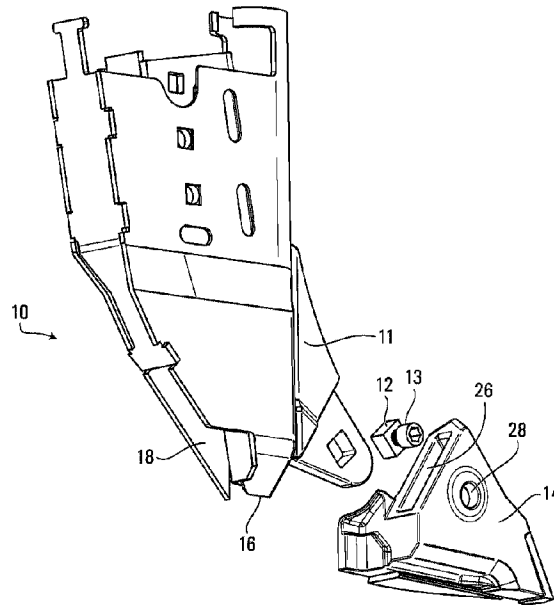




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(54) Title: SEEDING TOOL AND TIP THEREFOR



(57) **Abrégé/Abstract:**

A tip for a seeding tool is disclosed. The tip includes a knife portion and a wing portion extending rearwardly and laterally outwardly from one side of the knife portion. An underside of the wing portion includes a levelling portion configured to be parallel to ground in operation and extending laterally from an interior edge to an exterior edge of the wing portion, the interior edge extending substantially in a direction of travel of the tip in operation. An underside of the knife portion includes a recess with respect to the levelling portion, the recess extending adjacent the interior edge rearwardly until a rear edge of the knife portion. In operation, the tip creates a furrow having a first surface at a first depth formed by the recess and a second surface at a second depth formed by the levelling portion, the second depth being greater than the first depth.

**ABSTRACT**

A tip for a seeding tool is disclosed. The tip includes a knife portion and a wing portion extending rearwardly and laterally outwardly from one side of the knife portion. An underside of the wing portion includes a levelling portion configured to be parallel to ground in operation and extending laterally from an interior edge to an exterior edge of the wing portion, the interior edge extending substantially in a direction of travel of the tip in operation. An underside of the knife portion includes a recess with respect to the levelling portion, the recess extending adjacent the interior edge rearwardly until a rear edge of the knife portion. In operation, the tip creates a furrow having a first surface at a first depth formed by the recess and a second surface at a second depth formed by the levelling portion, the second depth being greater than the first depth.

## SEEDING TOOL AND TIP THEREFOR

### **FIELD**

[0001] This application relates generally to agricultural tools and in particular to a seeding tool and a tip therefor.

### 5 **BACKGROUND**

[0002] In typical seeding applications, openers are pulled through soil, creating furrows for depositing seed and fertilizer. In current multi-shoot seed openers, seed and fertilizer are placed into different bands. Starting fertilizer, such as liquid phosphorus, is delivered onto the seed or in the same band as the seed. A second band, formed to one side of the seed, receives  
10 fertilizer for later growth.

[0003] The first multi-shoot openers were higher in draft because the fertilizer was deposited much deeper than the seed. These openers have worked well, but as implement widths have increased, a lower draft opener was needed to achieve a smoother field finish. In addition, the multi- shoot openers were found to often require too much tractor horsepower to  
15 pull them through the ground. This led to the design of lower draft openers.

[0004] While lower draft openers are an improvement, there is a desire to further develop low draft openers to improve seeding, fertilization and, ultimately, crop yields.

### **SUMMARY**

[0005] According to some embodiments of the present disclosure, there is provided a tip  
20 for a multi-shoot seeding tool, the tip comprising: a knife portion; and a wing portion extending rearwardly and laterally outwardly from one side of the knife portion, wherein an underside of the wing portion comprises a levelling portion configured to be parallel to ground in operation and extending laterally from an interior edge to an exterior edge of the wing portion, the interior edge extending substantially in a direction of travel of the tip in  
25 operation, and wherein an underside of the knife portion comprises a recess with respect to the levelling portion, the recess extending adjacent the interior edge rearwardly until a rear edge of the knife portion, such that, in operation, the tip creates a furrow having a first surface at a

first depth formed by the recess and a second surface at a second depth formed by the levelling portion, the second depth being greater than the first depth.

[0005a] According to some embodiments of the present disclosure, there is provided a tip for a seeding tool having a seed outlet and a fertilizer outlet, the tip comprising: a knife portion; and a wing portion extending rearwardly and laterally outwardly from one side of the knife portion, wherein an underside of the wing portion comprises a levelling portion configured to be parallel to ground in operation and extending laterally from an interior edge to an exterior edge of the wing portion, the interior edge extending substantially in a direction of travel of the tip in operation, and wherein an underside of the knife portion comprises a recess with respect to the levelling portion, the recess extending adjacent the interior edge rearwardly until a rear edge of the knife portion, such that, in operation, the tip creates a furrow having a first surface at a first depth formed by the recess and a second surface at a second depth formed by the levelling portion, the second depth being greater than the first depth.

