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(54) **TIP AND ADAPTER ASSEMBLY**

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(57) **ABSTRACT**

A wear member for use with an adapter of an earthworking implement is provided. The wear member comprises a body having a pocket adapted to receive the adapter. The pocket has a mouth, a frontal portion, a top wall, a bottom wall, and a pair of side walls, and each top wall and bottom wall are conjoined to a respective side wall by a curvilinear corner each having a radius increasing in size from said frontal portion to the mouth.

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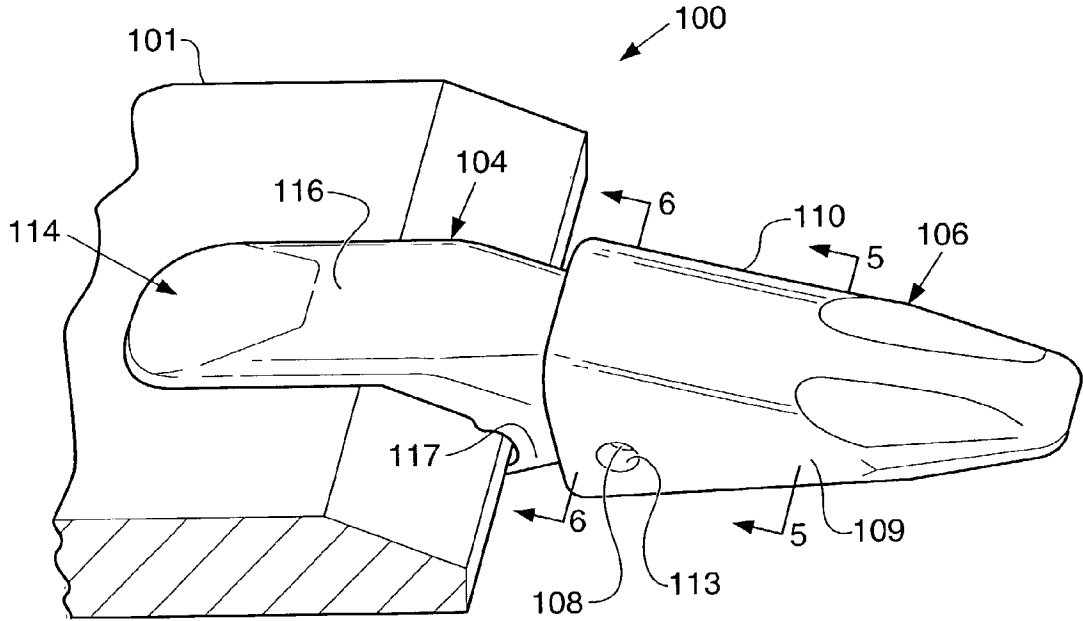


FIG. 1.

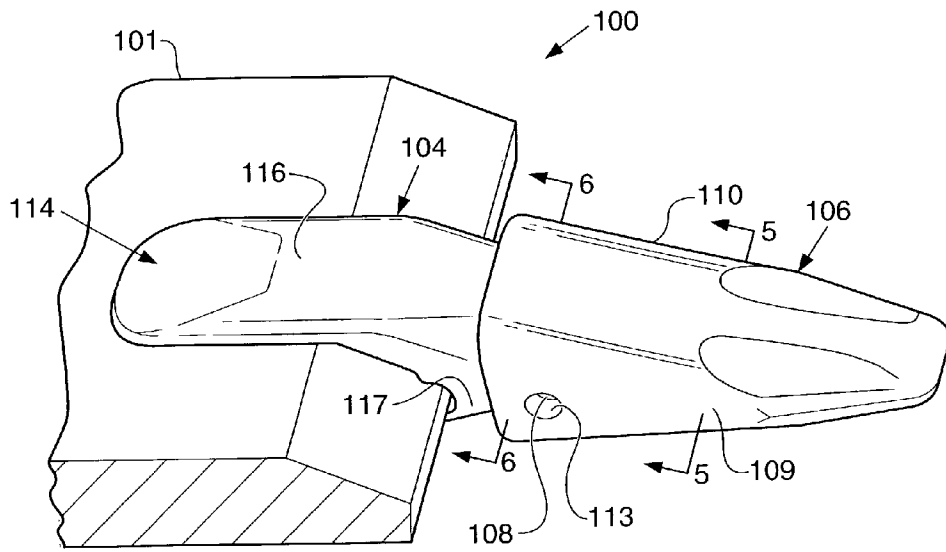


FIG. 2.

