United States Patent

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[54] **REPLACEABLE RIPPER TIP ASSEMBLY**
7 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **172/719,** 37/142, 172/753, 306/1.6
[51] **Int. Cl.** **A01b 23/02**
[50] **Field of Search** ..... 172/719, 700, 699, 753, 772, 769; 306/1.5, 1.6; 37/142, 142(R)

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ABSTRACT: A replaceable ripper tip assembly for mounting on a shank comprising a socketed ripper tip disposed on a tapered end of the shank, a load member surrounding the shank, abutting the tip below the shank and interlocking with the tip above the shank, and a shin guard disposed on a forward portion of the shank above the tip and load member. The load member provides rapidly and simply replaceable means for effectively transferring ripping forces from the tip to the shank.

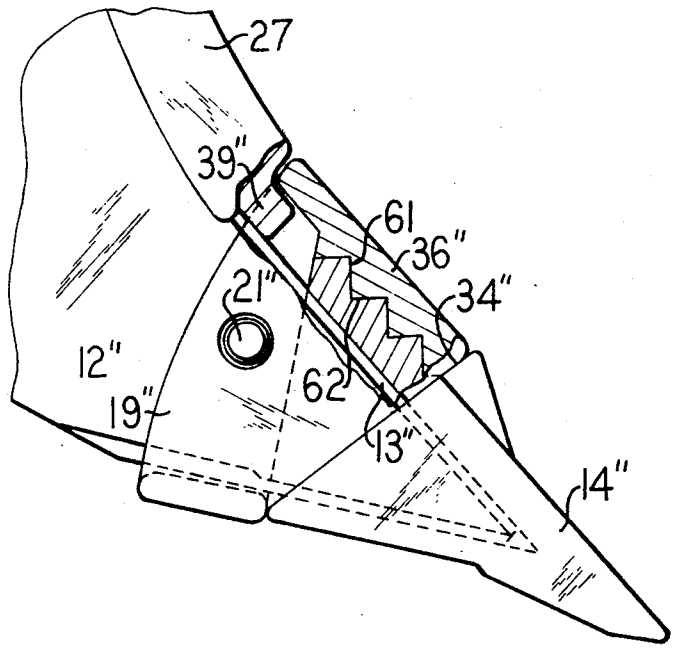

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Fig. 1.