[0005b] According to some embodiments of the present disclosure, there is provided a seeding tool having a seed outlet and a fertilizer outlet, the seeding tool comprising a holder and a tip as described herein connectable to the holder.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0006] The foregoing summary, as well as the following detailed description of illustrative embodiments of the present application, will be better understood when read in conjunction with the appended drawings. For the purposes of illustrating the present application, there is shown in the drawings illustrative embodiments of the disclosure. It should be understood, however, that the application is not limited to the precise arrangements and instrumentalities shown. In the drawings:

[0007] Fig. 1 is an exploded perspective view of a multi-shoot seeder assembly, including a tip according to embodiments of the present disclosure.

[0008] Fig. 2 is a second exploded perspective view thereof.

[0009] Fig. 3 is a front perspective view of the tip of Fig. 1.

[0010] Fig. 4 is a second front perspective view thereof.

[0011] Fig. 5 is a bottom view thereof.

[0012] Fig. 6 is a rear perspective view thereof.

### **DETAILED DESCRIPTION**

5 [0013] In conventional side band multi-shoot seeders, seed and fertilizer are deposited into neighbouring bands, either on the same level or on different levels, i.e. at the same depth or at different depths.

[0014] Conventional ground opener and furrowing tips that permit for seed and fertilizer to be placed on different levels are considered to be high draft openers since they comprise a downwardly  
10 extending knife portion that extends into the ground further than one or two rearwardly and laterally extending wing portions, the knife portion creating the lower level band and the wing portion(s) creating the higher level band.

**[0015]** In contrast, conventional openers that are considered low draft do not have a downwardly extending knife and instead generate side-by-side bands at the same level by having the knife portion cut into the ground and spread the soil across the wing portion.

5 **[0016]** However, placing seed and fertilizer on substantially the same level increases the risk of seed burn, meaning it becomes more difficult for a farmer to apply the same amount of fertilizer than with high draft openers. Thus, there is a desire to provide a low draft side band opener tip that nonetheless forms bands at different depths for separating seed and fertilizer.

10 **[0017]** Some embodiments of the present disclosure may provide a low draft ground opener or furrowing tip intended for side band multi-shoot seed openers that forms or creates bands at different depths in the soil. Such openers may be advantageous for placing seed and fertilizer at different levels and/or placing the seed and starter fertilizers in different bands and at different levels rather than in the same band. In the latter configurations, a second parallel opener (e.g. a mid-row band opener) may be used for placement of later stage nitrogen fertilizer.

15 **[0018]** Figs. 1 and 2 show exploded front and rear perspective views, respectively, of a multi-shoot seed opener assembly 10, including a holder 11, a connecting nut 12, bolt 13 and a removable tip 14 according to embodiments of the present disclosure. The holder 10 may be connected to a seeding drill and operatively connected to tubing (not shown) to permit starter fertilizer to be fed to fertilizer outlet 16 and seed to be fed to drop down outlet 18.

20 **[0019]** In operation, the assembly 10 travels through ground and soil to form a furrow in which both seed and fertilizer are deposited at different levels, respectively, as will be described further below. The assembly may be installed on a drill or other agricultural tool to be pulled by a tractor or vehicle. Multiple assemblies 10 may be arranged in parallel laterally in a row with multiple rows on each drill. Left and right hand assemblies 10 (i.e. assemblies  
25 with mirror image tips of the assembly shown in the drawings) may be used on a drill to accommodate multiple assemblies in close proximity. Mid-row banders may be combined with assembly 10 to place additional nitrogen fertilizer between seed rows formed by assemblies 10.

**[0020]** Holder 11 is but one example of a holder that may be used with tips according to embodiments of the present disclosure, such as the tip 14. Tips according to the present disclosure may be installed on other holders, such as other holders sold and marketed by F.P. Bourgault Tillage Tools Ltd. of Saskatchewan, Canada.

5 **[0021]** The tip 14 is connected to the holder 11 by inserting the square nut 13 into the square opening 20 in the nose 22 of the holder 11, inserting the nose 22 into the slotted opening 26 of the tip and fastening the bolt 12 through a bolt hole 28 in a side of the tip 14. However, other connecting means and configurations are possible and within the scope of the present disclosure. In particular, other holders than the illustrated holder may require other  
10 connecting means and tips according to the present disclosure may be adapted to accommodate such other connecting means.

**[0022]** Referring to Figs. 3 to 6, one embodiment of the tip 14 will be described. The tip 14 includes a knife portion 30 with a generally vertical wing side 32, a generally vertical connection side 34 opposite the wing side 32, a forwardly angled forward side 36 between the  
15 connection side 34 and the wing side 32, and a rearwardly angled rear side 38 between the connection side 34 and the wing side 32. The forward and rear sides 36, 38 meet at a peaked ridge 40.

**[0023]** The forward side 36 has first and second front facets 42, 44 that meet at forward ridge 46. A nose 39 is positioned at a lower end of the forward side 36 and includes a front  
20 cutting surface 48 with first and second cutting facets 50, 52 having lower first and second cutting edges 54 and 56, respectively. In operation, as the tip 14 is pulled through the soil, the nose 39 cuts into and burrows through the soil, causing the soil to rise and move over the nose 39 onto opposing sides of the knife portion 30, assisted by the forward ridge 46. To this end, the nose 39 may include a material with higher wear resistance than the remainder of the tip  
25 14, such as a carbide layer positioned at a lower end of the nose 39.