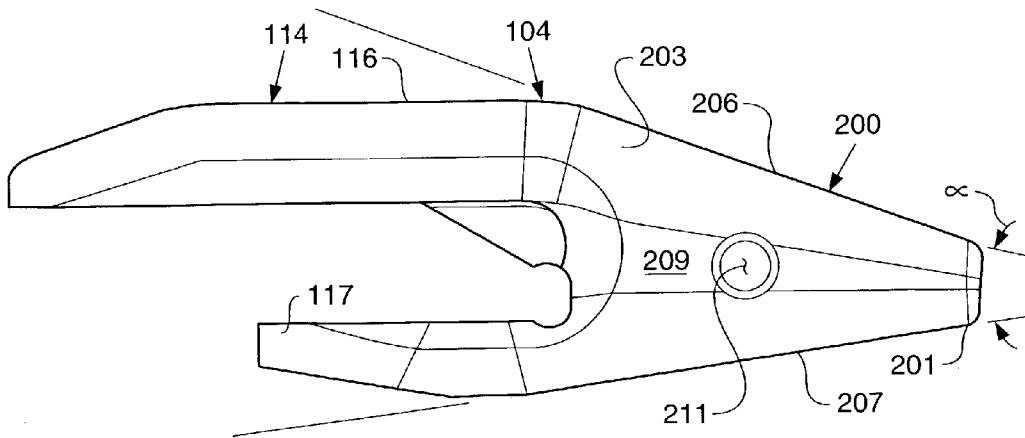


FIG - 3 -

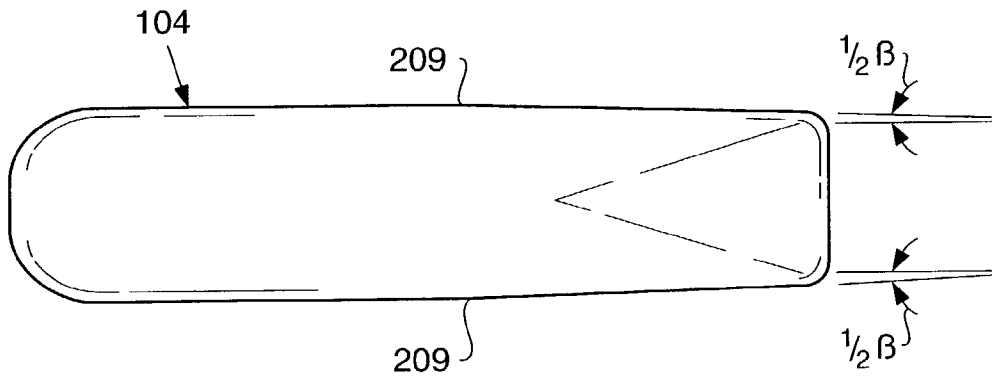


FIG - 4 -

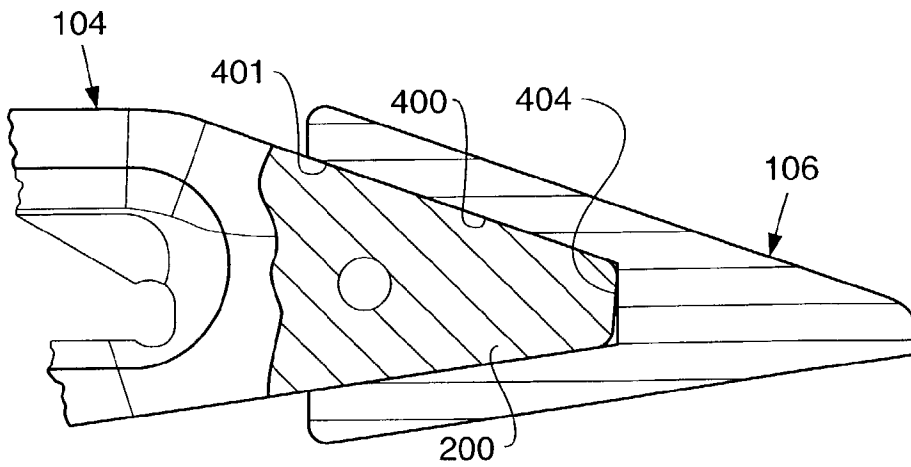


