



(22) Date de dépôt/Filing Date: 1994/11/04

(41) Mise à la disp. pub./Open to Public Insp.: 1996/05/05

(45) Date de délivrance/Issue Date: 2004/04/06

(51) Cl.Int.⁵/Int.Cl.⁵ A01B 23/04

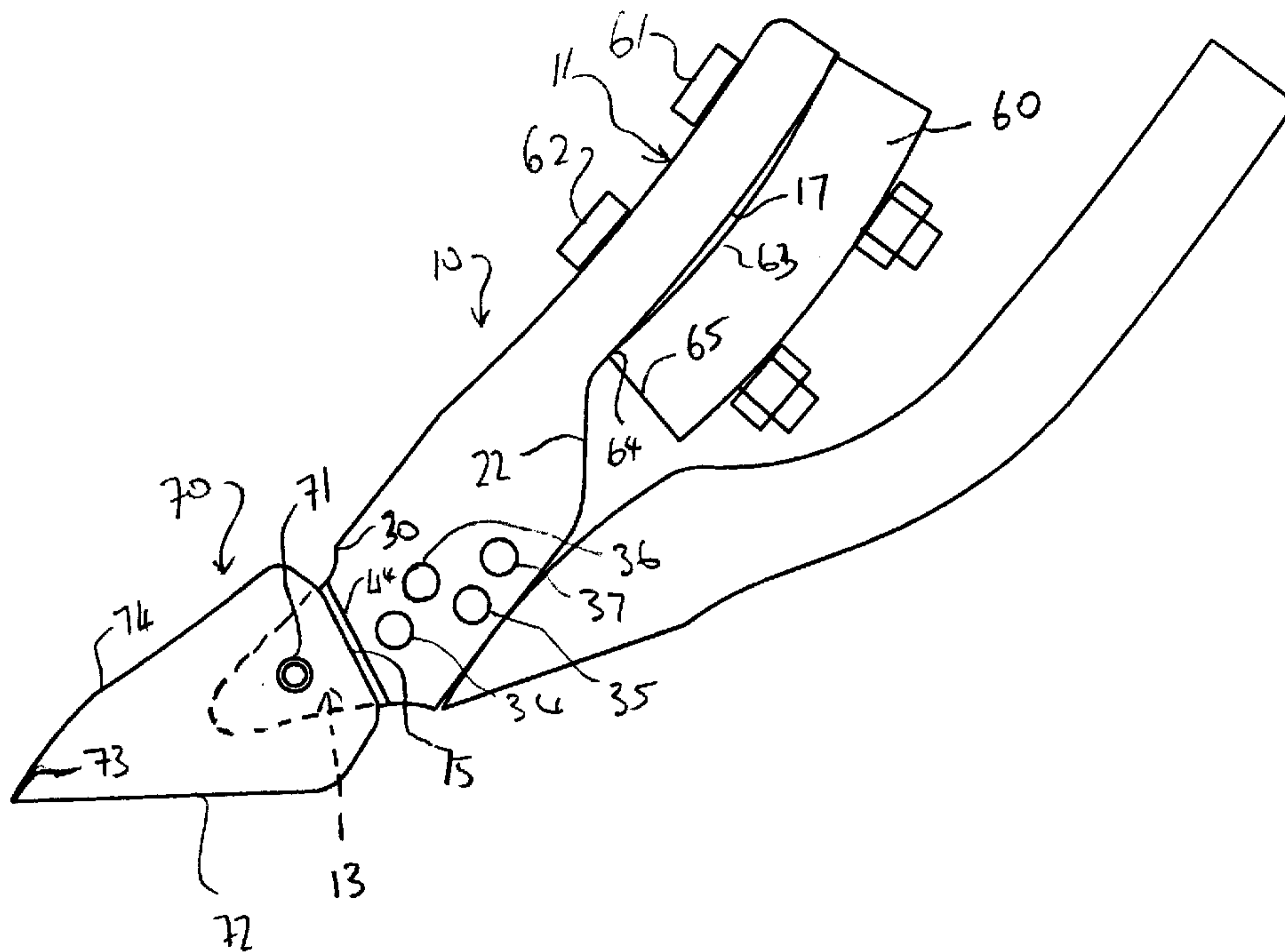
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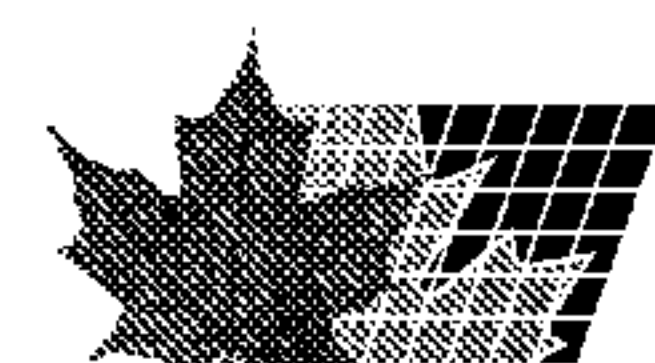
(54) Titre : ADAPTATEUR POLYVALENT POUR OUTILS DE TRAVAIL DU SOL D'UN CULTIVATEUR

(54) Title: MULTI PURPOSE SHANK ADAPTER FOR ATTACHMENT OF GROUND WORKING TOOLS TO THE SHANK OF AN AGRICULTURAL CULTIVATOR



(57) Abrégé/Abstract:

An adapter for attachment to the shank of a cultivator includes a first portion for attachment to the bottom end of the shank, a second portion for attachment to a sweep or to a pair of wings and a third forward triangular portion for receiving a deep banding point. The adapter can thus be used with deep banding point, with the deep banding point in conjunction with wings or with a sweep after the point and wings have been removed. A material delivery tube is welded directly to a rear surface of the second portion with that rear surface being inclined upwardly and rearwardly toward the shank so as to hold the material delivery duct at a required position for dispensing the material behind the point or behind the sweep.



