this invention;

FIG. 4 is a sectional view taken along line 4-4 of FIG. 1;

FIGS. 5 and 6 are respectively sectional views taken generally along lines 5-5 and 6-6 of FIG. 2; and

FIG. 7 is an end elevational view of the assembly taken along line 7-7 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to the drawings, the assembly includes an adaptor designated generally by reference numeral 10, and a tooth by reference numeral 11. The conical nose of the adaptor bears reference numeral 12, and is of circular cross section, as clearly shown in FIG. 4. The tooth 11 is formed with an inner conical opening or recess 13 that is complementary to the conical shape of the nose 12, whereby the tooth may be disposed in closely fitted relationship on nose 12. The base of the adaptor is designated by reference numeral 15, and as can well be seen in FIGS. 5, 6, and 7, it is substantially square in form. Obviously, other geometric forms may be utilized without departing from the spirit or scope of this invention. However, the conical adaptor nose 12 and the conical tooth recess 13 provides uniform and distributed loading thereof; movement between the parts are diminished to reduce the impact loading therebetween; and the conical shapes are easier to cast and clean. Even if a tooth is worn through a side and slight damage results to the adaptor nose 12, the replaced tooth will be properly fitted thereto and function substantially as if no such damage is present on such adaptor nose 12.

Each of the four sides 15' of the base 15 has a depression 16 formed for coaction with a portion in the form of flange 17 of tooth 11. Extending from the base of the cone portion 11' of the tooth 11, are four flanges 17 complementary in shape to fit within the depressions 16, as best seen in FIGS. 5 and 6. While the cone shaped adaptor nose 12 will hold the tooth 11 accurately and firmly in the position illustrated in FIGS. 1 and 2, the flanges 17 resting in the depressions 16 will further stabilize the tooth 11 relatively to adaptor 10.

In accord with an aspect of the invention, the flanges 17 are utilized for coaction with a key 23 for holding the tooth 11 on the adaptor nose 12. Thus, a transverse opening 20 is formed in the adaptor base 15, such opening being termed a key slot. At one side 20' of the slot 20 there is mounted a resilient or yielding body 21, preferably rubber, which is covered by a metal cap 22, primarily for reducing the sliding friction between yielding body 21 and key 23. The key 23 is adapted at one side 23' thereof to press against the cap 22 of the yielding body 21, with the other side 23'' being spaced

from the surface 24 defining the opposed side of the slot 20. It is to be noted that key 23 is symmetrical, FIG. 2 showing only the bottom half of the key.

Two of the four flanges 17 of the tooth are formed with a retaining slot 25 as is best seen in FIG. 2, and when the tooth 11 is applied to the nose 12 of the adaptor, these two slots 25 will be partially aligned with the key slot 20. The key 23 is provided with end portions 26 adapted to enter the retaining slots 25, and a cam surface 27 on each end portion 26 is adapted to coact with a bounding surface of slot 25, as clearly shown in FIG. 2, for camming key 23 into locking position within each slot 25, and is there retained by cooperation of limit surface 31 and 16'. Surface 29 is urged into firm engagement with a bounding surface of slot 25 by yielding body 21. As is clearly apparent from FIG. 2, the key 23 could not be inserted into the key slot 20 and slot 25 were the body 21 unyielding. The yielding body 21 will allow the movement of the key 23 bodily axially of nose 12 into a position where each of its end portions 26 will be positioned in a slot 25. In this position of the key 23, it is obvious that the yielding body 21 will press the key 23 axially in the direction of the arrow 30 in FIG. 2 so as to hold the tooth yieldingly in its position shown in FIGS. 1 and 2. Key slot 20 is of such width that the key 23 is held with surfaces 29 at one side against bounding surfaces of slots 25, and at its other side against cap 22, while key side 23'' is spaced from surface 24.

Most importantly, the key 23 is formed with a shoulder in the form of a limit surface 31 just inwardly and axially of each of its end portions 26. It will be apparent that each of the surfaces 31 will inhibit movement of the key in its linear axis out of the key slot 20, due to coaction of the surfaces 31 with the shoulders or limit surfaces 16' overlying the ends of the slots 25 of the flanges 17.

Another embodiment of the assembly in accord with the invention is shown in FIG. 3, wherein the key is noted by numeral 23a and has end locking portions 26a at each end, the key being symmetrical as in the first embodiment shown in FIGS. 1, 2 and 4 to 7. Instead of a cam surface 27 as in FIG. 2, the form shown in FIG. 3 utilizes an opposed cam surface 27a coacting with metal cap 22 for effecting the camming of the key into each slot 25. In the position of the key in FIGS. 2 and 3, it is obvious that were the opposed end of the key made without a limit surface 31, the key could be driven upwardly in the direction of the arrow 35, without substantial opposition, unless the upper flange were solid or did not include a retaining slot 25. However, if pressure is applied to the key 23a or key 23 in the direction of the arrow 36, as by pressure exerted on the end of the key opposite the end shown in FIGS. 2 and 3, the surface 31 must cam the key axially of nose 12 against the cap 22 of the yielding body 21, because the tooth 11 and its flange 17 will not move axially since tooth 11 is fully applied to nose 12. The key 23 will move bodily by compressing body 21, and this permits the key to move downwardly and outwardly of the key slot 20 and through the particular retaining slot 25 shown in FIGS. 2 and 3. In other words, the yielding body 21 will hold the key yieldingly in its retaining position of FIGS. 2 and 3 but will yield to permit movement bodily of the key 23 by cam surface 31 out of its retaining position to permit release of the tooth 11. Because keys 23 and

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23a are symmetrical they can be released or inserted in opposed directions.