FIG. 5

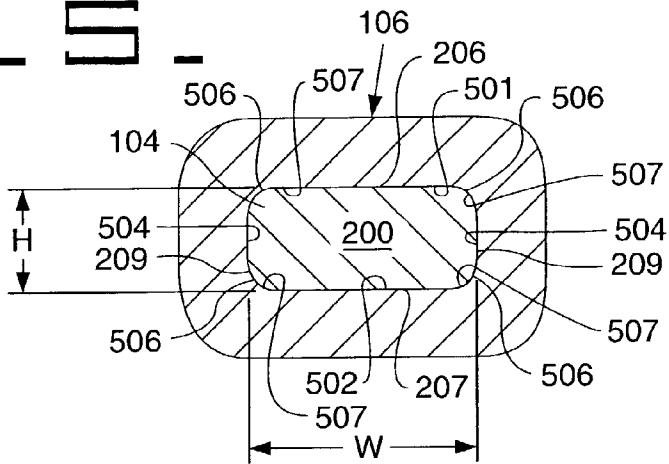


FIG. 6

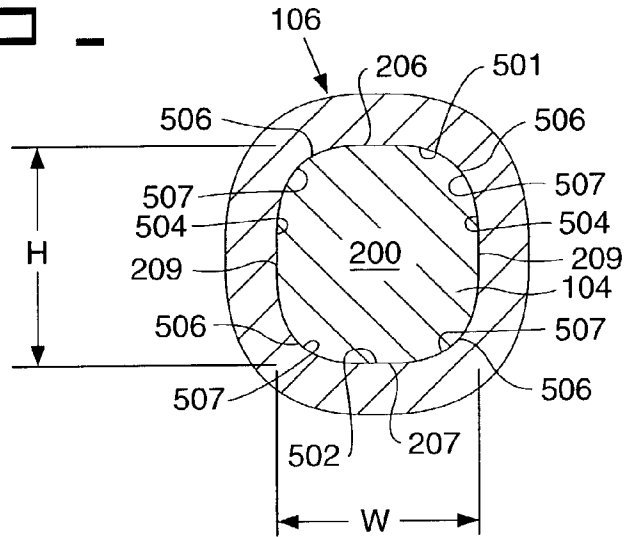
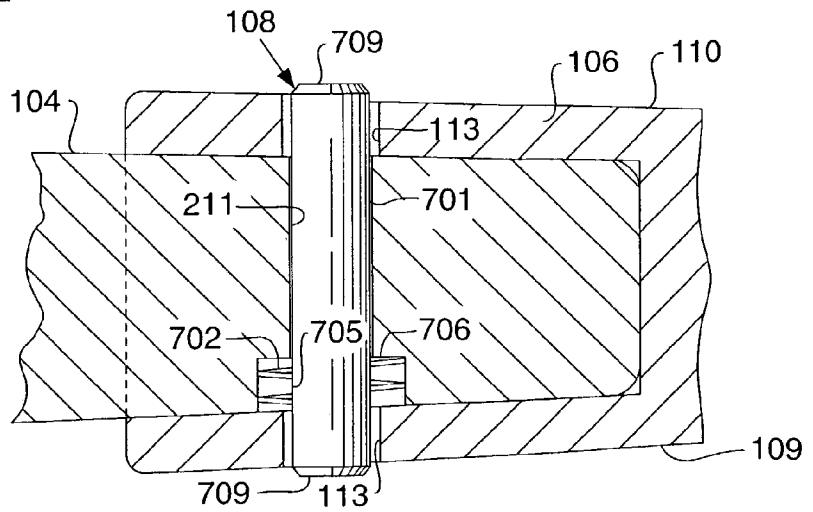