ABSTRACT

An adapter for attachment to the shank of a cultivator includes a first portion for attachment to the bottom end of the shank, a second portion for attachment to a sweep or to a pair of wings and a third forward triangular portion for receiving a deep banding point. The adapter can thus be used with deep banding point, with the deep banding point in conjunction with wings or with a sweep after the point and wings have been removed. A material delivery tube is welded directly to a rear surface of the second portion with that rear surface being inclined upwardly and rearwardly toward the shank so as to hold the material delivery duct at a required position for dispensing the material behind the point or behind the sweep.

MULTI PURPOSE SHANK ADAPTER FOR ATTACHMENT OF
GROUND WORKING TOOLS TO THE SHANK OF AN
AGRICULTURAL CULTIVATOR

BACKGROUND OF THE INVENTION

5 This invention relates to a shank adapter for mounting
on a shank of agricultural cultivator by which a plurality of
alternative ground working tools can be carried on the shank, to a
ground working tool apparatus including the shank adapter and the
plurality of separate tools and to details of the individual tools.

10 Agricultural cultivators are well known and available
from many different manufacturers. Such cultivators generally
comprise one or more separate frame structures which are
connected together for common movement across the ground and
supported on ground wheel arrangements for carrying the frame at
15 a predetermined height from the ground. The frame defines a
plurality of tool bars with each tool bar carrying a plurality of
spaced cultivator shanks which are generally C-shaped extending
from a trip mechanism at the tool bar downwardly and then
curving forwardly to a lower end of the shank on which the
20 ground working tool is mounted.

 The conventional ground working tool mounted on the
lower end of the shank is either a sweep which is a generally
triangular shaped member in plan view which has a tongue
extending upwardly and rearwardly which is bolted to the front
25 face of the shank at the lower end. From the tongue it extends
forwardly and downwardly to a front point and a pair of cutting

side edges extend rearwardly and outwardly from the sweep each to a respective side.

An alternative form of ground working tool which can also be mounted on the shank in replacement for the sweep is the
5 deep banding knife. One style of the knife includes a generally flat strap of metal with an upper portion bolted to the upper face of the lower end of the shank with the plate of metal being twisted below the bottom end of the shank so as to turn with the narrower edge facing forwardly and that narrow edge defines the front edge
10 of the knife.

A yet further arrangement manufactured by Dutch Industries is that known as the Eaglebuster (trade mark) which includes a shank adapter mounted on the lower end of the shank and providing a forward attachment portion for receiving an Eagle
15 point thereon. A strut is welded to the underside of the attachment portion and extends rearwardly therefrom to carry a material delivery tube at a rear end thereof. This arrangement is however limited in its application and cannot accommodate alternative mounting of other tools.

20 Another form of knife also manufactured by Dutch is known as a liquid and seed knife and includes a fixed point welded on a front face of the knife with two pairs of holes through the knife for attachment of a pair of wings known as Fert-till (trade mark) wings which are bolted on respective sides of the knife.
25 Further details of the various mounting elements, knives and tools

manufactured by Dutch are shown in brochures of Dutch which are publicly available.

SUMMARY OF THE INVENTION

It is one object of the present invention to provide a
5 shank adapter which can accommodate different ground working tools for different farming conditions.

According to one aspect of the invention there is provided a shank adapter for mounting on a shank of an agricultural cultivator by which a plurality of alternative ground
10 working tools can be carried on the shank, the shank adapter comprising an integral body including a first mounting portion having a generally flat plate with an undersurface for engaging an upper surface of the shank, an upper surface opposite to the undersurface, two side surfaces and two ends and with at least
15 one hole through the plate from the upper surface to the undersurface for bolting the undersurface to the shank, a second tool attachment portion attached to one end of the flat plate so as to project outwardly beyond said one end and defining two parallel spaced side surfaces lying generally parallel to the side surfaces of
20 the first mounting portion, a top surface and a bottom surface, with a plurality of holes through the second tool attachment portion from one side surface to the other side surface therefore, a third tool attachment portion attached to an end of the second tool attachment portion opposite to the first mounting portion, the third
25 tool attachment portion having two parallel side surfaces, an upper surface and a lower surface, the side surfaces of the third tool

attachment portion being spaced by distance less than a distance between the sides surfaces of the second tool attachment portion so as to define a pair of shoulders each on a respective side surface of the third tool attachment portion at an end of the third tool attachment portion at the second tool attachment portion and a hole through the third tool attachment portion extending from one side surface to the other side surface thereof and a material delivery feed duct welded to the bottom surface of the second tool attachment portion.