**[0024]** The rear side 38 defines the slotted opening 26 and extends from the peaked ridge 40 to a generally vertical rear surface 60 having a rear knife edge 62 at its lower extent. The rear side 38 meets the connection side 34 along a first rear connection edge 64. The rear surface 60 meets the connection side 34 along a second rear connection edge 66.

**[0025]** A wing portion 68 extends laterally and rearwardly from the wing side 32. The wing portion 68 includes rounded upper surface 70 that meets the wing side 32 along a concavely shaped wing side edge 72, which extends upwards and rearwards from a forward end proximate the nose 39 until the rear side 38. A lower wing edge 74 defines a lower exterior edge of the wing portion 68. The lower wing edge 74 includes a first edge part 76 that extends laterally outward and rearwardly and a second edge part 78 that extends rearwardly generally parallel to a direction of travel of the tip 14 in operation. The first and second edge parts 76, 78 meet at a rounded corner 79 and merge continuously into each other.

**[0026]** The wing portion 68 further includes extension 80, which comprises a part of the wing portion 68 that extends rearwardly beyond the rear surface 60 of the knife portion 30. As best seen in Fig. 1, the extension 80 is shaped and configured to mate with and at least partially receive and cover the outlet 16 to shield the outlet 16 from oncoming soil in operation.

**[0027]** Referring now specifically to Figs. 4 and 5, an underside of the wing portion 68 includes a flat levelling portion 82 configured to be substantially parallel to ground when in operation. The levelling portion 82 includes a ground contacting layer 84. In the illustrated embodiment, the ground contacting layer 84 is formed of a material with higher wear resistance than a remainder of the wing portion 68. For example, the ground contacting layer 84 may comprise a carbide layer brazed to the levelling portion 82, whereas the remainder of the wing portion 68 may be produced from steel or a steel containing alloy.

**[0028]** The levelling portion 82 extends laterally from an interior edge 86, which runs parallel to a direction of travel of the tip in operation, to the exterior, lower wing edge 74 of the wing portion 68.

**[0029]** In the illustrated embodiment, the carbide ground contacting layer 84 extends over the entire levelling portion 82. In other embodiments, a separate ground contacting layer with higher wear resistance may extend over only a portion of the levelling portion and be flush with the remainder of the levelling portion.

**[0030]** Rearwardly, the levelling portion 82 does not extend all the way to a lower rear edge 88 of the wing portion 68 and instead is spaced from the edge 88. This may aid in

reducing the “orange peeling” effect of soil as it travels under and past the levelling portion 82.

5 [0031] Adjacent to the levelling portion 82, the underside of the knife portion 30 includes a recess 90, having a recessed surface 91 with respect to the levelling portion 82. The recess 90 generally extends rearwardly until a lower rear edge 92 of the rear surface 60. Laterally, the recess 90 extends from the interior edge 86 to a chamfered surface 94, which extends substantially parallel to the direction of travel of the tip 14 in operation from the rear surface 60 and curves downward proximate the forward end of the knife portion 30. The chamfered surface 94 also aids in reducing the “orange peeling” effect of soil passing and being pressed  
10 laterally outward from the recess 90.

[0032] In other embodiments, the recess 90 may have other configurations. The recessed surface may have a different shape and/or configuration than shown in the illustrated embodiment. For example, the recessed surface may not be flat.

15 [0033] The recess may not be continuous and may be comprised of multiple recesses, e.g. channels. The recess may be comprised of multiple recesses of different depths. The recess may not extend rearwards a same amount as shown in the illustrated embodiment, for example until a lower rear edge. The recess may begin further rearward than shown and may not extend from an interior edge. There may be a step or shallower recess separating the recess from the levelling portion. The transition from the levelling portion to the recess may be  
20 curved, as shown in the illustrated embodiment, or configured differently. The chamfered surface delineating the exterior side of the recess may be configured differently (e.g. bigger or smaller) or may be omitted. The recess may extend from an interior edge to an exterior edge.

[0034] In some embodiments, the interior edge may not extend in a travel direction of the tip for part or all of its length. The interior edge may be curved or have curvatures.

25 [0035] More generally, any structure on an underside of the tip which functions to substantially form a band in the soil less deep than the band formed by a levelling portion underneath the wing portion may be considered to fall within the scope of the present disclosure.

**[0036]** Forward of the recess 90, a flat surface 96 forms an underside of the nose 39 and may be coplanar with the levelling portion 82. Flat surface 96 is formed by a thickness of the nose 39 in the rearward direction before the beginning of the recess 90 and provides strength and support to the nose 39. In other embodiments, the nose may have a different thickness resulting in a different size and configuration of the flat surface 96.