FIG. 7



TIP AND ADAPTER ASSEMBLY

TECHNICAL FIELD

[0001] This invention relates generally to a tip and adapter assembly for an earthworking bucket and the like and, more particularly, to a novel interface between the tip and the adapter.

BACKGROUND

[0002] Earthworking implements, such as buckets for loaders and excavators commonly employ replaceable tips or teeth that engage the earth being worked or materials being excavated or loaded. Because of the highly abrasive materials encountered, bucket tips wear out rapidly and need to be replaced in order to protect the parent material of the bucket and to keep the bucket working at peak efficiency. Bucket tips are typically mounted on mounting structures referred to as adapters and are frequently subjected to high impact and prying forces that must be transferred from the tip to the adapter. To accomplish this, the adapter has a mounting nose that is received into a pocket of the tip. However if the forces acting on the tip become so great as to cause either the tip or adapter to break, it is more desirable to have the tip break, rather than the adapter as the adapter is more costly and more time consuming to replace.

[0003] The forces and impact loads on the tip also cause wear between the mating surfaces between the pocket of the tip and the mounting nose of the adapter. Therefore, it is also desirable to provide a tip/adapter interface with adequate load carrying surfaces to minimize such wear and to extend the usable life of both the tip and adapter as a result of such wear. While it is desirable to minimize such wear on the adapter, it cannot be completely eliminated. In addition, such wear is not readily apparent as the adapter nose is hidden from view due to being encased within the pocket of the tip. If too much wear occurs on the interface surfaces, the tip becomes exceedingly loose and wear between the tip and adapter interface surfaces accelerates and frequently results in premature tip failure or the loss of the tip from the adapter.

[0004] Furthermore, many known tip assemblies include a tip and an adapter wherein the tip has rearwardly extending ears and the adapter has corresponding slots to receive the ears of the tip. Even though the ears aid in the control of forces being subjected to the tip by transferring such forces to the adapter, various type of loads have a tendency to bend the ears of the tip outwardly, thus, subjecting the ears to breakage.

[0005] The present invention is intended to overcome one or more of the problems set forth above.

SUMMARY OF THE INVENTION

[0006] In accordance with an embodiment of the present invention, a wear member for use with an adapter of an earthworking implement is provided. The wear member comprises a body having a pocket adapted to receive the adapter. The pocket has a mouth, a frontal portion, a top wall, a bottom wall, and a pair of side walls, and each top wall and bottom wall are conjoined to a respective side wall by a curvilinear corner each having a radius increasing in size from said frontal portion to the mouth.

[0007] In accordance with another embodiment of the present invention, a wear member and adapter assembly is

provided. The assembly comprises an adapter having a rear mounting portion and a nose portion having a nose frontal portion. The assembly also comprises a wear member having a pocket sized to matingly engage the nose portion. The pocket includes a mouth and a frontal portion. A retainer device adapted to detachably retain the wear member on the adapter is also provided. The assembly is such that the engagement of the pocket and the nose portion defines a boundary having a plurality of curvilinear corners increasing in size from the nose frontal portion to the mouth.