It is clear that each time a new tooth 11 is applied to the nose 12, there will be new retaining slots 25 with new limit surfaces 16' for cooperation with each end of the key 23. Furthermore, if the key 23 is worn at any time, it can readily be replaced. At the most, all that will require replacement will be a key 23 each time that a new tooth is to be applied. The adaptor 10 will remain practically untouched and not appreciably worn because of the digging operation performed by the tooth. This will naturally contribute to extreme long life of the adaptor. It is also well appreciated, that each tooth will be held firmly and accurately in its proper relation to the nose 12 of the adaptor, while at the same time, slight endwise movement of the tooth as may occur under particular stresses, will be absorbed by the yielding body 21. The yielding body will not function to retain the key 23 against endwise motion as in many prior art patents, that function being performed by the flanges of the tooth. Upon sufficient wear of the tip of the adaptor nose 12, the impact loading on the tooth (normally transmitted only through the nose) may also be transmitted through the flanges 17 to the base of adaptor 10, but the assembly is not designed for the entire impact loading to be transmitted through such flanges 17.

While the invention has been described with respect to certain specific embodiments, it will be appreciated that many modifications and changes may be made by those skilled in the art without departing from the spirit of the invention. It is intended, therefore, by the appended claims to cover all such modifications and changes as fall within the true spirit and scope of the invention.

What is claimed as new and what it is desired to secure by Letters Patent of the United States is:

1. In a replaceable tooth assembly comprising an adaptor having a base extending into a conical nose of circular cross section, said adaptor base having a plurality of spaced depressions in the outside surface thereof, an elongated replaceable tooth having a longitudinal axis and a base, said tooth having an internal conical opening of circular cross section complementary to said nose whereby said tooth may be fitted on said nose, a plurality of spaced apart end flanges on said tooth extending axially of said tooth base and formed to fit in and substantially fill said depressions and having outer surfaces substantially flush with said outside surface of said adaptor base, means for removably securing said tooth against axial removal from said adaptor nose, said adaptor base coacting with said end flanges to maintain said tooth against rotation on said nose, said adaptor base having a key slot, said tooth having

opposed slots in two of said tooth flanges and being in alignment with said key slot, said means for removably securing said tooth including an elongated key disposed in said key slot with the opposed key ends respectively 5 lying in said retaining slots, said key having a shoulder, said flange adjacent one said retaining slot having a shoulder cooperating with said key shoulder to maintain said key in tooth retaining position within said key slot and said retaining slot, a yielding member in said key slot for biasing said key in a direction toward said key shoulder.

2. In the assembly as defined in claim 1, wherein said one key end portion includes a cam surface to permit camming of said key into one of said retaining slots and then into said key slot, said yielding member yielding to permit lateral movement of said key when said tooth is in a fully assembled position on said nose.

3. In the assembly as defined in claim 1 wherein said yielding member is compressible to permit movement of said key axially of said nose whereby said key shoulder is forced into said retaining slot by the forcible removal of said key laterally of said nose.

4. In the assembly as defined in claim 3, wherein said yielding member includes a smooth metal element covering a compressible plug with said metal element being in contact with a side of said key opposite from said key shoulder.

5. In the assembly as defined in claim 1, wherein said tooth includes an opposed retaining slot and another shoulder adjacent thereto, said key including an opposed end portion lying in said opposed retaining slot, said opposed end portion having another shoulder overlying and coacting with said other tooth shoulder to maintain said key in tooth retaining position within said key slot and said opposed retaining slot.

6. In the assembly as defined in claim 5, wherein said key has a pressure surface opposed to said shoulders, said pressure surface forcibly engaging a pressure surface adjacent one side of said key slot, said key includes another pressure surfaces adjacent to and on the same side as said shoulders, said retaining slots having pressure surfaces adjacent to and in contact with said other key pressure surface, said key slot and retaining slots being of sufficient width whereby said key is spaced from the other side of said key slot and from the surfaces of said retaining slots opposed to said retaining slot pressure surfaces when said key is operatively positioned in said key and retaining slots.

7. In the assembly as defined in claim 5, wherein one of said ends of said one key is tapered to facilitate movement of said key into said key slot after insertion of one said key end portions into one of said retaining slots.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,708,895 Dated January 9, 1973

Inventor(s) Norman N. Griffith; John D. Hollingsworth

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Abstract, line 1, the word "replacable" should read
-- replaceable --

Column 6, line 50, omit the word "one"

Column 6, line 52, the phrase "one said" should read
-- said one --

Signed and sealed this 18th day of December 1973.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMAYER
Acting Commissioner of Patents