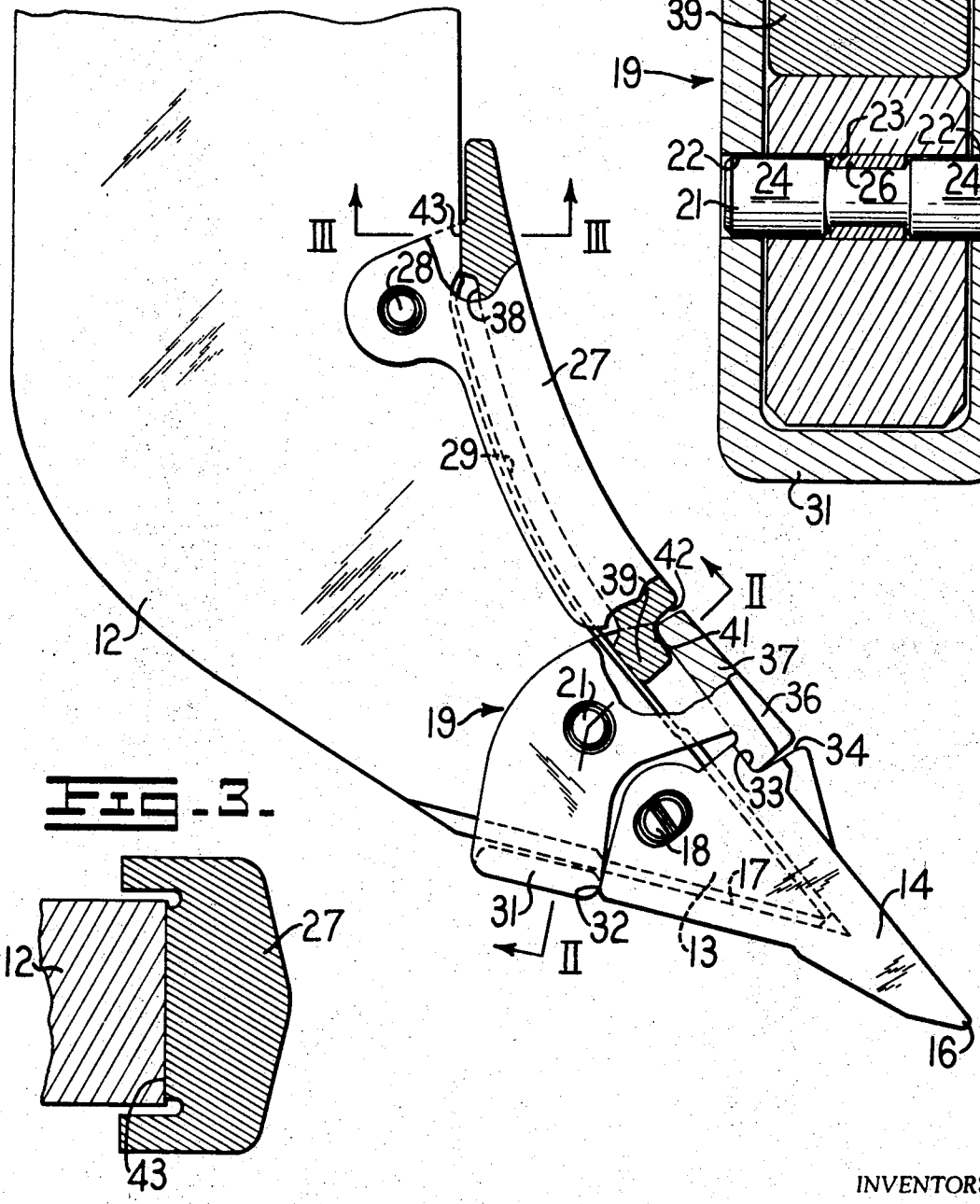

Fig. 2.

Fig. 3.

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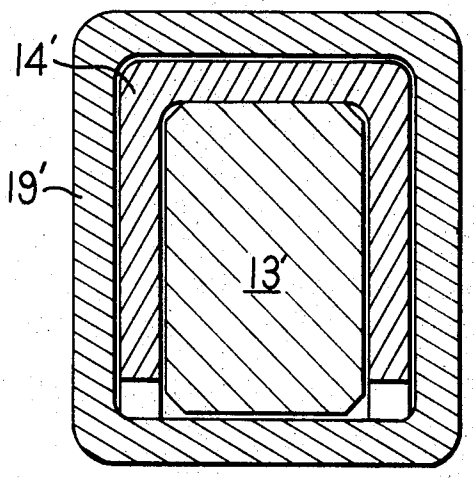

Fig. 5.

Fig. 4.

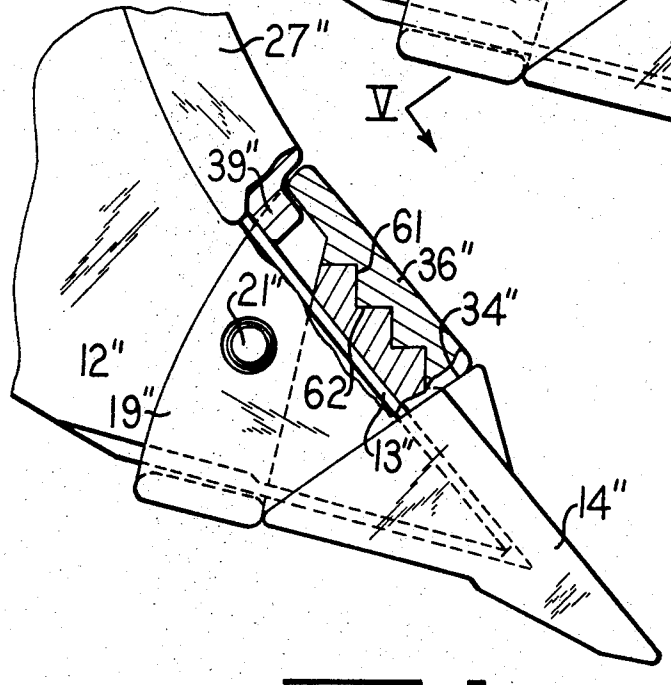

Fig. 6.