**[0037]** In operation, as the tip 14 furrows through the soil, the cutting surface 48 of the nose 39 initially breaks the soil, which then deflects over the cutting facets 50, 52. The rounded upper surface 70 deflects soil over the wing portion in a low draft manner by reducing the surface area exposed to the soil as compared to prior art tips and by providing a streamlined surface for the soil to flow over. Moreover, the extension 80 aids in protecting the outlet 16 from soil and in preventing the soil from interfering with the fertilizer being deposited by the outlet 16. This may aid in ensuring consistent placement of the fertilizer.

**[0038]** Thus, the curvature of the upper surface 70, the concave wing side edge 72, as well as progression of the first and second edge parts 76, 78, aid in reducing the draft of the tip 14, individually and in combination.

**[0039]** On the underside of the tip, soil passing under the levelling portion 82 is levelled and at least partially compacted, in particular by the ground contacting layer 84.

**[0040]** Meanwhile, soil that is initially compressed by flat surface 96 peels into and occupies recess 90. Thus, in operation, the tip creates a furrow having a first surface at a first depth formed by the recess and a second surface at a second depth formed by the levelling portion, the second depth being greater than the first depth.

**[0041]** In the illustrated embodiment, the recess is configured such that a difference between the first and second depths is approximately 0.25 inches. However, other configurations are possible and within the present disclosure that generate bands with different depths.

**[0042]** As discussed above, other structures on the underside of the tip may also result in a band neighbouring and less deep than the band formed under the wing portion, such structures being within the present disclosure.

**[0043]** As the two surfaces are formed by the tip 14, the multi-shoot seeding tool deposits seed onto the shallower surface formed by the recess 90 and starting fertilizer onto the deeper recess formed by the levelling portion 82. Furthermore, the levelling portion 82 forms a relatively compressed bed for placement of the fertilizer, while the recess 90 permits a more fractured bed surface better suited to seed placement. As noted above, spacing between the levelling portion 82 and edge 88 aids in relieving stress built up in the partially compacted and levelled soil while reducing the “orange peeling” effect that would be more pronounced if the levelling portion 82 and ground contacting layer 84 extended rearwards to the edge 88. This may further aid in ensuring a relatively flat and levelled bed for depositing the fertilizer.

10 **[0044]** As the soil moves over the tip 14, the soil causes wear. While the tip 14 is typically forged or cast from steel, it may be produced of other materials or combinations thereof and according to other methods of manufacture.

**[0045]** As in the illustrated embodiment, when the ground contacting layer 84 comprises a material with a higher wear resistance than a remainder of the tip, such as a carbide ground contacting layer, the upper surface 70 and parts of the wing portion 68 may wear faster than the ground contacting layer 84. Thus, placement of a material with a higher wear resistance as a substantial part of or even the entire ground contacting layer 84 aids to ensure that the levelling portion 82 continues to effectively produce a levelled bed even as the remainder of the wing portion 68 wears. This may increase the overall useful life of the tip as a whole.

20 **[0046]** Moreover, as the upper surface 70 and wing portion 68 wear with use, the draft caused by the tip 14 is further reduced as the wing portion 68 (and other parts of the tip 14, such as the knife portion 30) present less resistance to the soil. A plate-like, flat ground contacting layer 84, such as the carbide plate in the illustrated embodiment, presents little resistance to the soil and continues to effectively level the soil even as the wing portion 68 is worn down to the point that the ground contacting layer protrudes from the wing portion 68. This may also aid in increasing the effective life of the tip.

**[0047]** Other embodiments of the tip 14 are also possible. Notably, the features on the underside of the tip that result in surfaces of different depths, such as the recess, levelling portion and ground contacting layer, may be incorporated into the underside of tips that differ

from the illustrated embodiment. Thus, for example, other tips covered by the present disclosure may have a different shape and curvature of the wing portion, and its upper surface or the wing portion may not have a rounded upper surface. Similarly, the knife portion may differ from the illustrated embodiment, with a different shape, form factor, facets, etc.

5 [0048] Moreover, the features on the underside of the tip that result in surfaces of different depth, such as the recess, levelling portion and ground contacting layer, may be doubled or mirrored to be incorporated into a tip that is partially or fully symmetrical about a plane parallel to the travel direction.

[0049] Accordingly, numerous specific details have been set forth in order to provide a  
10 more thorough understanding of the inventive concepts. However, it will be apparent to one of ordinary skill in the art that the inventive concepts within the instant disclosure may be practiced without these specific details. In other instances, well-known features have not been described in detail to avoid unnecessarily complicating the instant disclosure.

[0050] As used herein, the terms "comprises," "comprising," "includes," "including,"  
15 "has," "having" or any other variation thereof, are intended to cover a nonexclusive inclusion. For example, a composition, a process, method, article, or apparatus that comprises a list of elements is not necessarily limited to only those elements but may include other elements not expressly listed or inherently present therein.

[0051] As used herein the terms "approximately," "about," "substantially" and variations  
20 thereof are intended to include not only the exact value qualified by the term, but to also include some slight deviations therefrom, such as deviations caused by measuring error, manufacturing tolerances, wear and tear on components or structures, stress exerted on structures, and combinations thereof, for example.

[0052] Use of the "a" or "an" are employed to describe elements and components of the  
25 embodiments herein. This is done merely for convenience and to give a general sense of the inventive concepts. This description should be read to include one or at least one and the singular also includes the plural unless it is obvious that it is meant otherwise.