10 According to a second aspect of the invention there is provided a ground working tool apparatus for mounting on a shank of an agricultural cultivator comprising a shank adapter comprising an integral body having a first mounting portion for bolting onto an end of the shank, a second tool attachment portion, a third tool
15 attachment portion and a material delivery feed duct welded to a bottom surface of the adapter, and a plurality of tools for use with the adapter comprising a deep banding tip shaped and arranged for mounting on the third tool attachment portion, a pair of wings each for mounting on a respective side of the second tool
20 attachment portion and a sweep for mounting on the adapter in replacement for the tip and the wings, the sweep being shaped for engagement over the third tool attachment portion and including means for attachment to the second tool attachment portion.

One embodiment of the invention will now be
25 described in conjunction with the accompanying drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a vertical cross sectional view through a shank adapter according to the present invention with the various tools provided therefor removed and omitted.

5 Figure 2 is a top plan view of the shank adapter of Figure 1 taken along the lines 2-2 of Figure 1.

Figure 3 is a side elevational view of the shank adapter of Figure 1 including a deep banding point mounted on the third or front portion of the shank adapter.

10 Figure 4 is a similar side elevational view of that of Figure 3 including the deep banding point and including a pair of wings bolted on the second or middle section of the shank adapter.

Figure 5 is a similar side elevational view to that of
15 Figures 3 and 4 with the deep banding point and the wings omitted and replaced by a cultivator sweep.

Figures 6, 7 and 8 are top plan, side elevational and front elevational views respectively of a modified banding point for mounting on the front or third portion of the shank adapter of
20 Figure 1.

Figures 9 and 10 are side elevational and top plan views of a further modified banding point for mounting on the front or third portion of the shank adapter of Figure 1.

Figure 11 is a side elevational view of a yet further
25 modified banding point for mounting on the front or third portion of the shank adapter of Figure 1.

In the drawings like characters of reference indicate corresponding parts in the different figures.

DETAILED DESCRIPTION

5 The shank adapter of the present invention comprises an integral metal body 10 including a first shank attachment portion 11, a second attachment portion 12 and a third attachment portion 13. The adapter further includes a material delivery tube 14. The tube 14 is welded onto the integral body 10 to form an
10 integrated construction which holds the tube in permanent position fixed relative to the body 10 of the shank adapter.

 The attachment portion 11 of the shank adapter includes a generally rectangular strap portion 15 formed of a substantially constant thickness between a top surface 16 and a
15 bottom surface 17. The width of the body at this first portion 11 is arranged to be relatively wide so as to match generally the width of the shank visible in Figures 3, 4 and 5. The upper and lower surfaces 16, 17 are slightly curved again so as to follow partially the curvature of the shank or the curvature is slightly less
20 than that of the shank so as to provide an effect to engagement portions of the bottom surface 17 against the upper surface of the shank. The attachment portion 11 includes two holes 18 and 19 each for receiving a bolt by which the attachment portion can be bolted onto the shank. The hole 18 is circular. The hole 19 is
25 elongate in a direction 20 longitudinal of the shank adapter, the direction 20 defining a centre line of the shank adapter. Both of

the holes lie on the centre line and the oval shape of the hole 19 allows adjustment of the position of the bolts to accommodate the holes in the shank which are of a conventional nature.

The second portion 12 of the shank adapter is
5 integrally formed with the first portion and the shape between the portions 11 and 12 converges through a transition section 21. The second portion 12 is very much narrower than the first portion 11 having a width approximately one half of the width of the first portion is increased in depth so that a bottom surface 22 of the
10 transition section extends from the bottom surface 17 downwardly toward a bottom surface 23 of the second portion. The bottom surface 23 is generally parallel to the bottom surface 17 but is spaced downwardly therefrom due to the increased depth of the second portion. An upper surface 24 of the second portion is
15 substantially contiguous with the upper surface 16 of the first portion. Thus the upper surface 24 is curved gradually upwardly to an apex 25 approximately at a commencement line 26 of the second portion whereupon the upper surface 24 extends gradually downwardly from the apex 25 and lies substantially parallel to the
20 bottom surface 23. The second portion thus includes side surfaces 26 and 27 which are parallel and spaced by the width of the second portion so the spacing therebetween is significantly less than the spacing between sides 28 and 29 of the first portion.

The top surface 24 from the apex 25 extends
25 gradually downwardly to a second apex 30 adjacent a forward end of the second portion. Similarly the bottom surface extends

parallel to the top surface 24 toward a further apex 31 adjacent a forward end of the second portion. From the apex 30 and 31, the second portion converges rapidly inwardly on converging upper surface 32 and converging lower surface 33.

5 The second portion includes a first pair of holes 34 and 35 and a second pair of holes 36 and 37. The holes are arranged at the apex of a parallelogram. Thus a line joining the holes 34 and 35 is parallel to a line joining the holes 36 and 37. The holes 36 and 37 are higher than the holes 34 and 35 and are
10 also moved rearwardly along the second portion toward the attachment portion.