[0008] In accordance with yet another embodiment of the present invention, a wear member for use with an adapter of an earthworking implement is provided. The wear member comprises a body having a pocket adapted to receive the adapter. The pocket has a mouth, a frontal portion, a top wall, a bottom wall, and a pair of side walls. The top wall and the bottom wall diverge away from each other from the frontal portion to the mouth at an included angle within a range of about 20 degrees to about 45 degrees; and the side walls diverge away from each other from the frontal portion to the mouth at an included angle within a range of from about 0 degrees to about 45 degrees.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is perspective view of a tip and adapter assembly embodying the principles of the present invention;

[0010] FIG. 2 is a side elevation view showing the adapter of FIG. 1;

[0011] FIG. 3 is a top view of the adapter of FIG. 1;

[0012] FIG. 4 is a partial cross sectional view showing the tip attached to the adapter;

[0013] FIG. 5 is a cross section taken along line 5-5 of FIG. 1;

[0014] FIG. 6 is a cross section taken along line 6-6 of FIG. 1; and

[0015] FIG. 7 is a partial cut-away view showing the retainer coupling the tip to the adapter.

DETAILED DESCRIPTION

[0016] Referring to the drawings, an exemplary embodiment of the present invention is disclosed in FIGS. 1-3 where a wear member or bucket tip and adapter assembly is shown at 100 attached to a bucket cutting edge 101 of an earthworking bucket (not shown). The tip and adapter assembly 100 includes an adapter 104, a bucket tip 106 and a retaining device 108 for detachably retaining the tip 106 onto the adapter 104. The tip 106 comprises a body having a first side 109 and a second side 110 each having a respective opening 113 (one shown in FIG. 1) sized to receive the retaining device 108. The adapter 104 comprises a body having a rear mounting portion 114, adapted for mounting the adapter 104 to the bucket cutting edge 101, and includes a top strap 116 and a bottom strap 117. With reference to FIG. 2, the adapter 104 further includes a nose portion 200 for receiving the bucket tip 106. The nose portion 200 comprises a frontal nose portion 201 and a rear nose portion 203 that terminates adjacent the rear mounting portion 114.

[0017] The nose portion 200 has a top surface 206, a bottom surface 207 and a pair of side surfaces (one of which

is shown at 209 in FIG. 2). Each of the top and bottom surfaces 206, 207 comprise substantially planar surfaces having an included angle α of between 20 and 45 degrees. In an embodiment of the present invention, the included angle α is about 30 degrees. As is further shown, the adapter 104 includes a traverse bore 211 sized to receive the retaining device 108 and is located to be substantially aligned with openings 113 when the tip 106 is coupled to the adapter 104. With reference to the FIG. 3 top view, the respective side surfaces 209 also comprise substantially planar surfaces that are formed to have an included angle β of between 0 and 45 degrees. In an embodiment of the present invention, angle β is about 4 degrees. As should be appreciated by those of ordinary skill in such art, by forming substantially planar respective top, bottom and side surfaces 206, 207 and 209, stress concentration which may arise by virtue of abrupt changes in the cross section of the nose portion 200 may be avoided. Furthermore, by providing these surfaces as continuous surfaces a more uniform load distribution acting on the nose portion 200 may be realized which may extend the useful life of the adapter 104.

[0018] With reference to FIGS. 4-6, shown in cross section are a plurality of views showing the interface or boundary between the tip 106 and the nose portion 200. The tip 106 includes a pocket 400 adapted to matingly engage the nose portion 200 and includes a pocket mouth 401 and a frontal portion 404. With reference to FIG. 5, shown in cross-section is the interface between the tip 106 and adapter 104 at a location adjacent the frontal nose portion 201. The pocket 400 includes a top wall 501, a bottom wall 502 and a pair of side walls 504. Each of the aforementioned walls 501, 502 and 504 are arranged to have substantially the same geometry as nose portion 200; therefore, the aforementioned description of the geometry of the nose portion 200 applies to the pocket 400 as well. Specifically, an arrangement in which the top wall 501 and the bottom wall 502 diverge away from each other from the frontal portion 404 to the mouth 401 at an included angle within a range of from about 20 degrees to about 45 degrees. In an embodiment of the present invention, the included angle is about 30 degrees. And, an arrangement in which the side walls 504 diverge away from each other from the frontal portion 404 to the mouth 401 at an included angle within a range of about 0 degrees to about 45 degrees. In an embodiment of the present invention, the angle is about 4 degrees.

