United States Patent

Hasforth et al.

[15] **3,704,753**

[45] **Dec. 5, 1972**

[54] **RIPPER SHANK**

[72] Inventors: **Hector Bernard Hasforth,** Botony, Sydney, Australia; **William H. Wolff,** Atherton, Calif.

[73] Assignee: **said Wolff by said Hasforth,** a part interest

[22] Filed: **April 29, 1970**

[21] Appl. No.: **32,878**

[52] **U.S. Cl.** **172/700,** 172/719, 37/142, 172/753, 287/119

[51] **Int. Cl.**.....**A01b 13/08,** E02j 9/28

[58] **Field of Search**.....172/699, 719, 749, 753, 700, 172/751; 37/142

[56] **References Cited**

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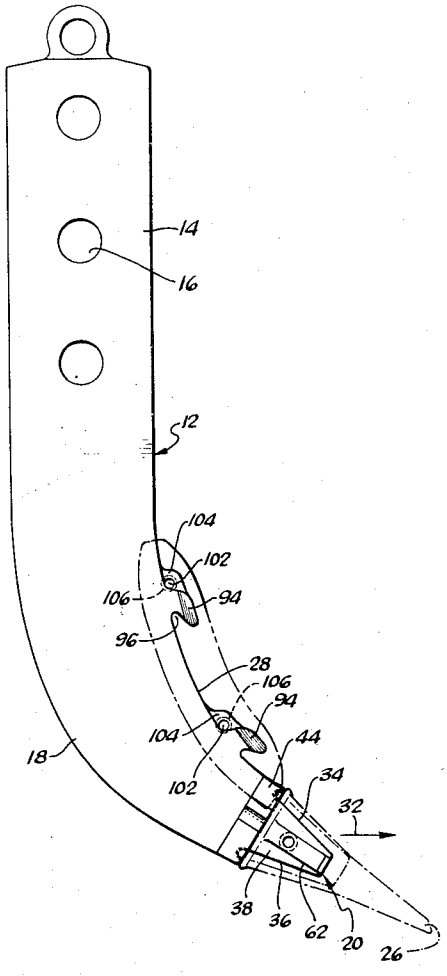
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Primary Examiner—Robert E. Pulfrey
Assistant Examiner—Stephen C. Pellegrino
Attorney—Townsend and Townsend

[57] **ABSTRACT**

A ripper shank having a replaceable earth working tooth and a replaceable wear plate. Improved configurations that afford rapid installation and removal of the wear plate and earth working tooth on the shank. The wear plate and tooth are retained in place by removable cross pins that have retaining shoulders intermediate their ends.