 The third portion 13 is generally triangular and includes a top surface 38 and a bottom surface 39 which converge toward a front apex 40 of the third portion. The third portion has
15 sides 41 and 42 which are parallel and parallel to a plane passing through the centre line 20. The spacing between the sides 41 and 42 is however reduced relative to the spacing between the sides 26 and 27 of the second portion so as to define a pair of shoulders 43 and 44 each on a respective side of the centre line
20 20 with the shoulder lying substantially at right angles to the plane of the centre line 20. The second portion is thus of constant thickness between the sides 26 and 27 up to the shoulders 43 and 44 and terminates at the shoulders 43 and 44.

 The third portion 13 includes a hole therethrough
25 substantially centrally thereof between the sides defined by the

surfaces 38 and 39 and by the shoulders 43, 44. The hole passes from one side surface 41 through to the second side surface 42.

The material delivery duct 14 is curved so as to provide an upper most surface 50 which touches and is welded to the bottom surface 23 of the second portion. From that surface 50, the duct 14 curves away from the attachment portion 11 to form a connector portion 51 which can be attached to a supply tube. The curvature of the material delivery duct away from the attachment portion leaves an area therebetween as best shown in Figures 3 and 4 for receiving the shank. The material delivery duct includes a mouth 52 which extends from a forward tip 53 of the tube to a rearward edge 54 of the delivery tube. The mouth thus lies in a plane defined by these tips or edges 53, 54. The plane of the mouth is located so that it commences just behind the apex 31 and extends slightly upwardly and rearwardly therefrom so that the mouth is hidden behind the apex 31 to prevent engagement of the soil with the material of the delivery duct in the working action.

Turning now to Figures 3 and 4, the shank adapter 10 is shown mounted on a shank 60 by bolts 61 and 62. The curvature of the surface 17 is slightly less than the curvature of the shank surface 63 so that there are two points of contact of the attachment portion 11 with the shank including particularly a point of contact adjacent the end of the shank as indicated at 64. This holds the shank adapter in fixed position on the shank so that the second portion of the shank adapter commences immediately at

the end of the shank 60 with the bottom surface 22 of the transition portion extending beyond an end surface 65 of the shank.

In the embodiment of Figure 3, the shank adapter is
5 used to carry a deep banding point 70 which is mounted on the third portion 13 of the shank adapter. For this purpose the point 70 includes a hollow generally triangular interior shaped to receive the third portions 13 as a sliding fit therein. The point further has a transverse hole for receiving a pin 71 which projects through the
10 sides of the point and through the hole 45 of the third portion 13. The point includes an integral point body with a bottom surface 72 which is intended to lie horizontal in the working position shown in Figure 3 which extends forwardly toward a front apex 73 at a forward most end of the bottom surface 72. From the apex 73
15 the upper surface extends upwardly and rearwardly as indicated at 74 to a position just in front of the apex 30. From the upper most point of the top surface 74, the point includes a rear surface 75 which extends downwardly parallel to the shoulders 43 and 44 and then extends forwardly to joint the bottom surface 72. The
20 point is of a conventional shape and the third portion is shaped to receive the conventional point.

In the arrangement shown in Figure 4, the same point 70 is mounted on the shank adapter but in addition there is attached to the shank adapter a pair of wings 80. Each wing
25 includes an inner connecting portion 81 which lies in a vertical plane parallel to the respective side 26, 27 of the second portion.

The wing further includes a horizontal portion 82 connected to the bottom of the connecting portion 81 extending outwardly therefrom in a horizontal plane. The portion 82 thus forms a wing having a sharpened front edge 83 which extends outwardly and rearwardly from the bottom of the connecting portion 81. The connecting portion 81 is thus formed of a flat plate and the wing is bent at the bottom of the flat plate to form the wing section 82. The connecting portion 81 has a pair of holes which receive bolts 85 and 86 arranged on the connecting portions so that when passing through one of the pairs of holes 34, 35 and 36, 37 holds the wing section in a horizontal orientation. Thus the bolts 85 and 86 can be engaged through a selected one of the pairs of holes and in the arrangement shown the bolts pass through the holes 34 and 35 leaving the holes 37 and 38 exposed. If the bolts however are passed through the holes 37 and 38, this moves the wing upwardly and rearwardly away from the point 70. This allows adjustment of the height of the front edge 83 relative to the point to accommodate different conditions in the working action.

Turning now to Figure 5, the same shank adapter 10 is mounted on the same shank 60 but in this arrangement the point 70 and the wings 80 have been removed and are replaced by a sweep 90. The sweep includes a front apex 91 with diverging sides 92 lying in a horizontal plane to form front cutting edges of a pair of wings of the sweep. The sweep includes a centre section 93 which extends upwardly and rearwardly from the wings and provides an attachment onto the second portion of the adapter 10.

Thus the centre connecting portion 93 defines a pair of sides 94
an upper surface 95 which are shaped to lie flat against the top
and sides respectively of the second portion. The sides 94 are
then clamped to the sides of the second portion of the adapter by
5 a bolt 96 which extends through the sides 94 and through the first
one of the holes which is the hole 34 adjacent the shoulder 44.
The sweep thus has a relatively narrow connection section 93 with
the sides 94 thereof having a spacing therebetween only sufficient
to receive the width of the second portion of the shank adapter.
10 The third portion 13 of the shank adapter merely projects into the
hollow interior of the connection section 93.

