Oct. 11, 1966 R. L. LAUNDER ET AL 3,277,592

REINFORCED REPLACEABLE TOOTH FOR DIGGING MACHINES

Filed Sept. 17, 1963 2 Sheets-Sheet 1

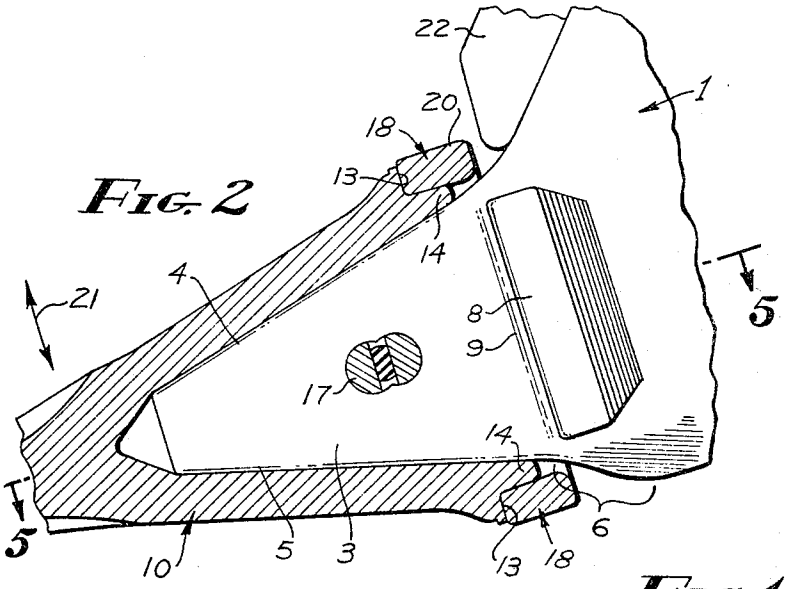


FIG. 2

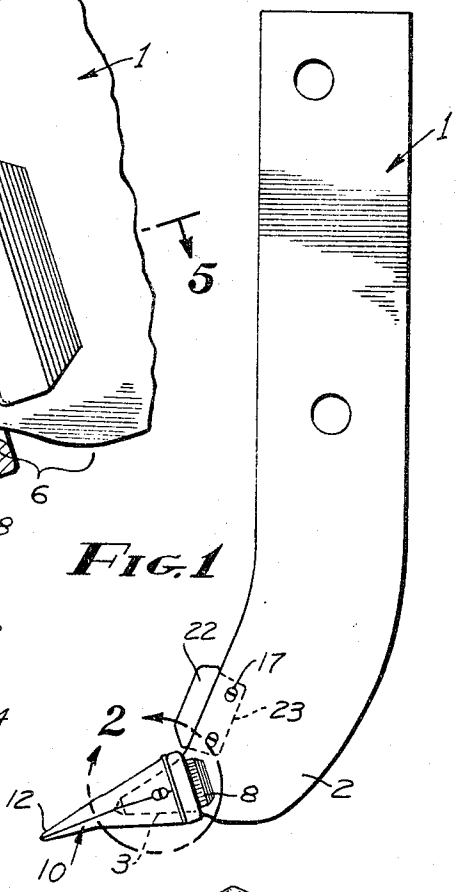


FIG. 1

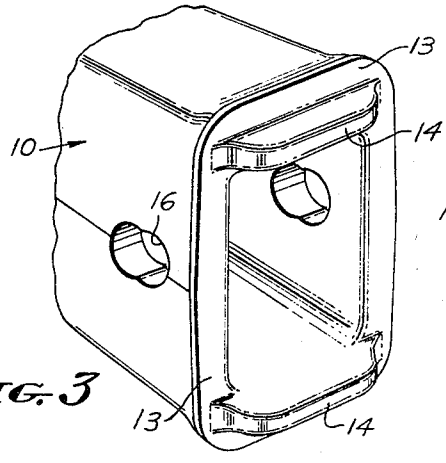


FIG. 3

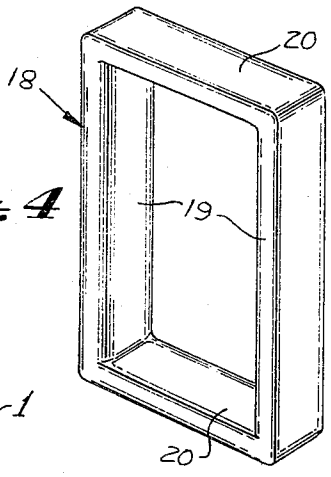
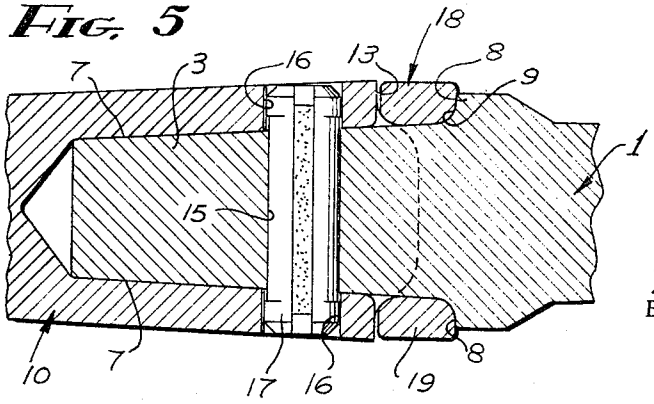


FIG. 4

FIG. 5



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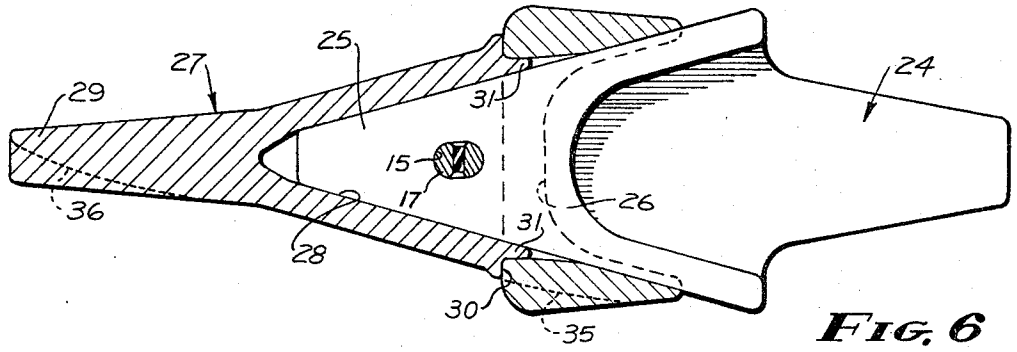

FIG. 6

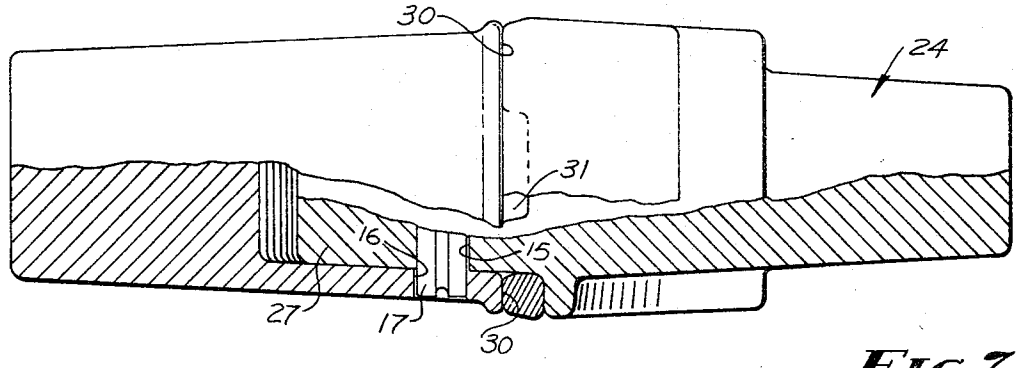

FIG. 7

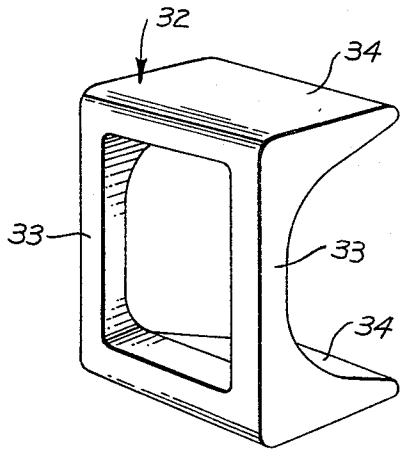

FIG. 8

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REINFORCED REPLACEABLE TOOTH FOR DIGGING MACHINES

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4 Claims. (Cl. 37—142)

This invention relates to reinforced replaceable teeth for digging machines, particularly digging machines in which the digging teeth are subjected to excessive loads and extreme abrasion, such as earth rippers and heavy-duty, power shovels.

Included in the objects of this invention are:

First, to provide a replaceable digging tooth and a special reinforcing means which envelopes the tooth at its juncture with the tooth holder, so as to minimize stress concentrations in this region and minimize breakage of the tooth holder, even under extreme conditions of use.