3 Claims, 9 Drawing Figures



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SHEET 1 OF 2

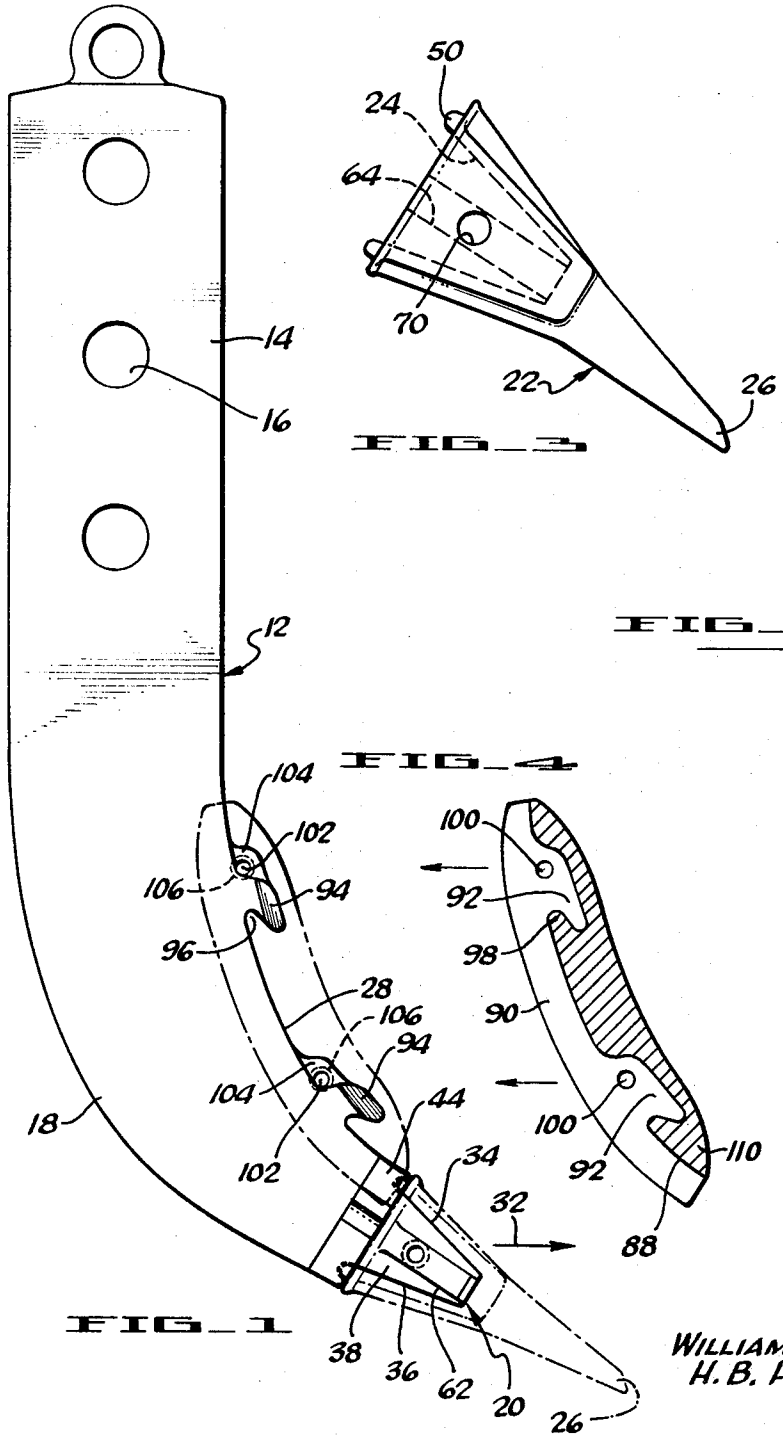


FIG_1

FIG_3

FIG_2

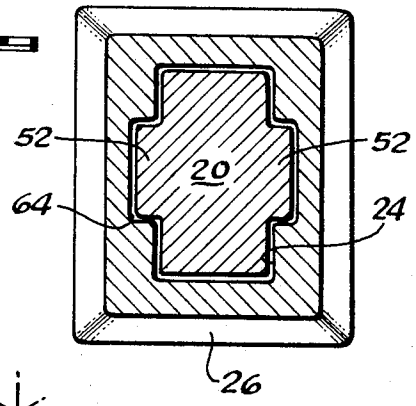
FIG_4

WILLIAM H. WOLFF and
H. B. HASFORTH
INVENTORS

BY Townsend and Townsend

ATTORNEYS

FIG_9



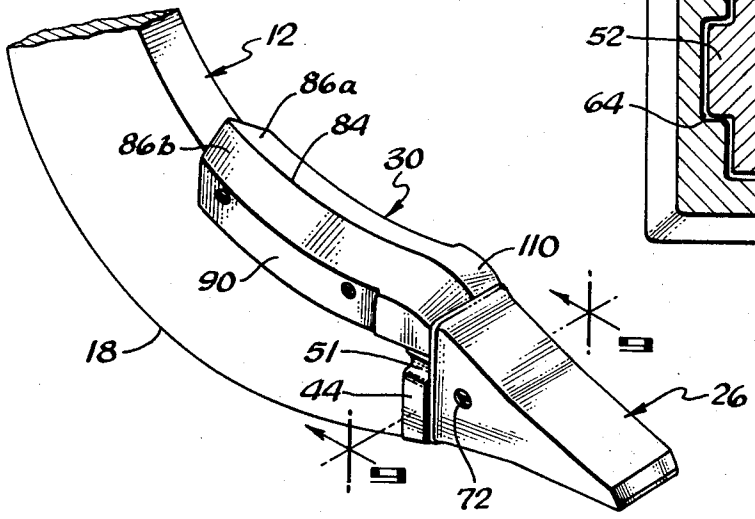


FIG_5

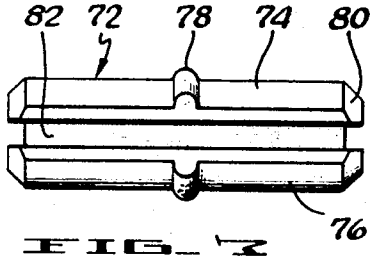


FIG_7

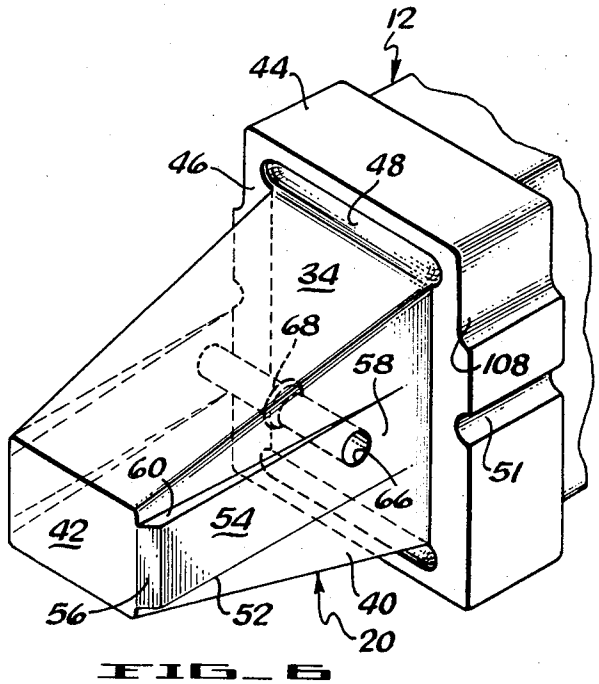


FIG_6

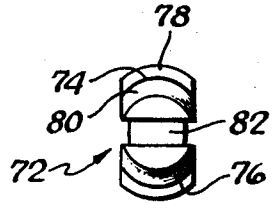


FIG_8

WILLIAM H. WOLFF and
H. B. HASFORTH
INVENTORS

BY Townsend and Townsend

ATTORNEYS

RIPPER SHANK

This invention relates to a ripper shank and more particularly to a structure for removably mounting on such shank a wear plate and an earth working tip. The environment in which a shank according to the present invention can be employed is exemplified in U.S. Pat. No. 3,116,797. Such environment includes a tracked vehicle to which the ripper shank is mounted so that as the vehicle traverses an earth surface the ripper shank moves through the earth to loosen it or break it up. Because the shank and its accoutrements are subject to severe forces, parts of the shank are removable for periodic replacement. Replaceable parts include the earth working tooth at the lower end of the shank and a wear plate that protects the leading edge of the shank above the tooth.

An object of the present invention is to provide an improved tooth mounting structure for a ripper shank tooth, and this object is achieved by providing at the tip of the shank a nose structure having opposed ridges or protuberances thereon that cooperate with complementary depressions in a cavity formed in the tooth so that relative movement between the tooth and the shank nose is virtually eliminated.

The shank nose and the tooth define openings or bores which register when the tooth is in position on the shank so as to receive therethrough a pin for retaining the tooth in place. Another object of the invention is to provide an improved pin formed of two semi-cylindric parts between which is placed a body of rubber or like resilient material. Extending from the semi-cylindric parts between the end thereof are shoulders