**[0053]** Any reference to "one embodiment" or "an embodiment" means that a particular element, feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment.

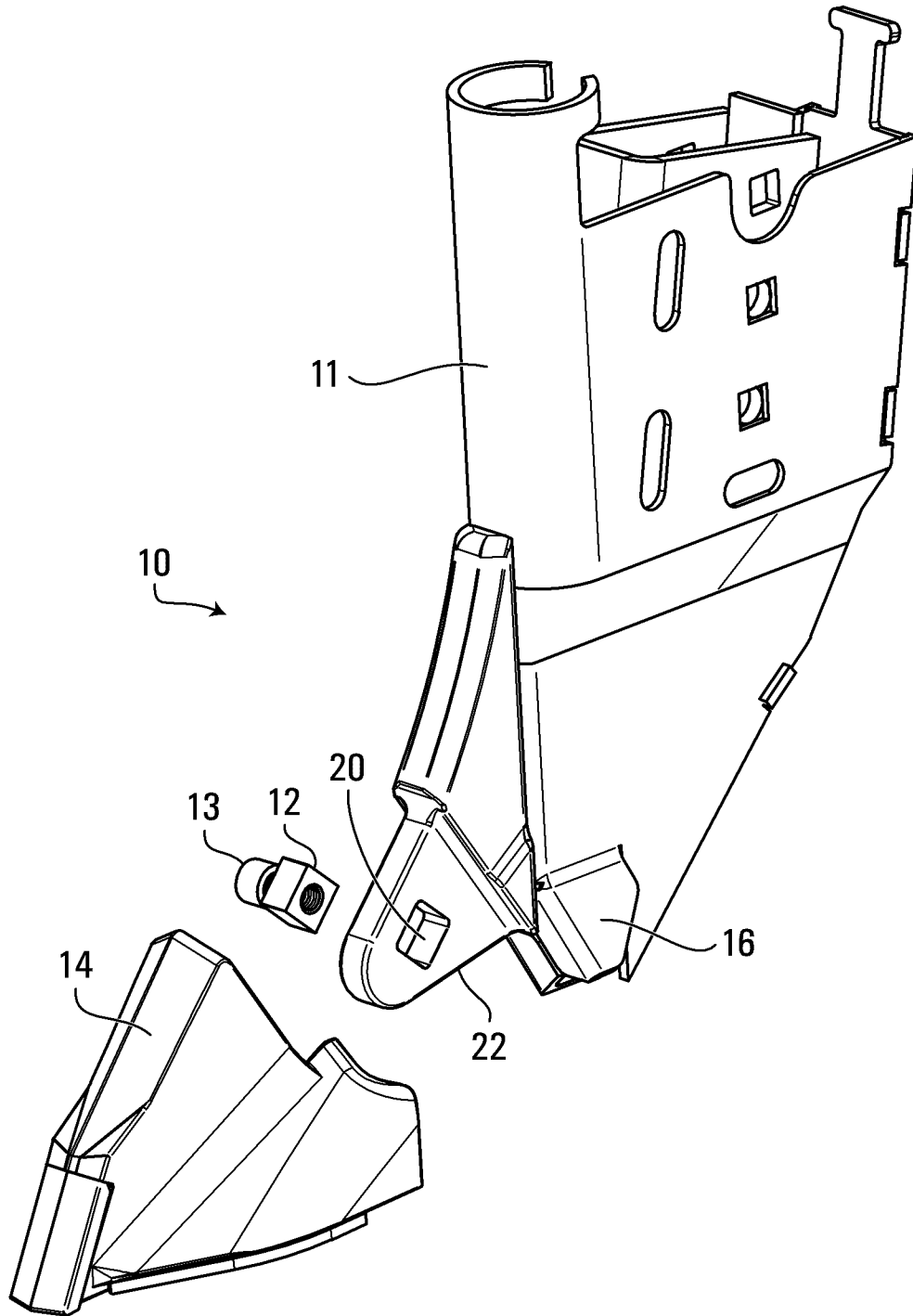
- 5 Moreover, it will be understood that features of one embodiment may be combined with features of other embodiments, even if not expressly recited or described as a combination.

CLAIMS:

1. A tip for a seeding tool having a seed outlet and a fertilizer outlet, the tip comprising:  
a knife portion; and  
a wing portion extending rearwardly and laterally outwardly from one side of the knife  
5 portion,  
wherein an underside of the wing portion comprises a levelling portion configured to be  
parallel to ground in operation and extending laterally from an interior edge to an exterior  
edge of the wing portion, the interior edge extending substantially in a direction of travel of  
the tip in operation, and  
10 wherein an underside of the knife portion comprises a recess with respect to the levelling  
portion, the recess extending adjacent the interior edge rearwardly until a rear edge of the  
knife portion,  
such that, in operation, the tip creates a furrow having a first surface at a first depth formed  
by the recess and a second surface at a second depth formed by the levelling portion, the  
15 second depth being greater than the first depth.
2. The tip of claim 1, wherein the levelling portion comprises a ground contacting layer, the  
ground contacting layer having a greater wear resistance than a remainder of the wing  
portion.
3. The tip of claim 2, wherein the ground contacting layer comprises carbide.
- 20 4. The tip of claim 2, wherein the ground contacting layer comprises a plate fixed to the  
underside of the wing portion.
5. The tip of claim 1, wherein the recess is configured such that a difference between the first  
and second depths is at least 0.635 cm (0.25 inches).
6. The tip of claim 1, wherein a chamfered surface extends along a side of the recess opposite  
25 the interior edge.