Turning now to Figures 6, 7 and 8, a modified point is
illustrated for replacement of the point 70. This point indicated at
97 includes an upper surface 98 similar in shape to the surface 74
15 of the point 70. The point further includes a hollow interior for
engaging over the third portion 13 of the shank adapter. The
upper surface 98 includes an apex 99 similar in shape to that of
the point 70 and to downwardly sloping side surfaces 100, 101 on
either side of the apex. From the inclined surfaces 100, 101, the
20 point includes side walls 102 which are substantially vertical that
is parallel to the sides of the shank adapter. At the bottom of the
sides 102 is provided a pair of wings 103 each of which projects
outwardly from the side 102 so as to define a base surface 104 of
the point which is of increased width and significantly wider than
25 the width of the point between the sides 102. The wings 103 are
also shaped so that they diverge outwardly from a front apex 104

of the point. The point is formed as an integral body as a cast member so that the only hollow part of the point is defined by the hollow interior 105 for engaging over the third portion 13 of the shank adapter. The wings 103 are very much narrower than the wings 80 or the wings 92 of the sweep. As shown in Figure 7, the wings have an upper surface which is inclined upwardly and rearwardly as indicated at 107 commencing at the apex 104 and terminating at a position adjacent the bottom of the hollow interior 105. The wings are however shaped to converge to narrow side edges at the outermost apex 108. Turning now to Figures 9 and 10, there is shown a yet further modification of the wing point shown in Figures 6, 7 and 8 in which the wings 103 are extended rearwardly from a rear edge 110 of the point to form a V shaped member 111. The V shaped member 111 converges to an apex 112 on a centre line of the point trailing rearwardly of the rear edge 110. The V shaped portion 111 includes two upper surfaces 113 and 114 which are inclined downwardly and outwardly from a centre line 115 extending forwardly from the apex 112. The V shaped member includes an under surface 116 which is inclined upwardly and rearwardly from an underside of the wing 103 adjacent the edge 110 toward the apex 112. The apex 112 is positioned sufficiently rearwardly from the edge 110 that, when the point is attached to the adaptor 10, the apex lies underneath the mouth 52 of the material feed duct 14. The apex 112 is positioned forwardly of the rear edge 54 of the mouth and rearwardly of the front edge 53 of the mouth. The apex is

positioned so that the majority of the material exiting from the mouth engages onto the upper surface of the V shaped member 111 and thus is deflected by engagement with the surfaces 113 and 114 outwardly to the sides to spread the seeds in a spread
5 pattern of increased width relative to the dimensions of the mouth 52.

For the first time, therefore, a V shaped member for spreading the seeds is mounted on or is integral with the deep banding point and is located on the adaptor at a position so that it
10 cooperates with the mouth of the feed duct welded to the rear surface of the adaptor.

Turning now to Figure 11, there is shown an arrangement of the banding point which can be used with the banding point of Figures 3, 4, 6 through 8 or Figures 9 and 10.
15 The banding point is modified such that the cast integral body 120 defining the replaceable banding point is formed with a recess 121 at the forward most edge. The recess is defined so that it cuts into a part of the lower most surface 72 and removes the apex 73 and cuts into part of the upper surface 74. Within the recess is
20 attached a carbide tip 123 which has a front edge 124 defining a front edge of the banding point. The front edge 124 is inclined relative to the front edge 74 of the body 120 thus forming an apex 125. The front edge 124 extends downwardly and very slightly forwardly from the apex 125 to join the bottom edge 72. The
25 carbide tip within the recess defines sides of the banding point

which are contiguous with or slightly proud of the sides of the body 120.

The shank adapter of the present invention therefore can be used in conjunction with the deep banding point 70, in
5 conjunction with the deep banding point 70 used with the wings 80 or can be used alternately with the sweep 90 or as a yet further alternative with the modified point of Figures 6 7 and 8. The shank adapter therefore provides a number of alternative uses all of which effectively mount and control the position of the
10 ground working tool on the end of the shank 60. The position of the material delivery duct welded to the rear surface of the second portion holds that delivery duct at a required position and allows it to properly dispense the fertilizer, seed, mixture of fertilizer and seed or to deliver liquid materials such as liquid fertilizer and
15 anhydrous ammonia to the soil at the required position behind the banding point or behind the sweep.

Since various modifications can be made in my invention as herein above described, and many apparently widely different embodiments of same made within the spirit and scope of
20 the claims without departing from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

CLAIMS:

1. A shank adapter for mounting on a shank of an agricultural cultivator by which a plurality of alternative ground working tools can be carried on the shank, the shank adapter comprising:
 - 5 an integral body including a first mounting portion having a generally flat plate with an undersurface for engaging an upper surface of the shank,
 - an upper surface opposite to the undersurface,
 - two side surfaces and two ends and with at least one hole through
 - 10 the plate from the upper surface of the plate to the undersurface of the plate for bolting the undersurface of the plate to the shank,
 - a second tool attachment portion attached to one end of the flat plate so as to project outwardly beyond said one end and defining two parallel spaced side surfaces lying generally parallel to the side surfaces of the first
 - 15 mounting portion,
 - a top surface and a bottom surface, with a plurality of holes through the second tool attachment portion from one side surface to the other side surface therefore,
 - a third tool attachment portion attached to an end of the second tool
 - 20 attachment portion opposite to the first mounting portion,
 - the third tool attachment portion having two parallel side surfaces, an upper surface and a lower surface,
 - the side surfaces of the third tool attachment portion being spaced by distance less than a distance between the sides surfaces of the second tool
 - 25 attachment portion so as to define a pair of shoulders, each being arranged on a

respective side surface of the third tool attachment portion and each being arranged at an end of the third tool attachment portion, which end is at the second tool attachment portion,

and a hole through the third tool attachment portion extending from
5 one side surface to the other side surface thereof and a material delivery feed duct welded to the bottom surface of the second tool attachment portion.