which engage an annular depression within the tooth bore to retain the pin against movement in a direction axial of the pin. Because the pin retention structure is located between the ends of the pins, the outer ends of the pins can be recessed inside the outer surface of the tooth. Consequently, wear on the pin is reduced or eliminated.

Still another object of the present invention is to provide a wear plate mounting structure that affords ready replacement of the wear plate that avoids the necessity for weakening the shank by drilling one or more holes therethrough. This object is achieved by providing at the leading edge of the shank one or more projections which engage with complementary depressions in the wear plate. The projections define grooves that open toward the shank tip so that forces imposed on the wear plate urge the wear plate into such grooves. The projections include a web opposite from the groove which strengthens the projection and defines an opening that registers with a corresponding opening on the wear plate to receive a mounting pin similar to the pin mentioned above.

Yet another object is to so form the wear plate that forces applied thereto as the shank is moved through the earth are minimized. This object is achieved in part by forming the leading edge of the wear plate, i.e., the edge immediately adjacent the tooth, at an acute angle, an angle no greater than 45 degrees.

The objects, features and advantages of the present invention will be more apparent after referring to the following specification and accompanying drawings in which:

FIG. 1 is a side view of a ripper shank embodying the present invention;

FIG. 2 is a front view of the ripper shank of FIG. 1;

FIG. 3 is a side view of an earth working tip of the invention;

FIG. 4 is a side view of a wear plate according to the present invention;

FIG. 5 is a perspective view of a shank of the invention with all accoutrements thereon;

FIG. 6 is a perspective view of the nose of the shank of this invention;

FIG. 7 is a side view of a mounting pin according to the invention;

FIG. 8 is an end view of FIG. 7; and

FIG. 9 is a cross-sectional view taken along line 9—9 of FIG. 5.