Second, to provide a reinforced, removable tooth wherein both the tooth and its reinforcing means are reversible to that, for example, after a predetermined portion of the metal has been abraded from one side of the tooth and reinforcing, both may be readily reversed to permit wear of the upper side.

Third, to provide a reinforcement for removable digging teeth of the type having a wedge-shaped socket which fits a wedge-shaped tooth holder, wherein the reinforcement is in the form of a loop having high hoop strength which encircles the tooth at its juncture with the tooth holder, to reinforce the tooth against force tending to spread and rupture the tooth socket.

With the above and other objects in view, as may appear hereinafter, reference is directed to the accompanying drawings in which:

FIG. 1 is a side view showing one form of the reinforced tooth mounted on an earth ripper shank, shown detached from the tractor to which it is attached when in use;

FIG. 2 is a fragmentary, enlarged view taken within circle 2 of FIG. 1, and showing the digging tooth and reinforcing member in section;

FIG. 3 is a fragmentary, perspective view showing the root end of the digging tooth;

FIG. 4 is a perspective view of the reinforcing member;

FIG. 5 is a fragmentary, sectional view taken through 5—5 of FIG. 2;

FIG. 6 is a longitudinal, sectional view showing a modified form of the reinforced tooth attached to a tooth holder of the type used on power shovels, the holder being shown in elevation;

FIG. 7 is a partial top, partial sectional view thereof;

FIG. 8 is a perspective view of the modified reinforcing member.

Reference is first directed to FIGS. 1 through 5 wherein the reinforced tooth is attached to an earth ripper shank 1. The shank 1 is installed in a tool holder carried by a tractor, and is disposed in an essentially vertical position. The shank 1 includes a forwardly directed, downwardly inclined, lower end portion 2 which terminates in a tapered point 3.

The upper and lower surfaces 4 and 5 of the tapered point 3 converge at a relatively steep angle. In the region between the lower portion 2 and the tapered point 3, the upper and lower surfaces 4 and 5 of the tapered point merge gradually into the forward and under surfaces of the shank 1, as indicated by 6 in FIG. 2. The lateral sides 7 of the tapered point 3 also converge, but at a lesser angle than the upper and lower surfaces 4 and 5. At the root end of the tapered point 3 the shank 1 is provided

with abutments 8. The abutments have full fillets 9 to minimize stress concentrations.

Fitted on the tapered point 3 is a tooth 10 having a tapered socket 11, which conforms closely to the upper and lower surfaces 4 and 5 as well as to the lateral sides 7 of the tapered point 3. The tooth 10 continues from its socket 11 to form a digging point 12.

At its root end the tooth 10 forms a peripheral abutment 13. At its upper and lower sides the tooth 10 is provided with lugs 14 which conform to the upper and lower surfaces 4 and 5.

The tapered point 3 is provided with a transverse bore 15, and the lateral sides of the tooth 10 are provided with openings 16 which register with the bore 15, so that the openings and the bore may receive a retainer pin 17. The retainer pin 17 may be of the type shown in Patent No. 2,716,822, issued to Launder et al. Sept. 6, 1955, entitled Digger Tooth Mounting.

Abutments 8 and 13 confront each other, and are spaced apart so as to receive a reinforcing ring 18 therebetween. The reinforcing ring 18 is rectangular and includes side portions 19, for bearing engagement with the abutment 8 and end portions 20 which overlie the lugs 14, and are capable of bearing engagement with the portions of the abutment 13 disposed outwardly from the lugs 14.

The tooth 10 may be installed on the shank 1 by first placing the reinforcing ring 18 over the lugs 14 for support thereby, and then guiding the tooth 10 onto the tapered point 3 until the openings 16 are in sufficient registry with the transverse bore 15 that the retainer pin 17 may be driven into place. In the course of use of the earth ripper, the tooth 10 is subjected to extreme loads in a downward direction or upward direction, as indicated by the arrow 21 in FIG. 2.

The reinforcing ring or loop 18 is formed of high strength steel with the grain structure so oriented that its side portions 19 especially have high tensile strength. As a consequence, the reinforcing loop 18 engages the lugs 14 to restrain the tooth socket 11 from spreading due to the forces indicated by the arrow 21.

Also, due to the fact that the upper and lower surfaces 4 and 5 of the tapered point 3 merge gradually into the corresponding surfaces of the shank 1, as indicated by 6 in FIG. 2, stress concentrations are eliminated. Consequently, the heavy loads imposed are transmitted to the shank 1 while minimizing any danger that the tapered point 3 might fail.