7. The tip of claim 1, wherein a rear edge of the levelling portion is longitudinally spaced from a rear edge of the wing portion.
8. The tip of claim 7, wherein the rear edge of the wing portion is recessed with respect to the rear edge of the levelling portion.
- 5 9. The tip of claim 1, wherein the exterior edge of the wing comprises a first edge part that extends at an angle to the interior edge and a second edge part that extends substantially parallel to the interior edge.
10. The tip of claim 9, wherein the first and second edge parts continuously merge into each other.
- 10 11. The tip of claim 1, wherein the wing portion comprises a rearwardly extending extension configured to at least partially cover the fertilizer outlet.
12. The tip of claim 1, wherein the wing portion comprises a rounded upper surface.
13. A seeding tool having a seed outlet and a fertilizer outlet, the seeding tool comprising a holder and a tip according to claim 1 connectable to the holder.
- 15 14. The seeding tool of claim 13, wherein the wing portion comprises a rearwardly extending extension configured to at least partially cover the fertilizer outlet.
15. The seeding tool of claim 13, wherein, in operation, the tool is configured to deposit seed onto the first surface and fertilizer onto the second surface.

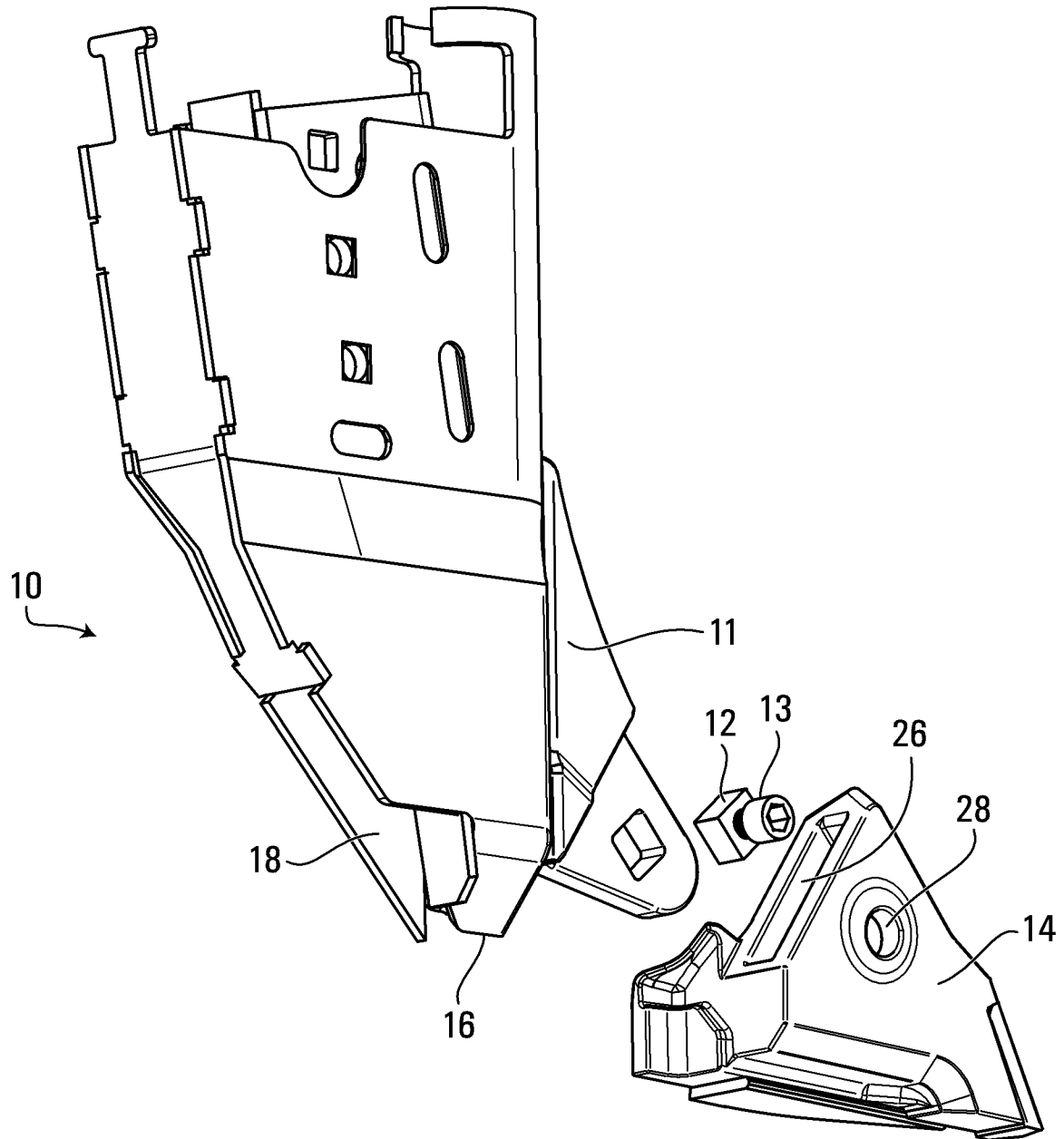
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**FIG. 1**