2. The adapter according to Claim 1 wherein the first mounting portion is wider between the side surfaces thereof than the width of the second tool attachment portion between the side surfaces thereof, wherein the second
10 tool attachment is deeper between the top surface and bottom surface thereof than the depth of the first mounting portion between the upper surface and the undersurface thereof and wherein there is provided a smooth transition portion therebetween gradually decreasing in width and gradually increasing in depth.

3. The adapter according to Claim 1 or 2 wherein the second
15 tool attachment portion includes two pairs of holes therethrough.

4. The adapter according to Claim 3 wherein there is an equal spacing between the holes of each pair and wherein one pair is arranged at a position along the second tool attachment portion toward the first mounting portion.

20 5. The adapter according to Claim 1, 2, 3 or 4 wherein the third tool attachment portion is substantially triangular in side elevational view such that the upper and lower surfaces of the third tool attachment portion converge from the second tool attachment portion toward a point at an end of the third tool attachment portion spaced away from the second tool attachment portion.

6. The adapter according to Claim 1, 2, 3, 4 or 5 wherein the material delivery feed duct comprises a single duct which is welded directly to the bottom surface of the second tool attachment portion.

7. The adapter according to Claim 6 wherein the material
5 delivery feed duct includes a first portion diverging from the bottom surface of the second tool attachment portion away from the first mounting portion and a second portion contiguous with the first portion extending generally parallel to the first mounting portion so as to leave a space between the undersurface of the first mounting portion and the second portion of the material delivery feed duct for
10 receiving the lower end of the shank therebetween.

8. The adapter according to any one of Claims 1 to 7 wherein the material delivery feed duct includes a mouth lying in a plane substantially aligned with the lower surface of the third tool attachment portion.

9. A ground working tool apparatus for mounting on a shank of
15 an agricultural cultivator comprising a shank adapter comprising:

an integral body having a first mounting portion for bolting onto an end of the shank,

a second tool attachment portion,

a third tool attachment portion and a material delivery feed duct
20 welded to a bottom surface of the adapter,

and a plurality of tools for use with the adapter comprising:

a deep banding tip shaped and arranged for mounting on the third tool attachment portion,

a pair of wings each for mounting on a respective side of the
25 second tool attachment portion

and a sweep for mounting on the adapter in replacement for the tip and the wings, the sweep being shaped for engagement over the third tool attachment portion and including means for attachment to the second tool attachment portion.

5 10. The apparatus according to Claim 9 wherein each of the wings includes a vertical attachment plate for bolting on a respective side surface of the second tool attachment portion and a wing portion extending outwardly from the vertical attachment plate and lying in a horizontal plane at right angles thereto.

10 11. The apparatus according to Claim 10 wherein the second tool attachment portion includes two pairs of holes with each pair of holes being arranged for alignment with a single pair of holes in the vertical attachment plate of the wing such that the wing can be attached to a selected one of the two pairs of holes for adjustment of the height of the wing relative to the adapter.

15 12. The apparatus according to Claim 9, 10 or 11 wherein the shank adapter comprises an integral body including a first mounting portion having a generally flat plate with an undersurface for engaging an upper surface of the shank, an upper surface opposite to the undersurface, two side surfaces and two ends and with at least one hole through the plate from the upper surface
20 to the undersurface for bolting the undersurface to the shank, a second tool attachment portion attached to one end of the flat plate so as to project outwardly beyond said one end and defining two parallel spaced side surfaces lying generally parallel to the side surfaces of the first mounting portion, a top surface and a bottom surface, with a plurality of holes through the second tool attachment
25 portion from one side surface to the other side surface therefore, a third tool

attachment portion attached to an end of the second tool attachment portion opposite to the first mounting portion, the third tool attachment portion having two parallel side surfaces, an upper surface and a lower surface, the side surfaces of the third tool attachment portion being spaced by distance less than a distance
5 between the sides surfaces of the second tool attachment portion so as to define a pair of shoulders each being arranged on a respective side surface of the third tool attachment portion and each being arranged at an end of the third tool attachment portion which end is at the second tool attachment portion and at least one hole through the third tool attachment portion extending from one side
10 surface to the other side surface thereof and a material delivery feed duct welded to the bottom surface of the second tool attachment portion.

13. The apparatus according to Claim 12 wherein the first mounting portion is wider between the side surfaces thereof than the width of the second tool attachment portion between the side surfaces thereof, wherein the
15 second tool attachment portion is deeper between the top surface and bottom surface thereof than the depth of the first mounting portion between the upper surface and the undersurface thereof and wherein there is provided a smooth transition portion therebetween gradually decreasing in width and gradually increasing in depth.

