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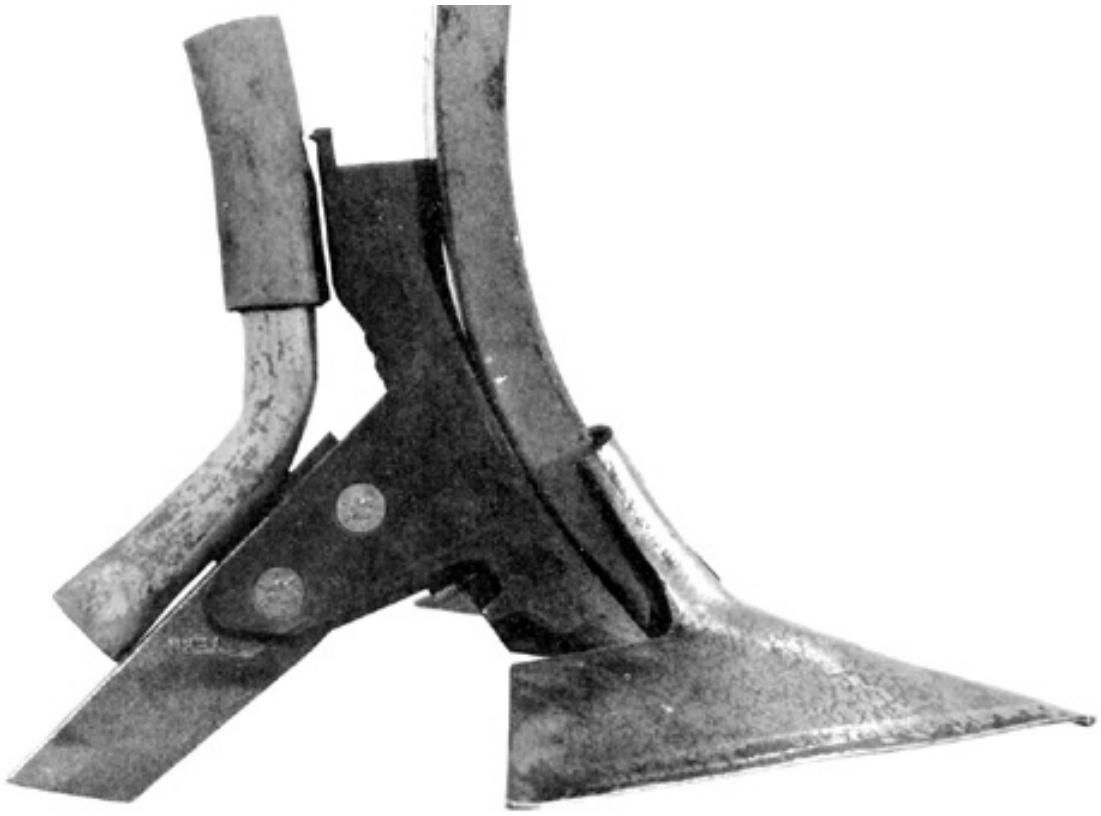

Vern Seed Boot and Banding Knife

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

VERN SEED BOOT AND BANDING KNIFE

MANUFACTURER AND DISTRIBUTOR:

Dutch Industries Ltd.
705 - 1st Avenue
Regina, Saskatchewan
S4N 4M4

RETAIL PRICE: $43.75 (March, 1988, f.o.b. Lethbridge, Alberta).

Model V563 Boot - $24.50
Model V814 Knife - $14.25
Model V40 Fertilizer Tube - $ 5.00
Total = $43.75

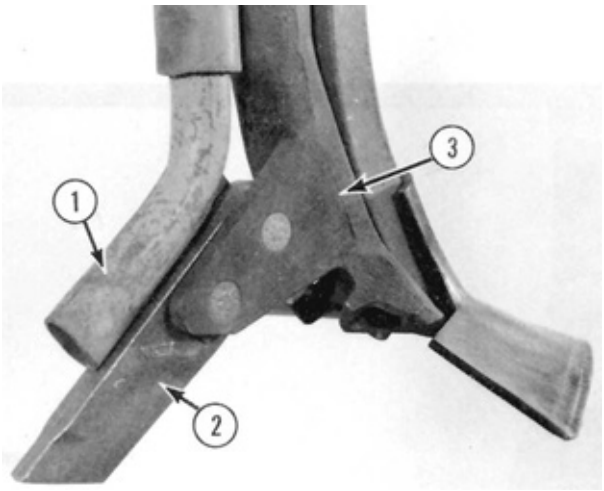

FIGURE 1. Vern Seed Boot and Bending Knife: (1) Fertilizer Tube, (2) Backswept Knife, (3) Paired Row Seed Boot.

SUMMARY AND CONCLUSIONS

QUALITY OF WORK

Penetration of the Vern Banding Knife was fair. In primary conditions, with hard soil, the backswept banding knives would ride out. Penetration was good in conditions with adequate moisture.

Seed placement of the Vern Seed Boot was good. Seed was normally placed in a double band width of 5.0 in (127 mm) with most seeds within 0.4 (10 mm) of the average seed depth in uniform soil conditions.

Fertilizer placement of the Vern Banding Knife was fair. The fertilizer was placed below and centered between the seed rows in an average bandwidth of 0.5 in (13 mm). Average depth below the seed was 1.2 in (30 mm) but was less under certain operating conditions.

The Vern Seed Boot and Banding Knife did not affect the soil finishing and trash clearance characteristics of the test cultivator and was rated as very good. A harrow packer drawbar was used as a post seeding operation.

Operation of the Vern Banding Knife in stony conditions was very good. No damage occurred to the knives during the test.