[0019] With further reference to FIGS. 5 and 6, for purposes of the following discussion, the designation of "H" in the Figures will refer to the term "height", and the designation "W" will refer to the term "width". The nose portion 200 is formed such that the ratio of the height to width at the frontal nose portion 201 is between about 30 percent to about 75 percent. In an embodiment of the present invention, the ratio is about 40 percent. Furthermore, because of the aforementioned mating engagement between the nose portion 200 and the pocket 400, the frontal portion 404 of the pocket 400 has a frontal portion height that is between about 30 percent to about 75 percent of the frontal portion width. In an embodiment of the present invention, the frontal portion height is about 40 percent of the frontal portion width. With reference to the FIG. 6 cross sectional view taken at a location corresponding to the rear nose portion 203, the nose portion 200 has a height that is between about 75 percent to about 170 percent of the width of the nose portion 200 at the rear nose portion 203.

Likewise, the mouth 401 of the pocket 400, which lies adjacent to the rear nose portion 203 when the tip 106 is coupled to the adapter 104, has a pocket mouth height that is about 75 percent to about 170 percent of the width. In an embodiment of the present invention, the pocket mouth height is about 110 percent of the pocket mouth width.

[0020] Also as shown, the respective top and bottom surfaces 206, 207 of the nose portion 200 are each conjoined to a respective side surface 209 by curvilinear corners 506 each having a radii that increase in size generally linearly from said frontal nose portion 201 to a location adjacent the rear nose portion 203. In an embodiment of the present invention, each radii adjacent the frontal nose portion 201 is about 50 percent of the height of the frontal nose portion 201 and about 33 percent of the height of the rear nose portion 203, as shown in FIG. 6. As is further shown, the pocket 400 likewise is provided with corresponding curvilinear corners 507 sized to matingly engage curvilinear corners 506. As should be appreciated by those of ordinary skill in such art, by utilizing matching curvilinear corners on the pocket 400 and nose portion 200, these corresponding areas may be less susceptible to wear. As should be appreciated, the provision of such large radii provides for a sleeker appearance than otherwise would be realized.

[0021] FIG. 7 shows the details of the retaining device 108 of the present invention shown coupling the tip 106 and adapter 104. The retaining device 108 includes an elongate pin 701 sized for receipt within the traverse bore 211, and a retainer 702 that is used to detachably retain the pin 701 within the traverse bore 211. The retainer 702 is shown comprising a metallic spring having a central passage 705 sized to frictionally engage the pin 701. It is contemplated, however, that other materials may be used to form the retainer 702 such as, for example, an elastomeric material having sufficient "give" to allow passage of the pin 701 yet also provide the necessary frictional engagement with the pin 701 sufficient to retain the pin 701 in the traverse bore 211. A recess 706, sized to receive the retainer 702, is provided on the adapter 104 and is substantially concentrically located with respect to the traverse bore 211.

[0022] In use, the retainer 702 is placed within the recess 706 and the tip 106 is inserted onto the adapter 104. The pin 701 is then threaded through the opening 113 from either the first or second side 109, 110 of the tip 106, is driven through the traverse bore 211, and forced through the central passage 705 of the retainer 702 until a respective end 709 of the pin 701 lies at least partially within each opening 113 of the tip 106. Because the size of the opening 113 is smaller than the size of the retainer 702, the tip 106 prevents dislodging of the retainer 702 while the pin 701 is forced through the central passage 705. It is to be understood that the retaining device 108 illustrated and described herein is exemplary only and other retaining means may be utilized without deviating from the spirit of the present invention.

[0023] Other aspects, objects and advantages of this invention can be obtained from a study of the drawings, the disclosure and the appended claims.