20 14. The apparatus according to Claim 12 or 13 wherein the second tool attachment portion includes two pairs of holes therethrough.

15. The apparatus according to claim 14 wherein there is an equal spacing between the holes of each pair and wherein one pair is arranged at a position along the second tool attachment portion toward the first mounting
25 portion.

16. The apparatus according to Claim 12, 13, 14 or 15 wherein the third tool attachment portion is substantially triangular in side elevational view such that the upper and lower surfaces of the third tool attachment portion converge from the second tool attachment portion toward a point at an end of the third tool attachment portion spaced away from the second tool attachment portion.

17. The apparatus according to any one of Claims 12 to 16 wherein the material delivery feed duct comprises a single duct which is welded directly to the bottom surface of the second tool attachment portion.

18. The apparatus according to any one of claims 12 to 17 wherein the material delivery feed duct includes a first portion diverging from the bottom surface of the second tool attachment portion away from the first mounting portion and a second portion contiguous with the first portion extending generally parallel to the first mounting portion so as to leave a space between the undersurface of the first mounting portion and the second portion of the material delivery feed duct for receiving the lower end of the shank therebetween.

19. The apparatus according to any one of claims 12 to 18 wherein the sweep includes an attachment portion having two side walls each clamped to a respective side surface of the second attachment portion of the shank adapter.

20. A ground working tool apparatus for mounting on a shank of an agricultural cultivator comprising:

a shank adapter defined by an integral body having a first mounting portion for bolting onto an end of the shank and a second tool attachment portion projecting forwardly from the first mounting portion;

and a replaceable deep banding tip shaped and arranged for mounting on the second tool attachment portion, the deep banding tip including a tip body having a forward edge inclined forwardly and downwardly from a position above the second tool attachment portion, a lowermost part of the edge being
5 defined by a front edge of a carbide insert member attached into a recess in the tip body.

21. A ground working tool apparatus for mounting on a shank of an agricultural cultivator comprising:

a shank adapter defined by an integral body having a first mounting
10 portion for bolting onto an end of the shank and a second tool attachment portion projecting forwardly from the first mounting portion,

a material delivery feed duct welded to a bottom surface of the adapter;

and a replaceable deep banding tip shaped and arranged for
15 mounting on the second tool attachment portion,

the deep banding tip including a tip body having a forward edge inclined forwardly and downwardly from a position above the second tool attachment portion and a trailing edge extending rearwardly from the second tool attachment portion to a position underneath the feed duct for engaging seeds
20 exiting from the feed duct.

22. The apparatus according to Claim 21 wherein the trailing edge is formed on a V-shaped tail portion of the tip body which converges rearwardly and inwardly to a rearward most apex.