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REPLACEABLE RIPPER TIP ASSEMBLY

CROSS REFERENCE TO RELATED U.S. PATENTS

The present invention has certain functions similar to those described in our assignee's U.S. Pat. No. 3,254,727 of E. L. Helton et al., entitled "Earth Ripping Apparatus" and issued June 7, 1966.

Ripper tips carried by shanks on suitable machines are commonly secured to the shanks in a replaceable manner. This is desirable since, although the tips are made of specially hardened metals, they tend to wear away rapidly from ripping interaction with earth, rocks and the like. It is also known to employ a replaceable guard, referred to as a shin guard, over portions of the shank which would otherwise tend to wear away during ripping operations. Thus, the worn ripper tip and guard can be simply and economically replaced on the same shank. The substantial prior art in this area is indicative of efforts to properly secure the replaceable ripper tip on the shank to withstand the heavy ripping loads encountered by the tip and transferred to the shank. The patent cited above illustrates one means of replaceably securing the ripper tip to the shank while providing for transferral of ripping forces from the tip to the shank. In that design, a socketed tip is replaceably secured upon a forwardly and downwardly extending tapered portion of the shank by a transverse pin in a generally horizontal position. To prevent pivotal motion of the tip about the forward end of the tapered portion of the shank and provide for better transfer of ripping forces to the shank, a shin guard is pinned to the shank and interacts with a rearward surface of the tip above the shank to resist upward motion of the tip. Similarly, a stop block is welded to the bottom of the shank so that it interacts with a rearward surface of the tip below the shank to resist downward motion of the tip. Although the above type of ripper tip assembly has proven satisfactory in use, the welded stop is subject to cracking or breakage as well as mechanical wear. Welding equipment necessary for its installation tends to complicate and increase repair time necessary for its replacement.

The present invention simplifies necessary replacement of the ripper tip assembly and provides still greater strength as well as economy for those components.

Accordingly, it is an object of the invention to provide a ripper tip assembly which has the advantages discussed above while providing for simple, rapid and economical replaceability of its component parts.

It is another object of the invention to provide for more uniform transferral of force from the tip to the shank by means which reduce the possibility of breakage and bending and thus increase reliability. In particular, a single replaceable load member transfers ripping forces from the tip to the shank and resists pivotal motion of the tip upon the tapered shank.

It is still another object to eliminate the use of components such as stops which must be secured to the shank as by welding. Welding increases time and expense of replacing components which are subject to substantial wear and undesirably tends to cause stress concentrations at the weld joint.

It is a further object to provide for separate replacement of component portions of the ripper tip assembly according to the rate of wear of the portions. In the present invention, a load bearing member adjacent the tip is subject to greater wear than the shin guard. Accordingly, the two components are formed as separate parts.

It is a further object of the present invention to secure the ripper tip upon the shank in a manner providing for greater strength in the shank and ripper tip assembly. One embodiment contemplates securing of the tip on the shank by forwardly overlapping relation of the load member thereto so that the need for a pin through the narrow portion of the shank is eliminated.

Other objects and advantages are made apparent in the following description, having reference to the accompanying drawings, wherein:

FIG. 1 is a side view of a ripper tip assembly mounted on a shank and having portions broken away to illustrate its construction according to the present invention;

FIGS. 2 and 3 are views taken along section lines II–II and III–III respectively of FIG. 1;

FIG. 4 is a side view, with parts broken away, of an alternate ripper tip assembly;

FIG. 5 is a view taken along section lines V–V of FIG. 4; and

FIG. 6 is a side view, with parts broken away, of a modification of the ripper tip assembly of FIG. 4.