Referring more particularly to the drawings, reference numeral 12 indicates a ripper shank that has a straight portion 14 in which is formed a series of holes 16 for attaching the shank to a vehicle. Because the mechanism for attaching the shank to the vehicles forms no part of present invention, such mechanism will not be described in detail, it being sufficient to know that FIG. 1 represents the approximate position of the shank in its operative position on a vehicle. Below straight portion 14 the shank includes a curved portion 18 at the lower extremity of which is a nose 20. A tooth 22 has a cavity 24 that engages nose 20; tooth 22 has a point 26 that constitutes the main earth working element of the assembly. Shank 12 defines a leading surface or edge 28 at curved portion 18 which according to the present invention is protected by a wear plate 30. In use the shank is moved through the earth in a direction indicated by arrow 32 in FIG. 1, as a consequence of which wear plate 30 and tooth 22 are subjected to abrasive and compressive forces.

Nose 20 is of generally truncated pyramidal shape formed by a leading face 34, a trailing face 36, and opposed lateral faces 38 and 40. The faces diverge rearwardly from an end face 42. As can be seen from FIG. 6, nose 20 includes a base flange 44 that is larger than the base of the pyramidal structure thereby defining an abutment 46 against which tooth 22 bears. Abutment 46 defines upper and lower slots 48 for receiving complementary rearwardly extending ribs 50 on tooth 22. Slots 48 and ribs 50 cooperate to reduce relative movement between the tooth and the shank. Flange 44 has one or more undercuts 51 to admit a driving tool for expediting removal of tooth 26 from nose 20.

For further reducing such relative movement nose 20 has projecting from lateral faces 38 and 40 wedge shaped shoulders 52, shown most clearly in FIG. 6. Each of the shoulders has a lateral face 54 which faces are parallel to one another and parallel to the direction of forward movement as designated by arrow 32 in FIG. 1. The forward portion of the shoulder includes a surface 56 that diverges from end face 42 to lateral face 54. At the rear, lateral face 54 of shoulder 52 meets or intersects lateral faces 38 and 40 of nose 20 in a smooth, discontinuity-free manner as indicated at 58. Finally, each shoulder includes upper and lower faces 60 and 62 which are parallel with one another. As shown in FIG. 1, shoulders 52 occupy approximately one-half the surface area of lateral faces 38 and 40.

FIGS. 3 and 9 indicate that cavity 24 of tooth 22 has laterally opposed depressions 64 which are complementary with shoulders 52 so that when the tooth is in place on nose 20 the surfaces of shoulder 52 engage the walls of depression 64 to position firmly the tooth on

the nose. (In FIG. 9, for the purposes of clarity only, a small space is shown between nose 20 and the walls of cavity 24; such space is nonexistent when the tooth is engaged on the nose.) Moreover, cavity 20 includes rearwardly diverging faces that are complementary with surfaces 34, 36, 38, and 40 of nose 20 so that substantially complete contact between the wall of the cavity and the outer surface of nose 20 exists when the tooth is in place.

For retaining the tooth in such position, nose 20 is provided with a cross bore 66 which extends between surfaces 54 of shoulders 52. Within cross bore 66, and preferably midway between faces 54, is an annular depression 68 that is concentric with cross bore 66 and of a larger diameter. Tooth 22 has a bore 70 through the opposite side walls thereof that registers with bore 66 when the tooth is in place on nose 20. A retaining pin 72 is provided for extending through bores 70 and bore 66 to retain the tooth on the nose.

As seen in FIGS. 7 and 8, retaining pin 72 is formed of two substantially identical halves 74 and 76, each of which has a semicylindric main body portion that has a radius of curvature approximating that of the inner wall of bore 66 and bore 70. Midway between the ends of pin 72 each of the segments has a shoulder 78; shoulders 78 are formed to engage annular depression 68 within bore 66 to retain the pin in place. The ends of pin segment 74 and 76 are tapered as at 80 to simplify insertion on the pin. Between pin segment 74 and 76 and joined thereto is a resilient body 82 formed of rubber or the like which is compressed when the pin is installed in bore 66 so as to urge shoulders 78 into annular depression 68. The pin is foreshortened so that the length thereof is somewhat less than the width of tooth 26. Accordingly, the ends of the pin reside inside the outer surface of the tooth whereby wear on the pin is avoided. Such foreshortening of the pin is possible because shoulders 78, which act to retain the pin within bore 66, are positioned between the ends of the pin.