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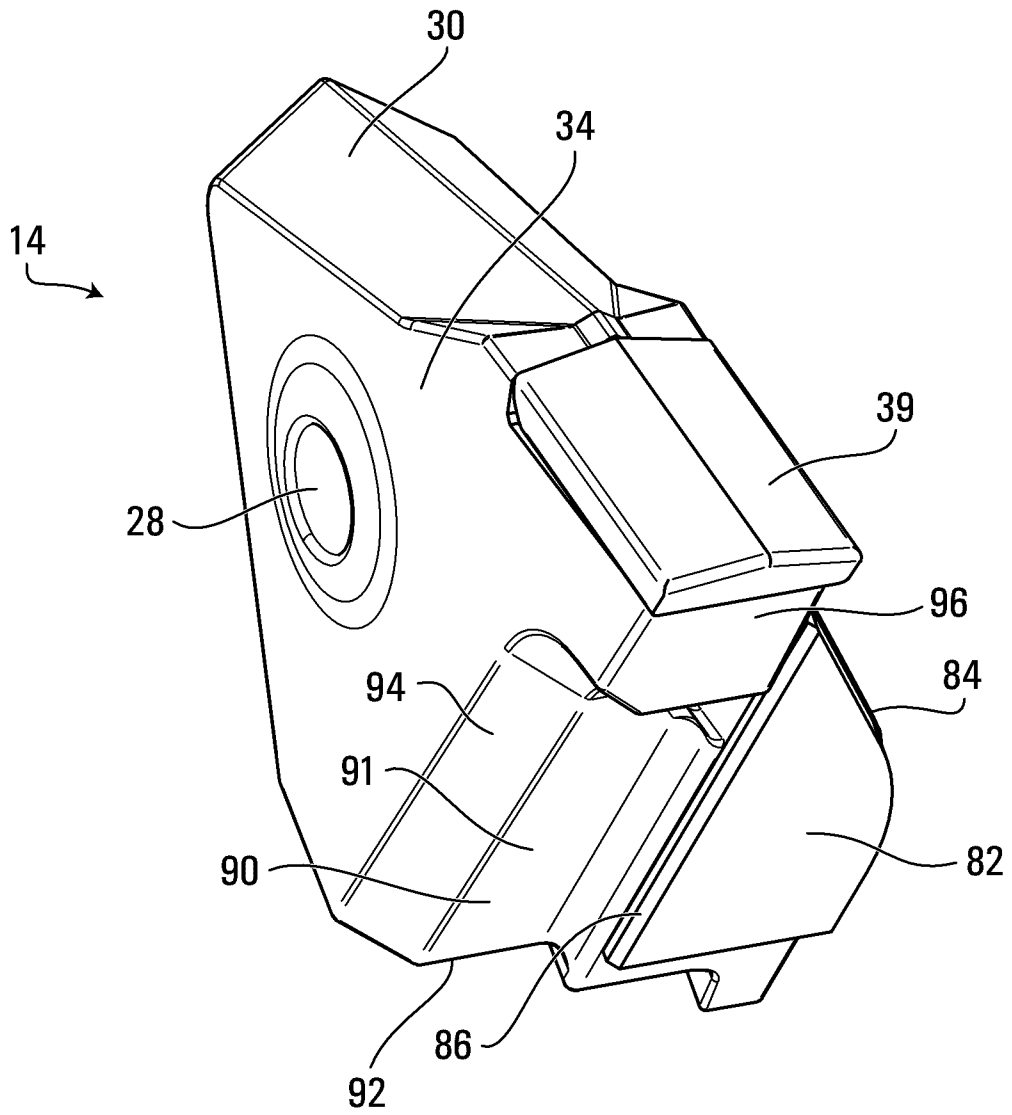