A ripper tip and guard assembly **11**, according to the present invention is replaceably mounted upon a shank **12** as shown in FIG. 1, which is carried by a suitable machine such as a tractor (not shown) in a conventional manner. The shank **12** is of a conventional shape having a tapered end portion **13** projecting generally forwardly and downwardly. The ripper tip assembly **11** has a generally conventional ripper tip **14** having a cutting edge or point **16** and a tapered socket **17** for receiving the tapered end portion **13** of the shank. The ripper tip **14** is replaceably secured upon the shank by a suitable pin **18**. To transfer ripping forces from the tip to the shank while providing for rapid and simple replacement of all component parts subject to wear, as discussed in greater detail below, a load member **19** encircles the shank behind the tip. Referring momentarily to FIG. 2 as well, the load member is replaceably secured upon the shank by a suitable load bearing pin **21** passing through respective bores **22** and **23** in the load member and shank. The pin **21** has portions **24** of large cross section which extend between the bores **22** and **23** to withstand shear forces and resist failure. The pin **21** has spreader means **26** to resist axial movement of the pin in its bores. A shin guard **27** is replaceably secured to the shank above the ripper tip and load member by a pin **28** to reduce wear on the forward surface **29** of the shank during ripping operation.

The present invention resides particularly in the configuration of the tip **14** and load member **19** and the manner in which they cooperate to transfer ripping forces from the tip to the shank. As the shank and ripper tip assembly are employed for ripping, surfaces of the ripper tip **14** are subject to greatest wear while greater wear occurs in the region of the load member **19** than upon the surfaces of the shin guard **27** of the assembly. To permit economical replacement of worn components without having to simultaneously replace other components portions which are still usable, the tip **14**, member **19** and guard **27** are formed separately.

While providing these components as separate parts, they are configured to advantageously cooperate with each other for transferral of ripping forces from the tip **14** to the shank so that bending and breaking of the shank, particularly its tapered portion **13**, and the replaceable components is reduced. Ripping forces act upon the tip **14** in a number of ways. The force components which are more difficult to resist and which are the greatest cause of damage are those which tend to pivot the tip **14** about the forward end of the tapered shank. It is undesirable to transfer ripping forces from the tip **14** directly to the tapered portion **13** of the shank because its relatively small cross section makes it particularly susceptible to bending or breaking. Further, if the pin **18** has a sufficiently large cross section to resist shearing forces, a large bore would be required in the tapered shank portion **13** making it still further susceptible to failure.

Accordingly, the load member **19** is designed to cooperate with the tip to transfer such forces into generally rearward portions of the shank which are of greater cross section and thus more resistant to failure. The load member **19** which encircles the shank and is secured thereto by the load bearing pin **21** has a portion **31** spanning the bottom of the shank and acting as a stop for the tip. The stop **31** is arranged for abutment with a rearward surface **32** of the ripper tip below the shank. The ripper tip also has rearwardly facing stepped surfaces **33** and **34** generally at its rearward termination above the shank. The load member has a forward projection **36**

above the shank which generally mates and interlocks with the stepped surfaces of the tip. As noted above, ripping forces are substantially transferred from the tip to the shank through the load bearing pin **21**. However, ripping forces which tend to pivot the tip **14** against the portion **31** or projection **36** of the load member are at least partially transferred to the shank directly through those portions of the load member. For example, when the tip tends to be pivoted downwardly or in a clockwise direction in FIG. **1**, it engages the portion **31** of the load member which is urged against the shank and acts as a stop for the tip. Upward or counterclockwise pivotal motion of the tip is similarly resisted by the projection **36** of the load member.

A portion **37** of the load member, which spans the top of the shank and supports the projection **36**, is spaced apart from the shank. The rear surface of the shin guard **27** is spaced apart from the shank. A projection **39** at the forward, lower end of the guard rests upon the shank and forms forwardly stepped surfaces **41** and **42** which generally mate with the portion **37** of the load member. Thus, the load member secures the lower end of the shin guard upon the shank and obviates the need for a second retaining pin in the guard. The present invention accordingly provides a load member which is readily replaceable, apart from the tip and shin guard, and effectively performs the functions of transferring ripping forces to the shank and resisting pivotal motion of the ripper tip.