What is claimed is:

1. A wear member for use with an adapter of an earth-working implement, comprising:
 - a body having a pocket adapted to receive the adapter;

said pocket having a mouth, a frontal portion, a top wall, a bottom wall, and a pair of side walls; and

each said top wall and said bottom wall are conjoined to a respective side wall by a curvilinear corner each having a radius increasing in size from said frontal portion to said mouth.

2. The wear member as set forth in claim 1 wherein said pocket has a frontal portion having a frontal portion height that is between about 30 percent to about 75 percent of the frontal portion width.

3. The wear member as set forth in claim 2 wherein said frontal portion height is about 40 percent of the frontal portion width.

4. The wear member as set forth in claim 1 wherein said pocket has a pocket mouth having a pocket mouth height that is between about 75 percent to about 170 percent of a pocket mouth width.

5. The wear member as set forth in claim 4 wherein said pocket mouth height is about 110 percent of said pocket mouth width.

6. The wear member as set forth in claim 1 wherein said top wall and said bottom wall diverge away from each other from said frontal portion to said mouth at an included angle within a range of about 20 degrees to about 45 degrees.

7. The wear member as set forth in claim 6 wherein said angle is about 30 degrees.

8. The wear member as set forth in claim 1 wherein said side walls diverge away from each other from said frontal portion to said mouth at an included angle within a range of from about 0 degrees to about 45 degrees.

9. The wear member as set forth in claim 8 wherein said angle is about 4 degrees.

10. The wear member as set forth in claim 1 wherein said radii of each said curvilinear corner increases linearly from said frontal portion to said mouth.

11. A wear member and adapter assembly, comprising:

an adapter having a rear mounting portion and having a nose portion, said nose portion having a nose frontal portion;

a wear member having a pocket sized to matingly engage said nose portion, said pocket further including a mouth and a frontal portion;

a retainer device adapted to detachably retain the wear member on the adapter; and

said engagement of said pocket and said nose portion defining a boundary having a plurality of curvilinear corners increasing in size from said nose frontal portion to said mouth.

12. The wear member and adapter assembly as set forth in claim 11 wherein

said wear member has a top surface and a bottom surface;

said adapter has a top wall structured and arranged to matingly engage said top surface thereby defining a

boundary between said top wall and said top surface, and a bottom wall structured and arranged to matingly engage said bottom surface thereby defining a boundary between said bottom wall and said bottom surface; and

each said respective boundary diverging away from each other from said frontal nose portion to said rear nose portion at an included angle within a range of about 20 degrees to about 45 degrees.

13. The wear member and adapted assembly as set forth in claim 12 wherein said angle is about 30 degrees.

14. The wear member and adapter assembly as set forth in claim 11 wherein:

said wear member has a pair of side walls;

said adapter has a pair of side surfaces each structured and arranged to matingly engage a respective side wall thereby defining a respective boundary between a said side wall and a said side surface; and

each said respective boundary diverging away from each other from said frontal nose portion to said rear nose portion at an included angle within a range of about 0 degrees to about 45 degrees.

15. The wear member and adapted assembly as set forth in claim 14 wherein said angle is about 4 degrees.

16. The wear member as set forth in claim 11 wherein said radii of each said curvilinear corner increases linearly from said frontal portion to said mouth.

17. A wear member for use with an adapter of an earthworking implement, comprising:

a body having a pocket adapted to receive the adapter;

said pocket having a mouth, a frontal portion, a top wall, a bottom wall, and a pair of side walls;

said top wall and said bottom wall diverge away from each other from said frontal portion to said mouth at an included angle within a range of about 20 degrees to about 45 degrees; and

said side walls diverge away from each other from said frontal portion to said mouth at an included angle within a range of from about 0 degrees to about 45 degrees.

18. The wear member as set forth in claim 17 wherein each said top wall and said bottom wall are conjoined to a respective side wall by a curvilinear corner each having a radius increasing in size from said frontal portion to said mouth.

19. The wear member as set forth in claim 18 wherein said radii of each said curvilinear corner increases linearly from said frontal portion to said mouth.

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