Leading edge 28 of shank 12 is subject to substantial abrasive forces as the shank is moved through the earth, and to avoid premature failure of the shank, a wear plate 30 is provided for protecting the shank from such forces. The earth contacting side of the wear plate includes a central knife edge 84 from which diverge rearwardly and laterally bearing faces 86*a* and 86*b*. Opposite the bearing faces of the wear plate, a slot 88 is formed which extends throughout the length of the wear plate and has a width equal to the thickness of shank 12. Consequently the wear plate defines skirt walls 90 that overlie the lateral faces of the shank. At the inner portion of slot 88 is formed one or more depressions 92 each of which is shaped complementarily with projections 94 that are integral with an extend from the forward edge of shank 12. Each projection is formed to define a recess or groove 96 which receives a shoulder 98 that is disposed between slot 88 and depression 92. Thus, forces on the wear plate tend to urge shoulder 98 more firmly into groove 96 thereby to retain the wear plate in place even under severe loads.

For preventing inadvertent removal of the wear plate, skirt walls 90 are formed with aligned bores 100 which register with a bore 102 that is formed in a web 104 at the side of projection 94 opposite groove 96. Bore 102 has formed therein an annular recess 106 which is identical in shape and function with annular recess 68 described hereinabove in connection with FIG. 6.

The present invention affords smooth transition between the outer surface of tooth 22 and the outer surface of wear plate 30 to avoid areas of stress concentration. In this connection, tooth flange 44 (see FIG. 6) has a portion of reduced width 108 so that, as can be seen in FIG. 5, skirt walls 90 of the wear plate extend down over and cover the upper portion of the flange. Thereby, the lateral surfaces of the wear plate are behind and do not protrude beyond the lateral faces of tooth 26. The upper or leading edge of the wear plate is identified by reference numeral 110; the forward extremity of the wear plate resides behind the rear extremity of tooth 26 as can be seen in FIG. 5. The leading edge 110 diverges upwardly rearwardly from the forward extremity at an acute angle with respect to the leading edge 28 of the shank so as to form a smooth transition between the tooth surface and the wear plate surface and to avoid creation of a region of severe wear. Moreover, the provision of such acute angle minimizes the resistance to forward movement caused by the transition from the tooth surface to the wear plate surface.

Thus it will be seen that the present invention provides an improved structure for removably attaching wearing parts to a ripper shank. Practice of the invention affords longer life because the forces applied to the parts during use tend merely to join the respective parts more firmly and intimately. The foregoing is achieved without sacrificing rapid and convenient replacement of such parts.

Although one embodiment of the invention has been shown and described, it will be apparent that other adaptations and modifications can be made without departing from the true spirit and scope of the invention.

What is claimed is:

1. In combination with a ripper shank having an earth working tip and a leading edge above the tip, an improved wear plate for protecting said leading edge comprising a rigid body shaped to overlie said leading edge, said body defining a slot for receiving therein said leading edge and having an earth contacting surface opposite said slot, at least one projection projecting from said leading edge, a depression within said slot for receiving said projection, said projection and said depression including means for preventing movement of the wear plate axially of said shank in a direction away from said tip and for permitting movement of the wear plate in an opposite direction, said projection including an apertured web opposite last said means, said wear plate having a portion within said slot for receiving said web, and a cross bore that registers with the web aperture when the wear plate is in place on said leading edge, said cross bore terminating in the exterior surface of said wear plate remote from said earth contacting surface, and a retaining pin extending through said bore and said aperture for retaining said wear plate on said shank.

2. The invention of claim 1 wherein said wear plate includes a front axial extremity, said front axial extremity of said wear plate residing adjacent said tip, said extremity including an earth contacting surface that diverges upward and rearward at an acute angle.

3. The invention of claim 1 wherein said retaining pin is defined by two substantially identical semicylindric halves and a resilient body disposed between said halves for biasing said halves diametrically outward, said halves each including intermediate the ends thereof a radially outwardly projecting shoulder, said apertured web having an annular depression therein for receiving said shoulders so as to retain said retaining pin in said bore.

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