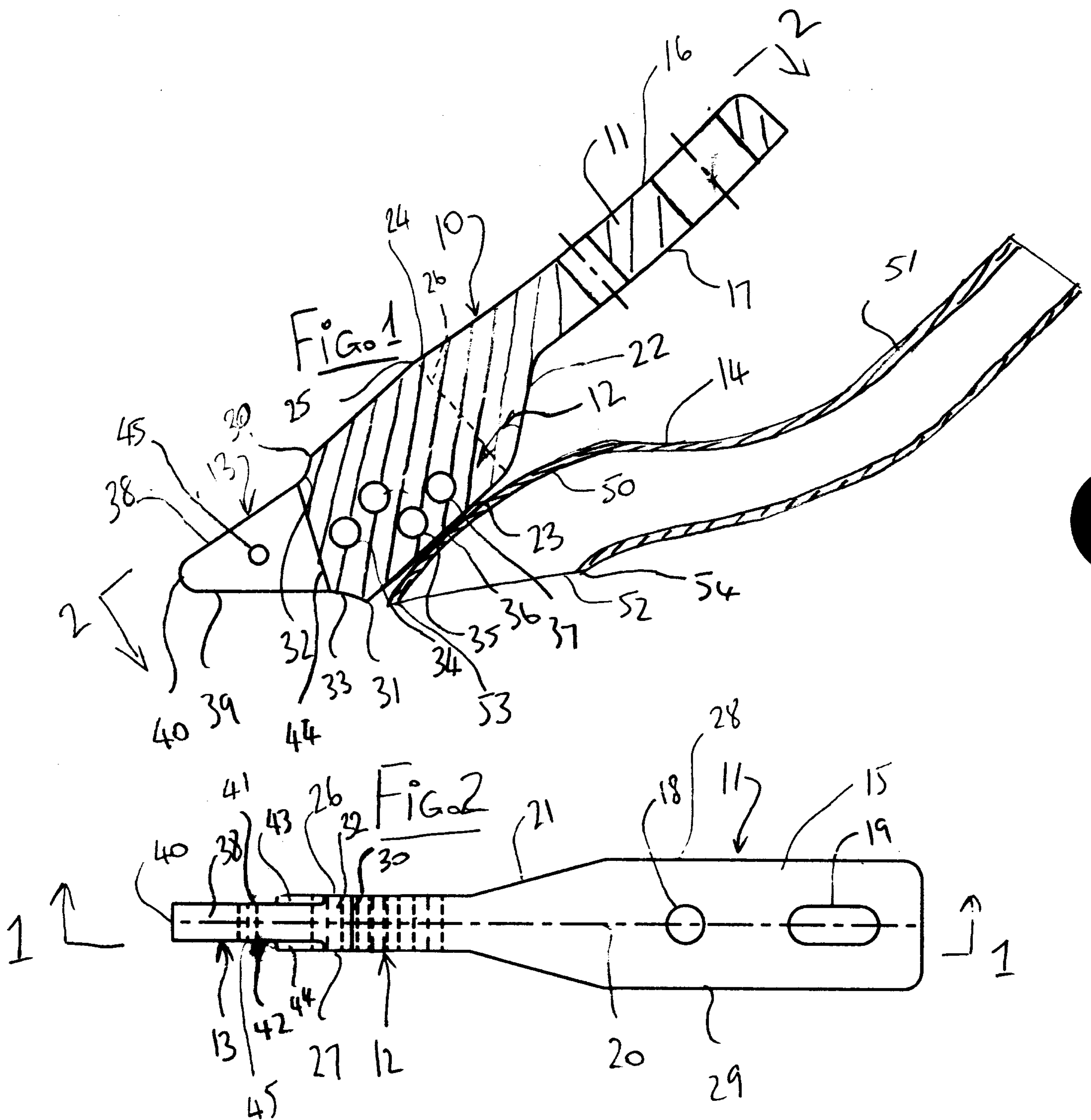


FIG. 3

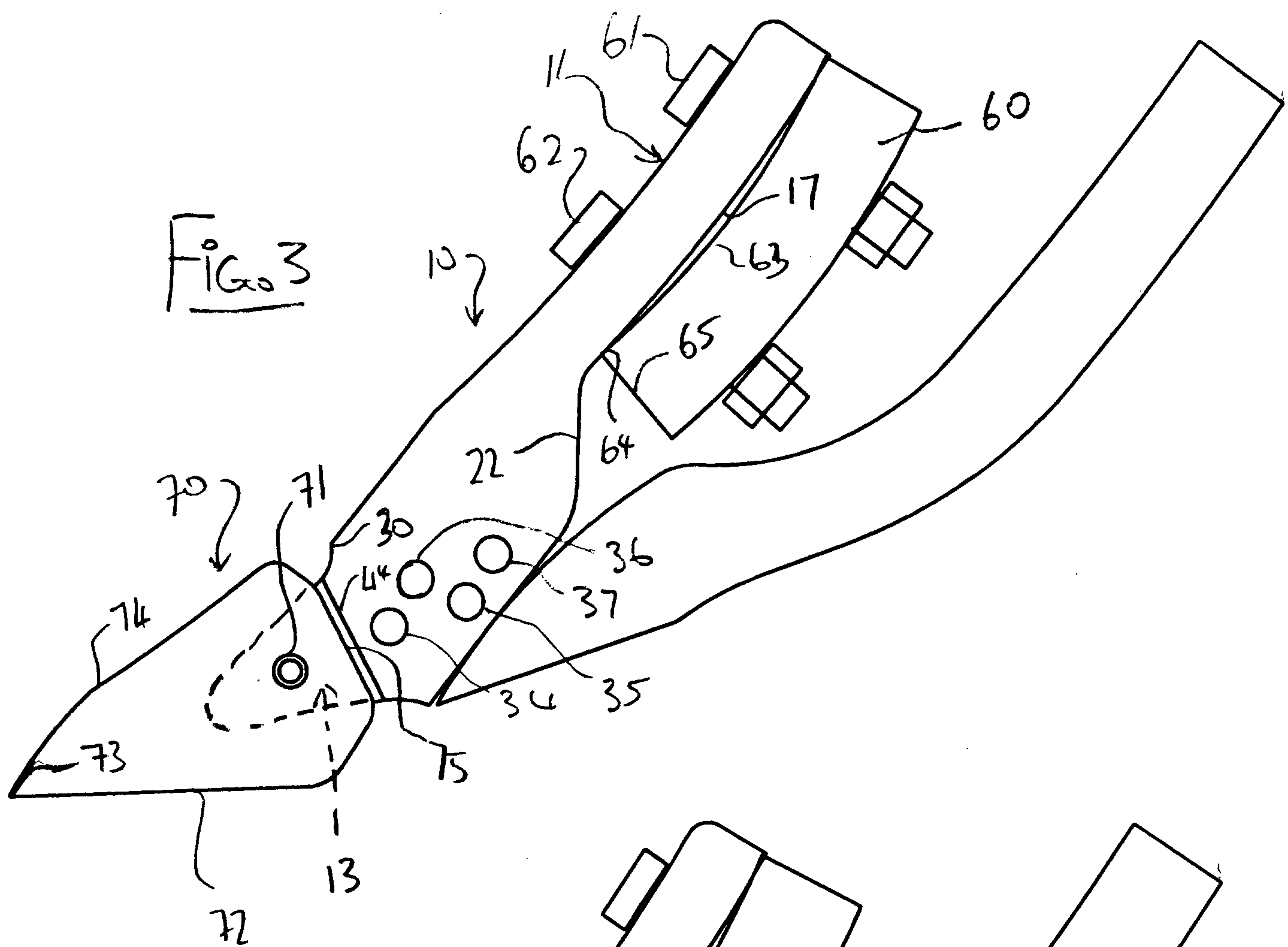


FIG. 4