**FIG. 2**

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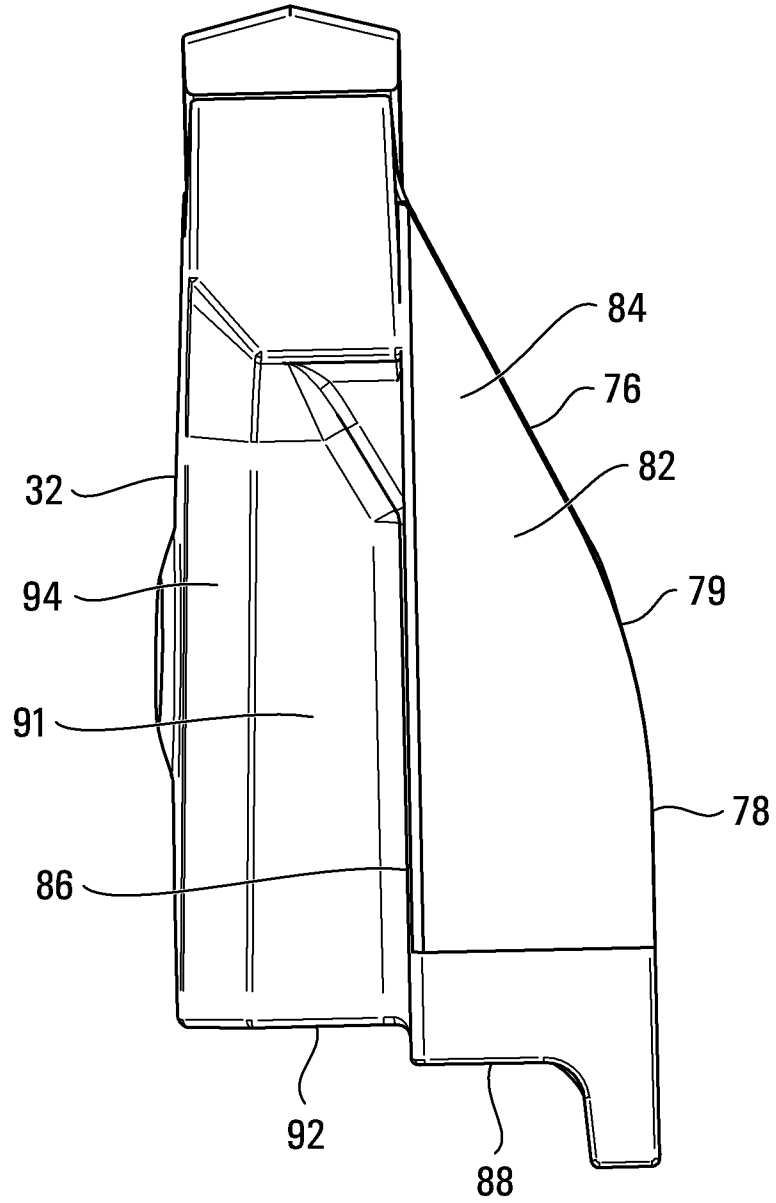
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**FIG. 4**

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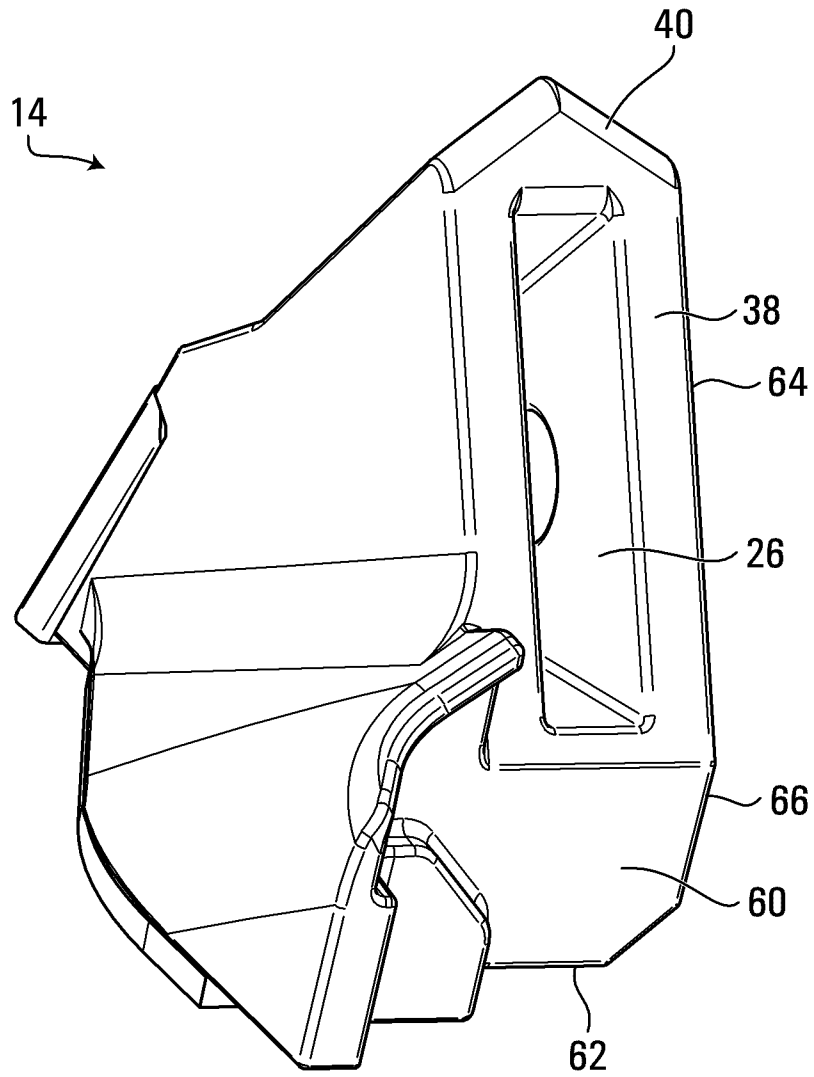
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**FIG. 5**

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**FIG. 6**

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