It is sometimes desirable to install a wear pad 22 on the upper side of the shank 1. The pad is provided with an extension 23 fitting within a socket formed within the shank 1 and held by retainer pins 17. The pad 22 affords wear protection for the upper side of the reinforcing ring 18 and the adjacent end of the tooth 10.

Reference is now directed to FIGS. 6, 7, and 8. In this construction the reinforced replaceable tooth is shown attached to a tooth holder 24, of the type commonly used in connection with power shovels. However, the modified structure may be adapted to ripper shanks or to other conventional digging implements.

The tooth holder 24 includes a tapered or wedge-shaped point 25 and is provided with side abutments 26. The tooth 27 is essentially the same as the tooth 10, in that it includes a socket 28 of wedge-shaped form to fit tightly on the tapered point 25. Extending from the socket portion of the tooth 27 is a digging tip 29.

The open side of the socket 28 is provided with a peripheral end abutment 30, and at the upper and lower sides the peripheral abutment 30 is provided with lugs 31 which bear against the corresponding surfaces of the tapered point 25. As in the first described structure, the tapered point 25 is provided with a transverse bore 15, and the tooth 27 is provided with mating openings 16 and retainer pins 17.

Fitted around the tapered point **25**, adjacent to and in engagement with the peripheral end abutment **30**, is a reinforcing ring or loop **32** having the side webs **33** of high tensile strength, and top and bottom wear pads **34**. The forward ends of the wear pads **34** overlie the lugs **31**, and project above and below the normal surfaces of the tooth **27**. The wear pads **34** also extend rearwardly or toward the tooth holder **24**, and their extremities overlie and bear against the tapered upper and lower surfaces of the tooth holder **24**.

The modified reinforcing ring or loop **32** functions essentially in the manner of the first described reinforcing ring. In addition, the top and bottom wear pads **34** are designed to be abraded in use, as indicated by dotted line **35**. This occurs simultaneously with the wearing of the tooth **27**, as indicated by dotted line **36**. When such wear has occurred, both the tooth **27** and the reinforcing ring **32** may be inverted.

It should be noted that under some conditions of use the wear occurs principally on the underside, and in other conditions of use, such as when used as a ripper tooth, the wear may be principally on the upper side. In either case, the reinforcing ring **32** and tooth **27** may be reversed to prolong their useful life.

While particular embodiments of this invention have been shown and described, it is not intended to limit the same to the exact details of the constructions set forth, and it embraces such changes, modifications, and equivalents of the parts and their formation and arrangement as come within the purview of the appended claims.

1(a) A digging tooth structure, comprising:
(b) a tooth holder having a tapered point;
(c) the upper and lower surfaces of said point merging gradually into the corresponding surfaces of said tooth holder;
(d) a tooth having a socket for receiving said tapered point, and including upper and lower lugs extending from its root end and conforming to the upper and lower surfaces of said tapered point;
(e) and a reinforcing ring encircling said tooth holder beyond the root end of said tooth and overlying said lugs.

2(a) A digging tooth structure, comprising:
(b) a tooth holder terminating in a tapered point;
(c) abutments at the sides of said tooth holder;
(d) a tooth having a socket for receiving said tapered point and forming at its root end a peripheral abutment;

(e) said tooth also having at its upper and lower sides, lugs extending from said abutment and conforming to the upper and lower surfaces of said tapered point;
(f) and a reinforcing member encircling said tapered point between said abutments and overlying said lugs.

3(a) A digging structure, comprising:
(b) a tooth holder including converging upper and lower sides, and abutments at opposite lateral sides;
(c) a tooth having converging upper and lower sides joined by lateral sides to form the walls of a socket adapted to receive and enclose said tooth holder, said lateral sides terminating in abutment end faces confronting said tooth holder abutments;
(d) a reinforcing loop having tension-resisting side straps interposed between said abutments, and top and bottom straps overlying the root end of said tooth to resist spreading of said socket;
(e) and means for securing said tooth to said tooth holder.

4(a) A digging tooth structure, comprising:
(b) a tooth holder including converging upper and lower sides, and abutments at opposite lateral sides;
(c) a tooth having converging upper and lower sides joined by lateral sides to form the walls of a socket adapted to receive and enclose said tooth holder, said lateral sides terminating in abutment end faces confronting said tooth holder abutments;
(d) a reinforcing loop having tension-resisting side straps interposed between said abutments, and top and bottom pads overlying the root end of said tooth to resist spreading of said socket, said pads also overlying the top and bottom surfaces of said tooth holder and exposed to abrading wear, thereby to minimize wear on adjacent surfaces of said tooth holder and the socket-forming portions of said tooth;
(e) and means for securing said tooth to said tooth holder.

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