An alternate embodiment of the ripper tip and shin guard assembly is illustrated in FIGS. **4** and **5** as having a generally similar ripper tip **14'**, load member **19'** and shin guard **27'** separately replaceable on a shank **12'**. The tip **14'**, member **19'** and guard **27'** cooperate in a generally similar manner as described above with respect to FIG. **1**. However, they are modified with at least the particular purpose of providing greater strength in the tapered shank position **13'** which is most susceptible to failure because of its relatively small cross section. The tip has rearwardly facing stepped surfaces **33'** and **34'** which tend to mate and interlock with a projection **36'** of the load member in a generally similar manner as described for the embodiment of FIGS. **1—3**. However, the tip extends rearwardly of the surfaces **33** and **34** to be partially surrounded by the load member **19'** which is suitably formed to receive that portion of the tip. A projection **51** at the rearward end of the tip above the shank forms a forwardly stepped surface **52**. The load member **19'** is suitably recessed, as at **53**, to receive and forwardly overlap the projecting portion **51** of the tip. By this arrangement, the load member serves the additional function of retaining the tip in place upon the shank. The necessity for a retaining pin (such as at **18** in FIG. **1**) extending through the tip **14'** and the tapered shank portion **13'** is eliminated.

A modification of the embodiment of FIGS. **4** and **5** is illustrated in FIG. **6** as having a similar tip **14''**, load member **19''** and guard member **27''** mounted on the shank **12'**. However, instead of the single projection **51** and single forward surface **52** (see FIG. **4**), the tip has a series of forwardly stepped surfaces **61** generally in a sawtooth configuration. The load member **19''** is recessed as at **62**, in a similar sawtooth fashion to generally mate and interlock with the surfaces **61** to retain the tip in place. A particular advantage of the sawtooth configuration is to provide for substantially more uniform cross-sectional area in adjacent portions of both the tip and the load member to further strengthen those parts.

We claim:

1. A ripper tip assembly for mounting on a suitable shank having a tapered end projecting forwardly and downwardly, comprising:

a ripper tip having a socket substantially larger than the tapered shank end, the ripper tip being mounted on the shank end by means of its socket, the tip having a rearward portion above the shank forming a rearwardly facing stepped surface, the tip also having a rearwardly facing surface below the shank;

a load member encircling the shank behind the ripper tip, the load member being replaceably and pivotally secured to the shank by a load bearing pin, the load member having a projection interlocking in overlapping relation with the rearwardly facing stepped surface on the tip, the load member also having a poriton spanning the bottom of the shank for abutting engagement with the rearwardly facing surface of the tip below the shank, the load member being substantially free for pivotal motion about the load bearing pin when it is in engagement with the two rearwardly facing surfaces on the tip; and

a separate guard member replaceably secured to the shank above the load member.

2. The assembly of claim **1** wherein the load member at least partially secures the guard member upon the shank.

3. The assembly of claim **2** wherein a forward projection on the guard member is overlapped by the load member above the shank.

4. The assembly of claim **1** including means for interlocking the load member and ripper tip to resist forward movement of the tip therefrom.

5. The assembly of claim **4** wherein said means comprises a portion of the tip extending rearwardly of its stepped surface and having a projection to extend into a recess formed by the load member so that the load member is in forwardly overlapping relation to the rearwardly extending tip portion, the load member being suitably formed to receive the rearwardly extending tip portion.

6. The assembly of claim **5** wherein the projection on the rearwardly extending tip portion has a sawtooth configuration and the recessed surface of the load member is of a sawtooth configuration to generally mate and interlock with the tip.

7. The assembly of claim **1** further comprising a retaining pin commonly penetrating the tip and shank for resisting forward motion of the tip on the shank.