EASE OF OPERATION AND ADJUSTMENT

No depth adjustment was provided on the Vern Seed Boot or Banding Knife for the seed or fertilizer.

Plugging of the seed boot or fertilizer boot was not a problem during the test.

The attachment had no effect on the transportation of the cultivator.

POWER REQUIREMENTS

Draft (drawbar pull) requirements depended on depth, field preparation, ground speed, soil type and moisture content. In primary conditions a 16 in (406 mm) sweep with the Vern Knife pulled 12 to 18% heavier than without the knife attached.

Maximum tractor power requirements in primary conditions for one Vern Banding Knife with a 16 in (406 mm) sweep ranged from 4.7 to 7.2 power take-off hp (3.5 to 5.4 kw).

EASE OF INSTALLATION

Ease of installing the Vern Seed Boot and Banding Knife was very good. The seed boot fit up to a 1.5 in (38 mm) diameter hose and the fertilizer boot required a 1.25 in (31.8 mm) diameter hose.

OPERATOR SAFETY

The Vern Seed Boots and Banding Knives presented no safety hazard if normal safety precaution were observed.

OPERATOR'S MANUAL

No operator's manual was provided.

MECHANICAL HISTORY

No major mechanical problems occurred during the test. The banding knives were worn out after 48 acres (19 ha) per knife.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Lengthening the fertilizer tube to assure more positive fertilizer placement under varying operating conditions.
2. Modifying the fertilizer tubes to accommodate different sizes of delivery hoses.
3. Providing an operator's manual with information on installation and operation.

Station Manager: R. P. Atkins
Project Engineer: L. W. Papworth

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The fertilizer tube will be lengthened in future production runs.
2. This recommendation will be taken under consideration.
3. An operator's manual will be provided in the future.

GENERAL DESCRIPTION

The Vern Seed Boot and Banding Knife is a double shoot system designed to be used with a conventional chisel sweep. The boot places the seed in a paired row and the knife deep bands the fertilizer below and between the rows. The depth difference between the paired seed row and the fertilizer is not adjustable.

The system includes a paired row seed boot, a backswept knife, a fertilizer tube and attachment hardware. The paired row seed boot fits onto the back of the cultivator shank. The backswept knife attaches to the rear of the seed boot with plow bolts. The fertilizer is placed through a steel tube mounted on

the rear of the backswept knife. The seed boot can be used alone, without the backswept knife. An attachment is available for just fertilizer applications.

FIGURE 1 shows the components of the system while detailed specifications are given in Appendix I.

SCOPE OF TEST

Each Vern Seed Boot and Banding Knife was operated in the conditions shown in TABLE 1 for 103.5 hours while seeding and banding 48.1 acres (19.2 ha). Soil conditions during the test varied from dry to very moist. The boots and knives were evaluated for quality of work, ease of operation and adjustment, power requirements, ease of installation and operator safety.

The openers were mounted on a Morris CP 725 chisel plow for the fertilizer banding. For the duration of the test they were mounted on a Flexi-coil Model 600 chisel plow. Throughout the test a harrow packer drawbar was used to level and pack the surface after seeding.

TABLE 1. Operating Conditions

MATERIAL SOWN	SOIL TYPE AND CONDITION	STONE CONDITIONS	FIELD AREA ac (ha)	HOURS
Fertilizer	Silt Loam Primary	Occasional Stones	5.2 (2.1)	10
	Silt Loam Secondary	Occasional Stones	16.8 (6.7)	31.5
Canola	Silt Loam Clay Loam Secondary	Moderately Stoney	4.4 (1.8)	8
Winter Wheat	Fine Sand Primary	Occasional Stones	6.1 (2.4)	16
	Fine Sandy Loam Secondary	Occasional Stones	1.7 (0.7)	5
	Fine Sandy Loam Secondary	Occasional Stones	5 (2)	13.5
	Silt Loam Secondary	Occasional Stones	8.9 (3.5)	19.5
TOTAL			48.1 (19.2)	103.5

RESULTS AND DISCUSSION

QUALITY OF WORK

Penetration: Penetration of the Vern Banding Knife in adverse conditions was fair. The backswept banding knives would cause the cultivator to ride out in hard dry soils. Under more desirable seeding conditions penetration of the Vern Banding Knife was good. Penetration of the banding knives decreased with wear.

Seed Placement: Seed placement of the Vern Seed Boot was good. The paired row seed boot placed the seed in a double row with an average band width of 5.0 in (127 mm) as shown in FIGURE 2. The size of band width varied with the amount of air flow through the delivery hoses.

When seeding in pre-tilled soil conditions variation in seed depth was small. At an average seeding depth of 2.2 in (56 mm) most of the seeds were placed within 0.4 in (10 mm) of the average seed depth.

Fertilizer Placement: Fertilizer placement of the Vern Banding Knife was fair. The fertilizer was placed in a narrow row below and between the seed rows. The bandwidth was an average of 0.5 in (13 mm). Average depth below the seed was 1.2 in (30 mm). The depth varied under certain operating conditions. For example, when operating the knife in loose soil at high speeds, the fertilizer would not reach the bottom of the banc[ing knife furrow. It is recommended that the manufacturer consider lengthening the fertilizer tube to assure more positive fertilizer placement under all operating conditions.

FIGURE 2. Winter Wheat Emergence on a Summerfallow Field.

Soil Finishing/Trash Clearance: The Vern Seed Boot and Banding Knife had no affect on the soil finishing or trash clearance of the cultivator and was rated as very good.

Stoney Conditions: Operation of the Vern Banding Knife in stony conditions was very good. No damage occurred to the knives during the test.

EASE OF OPERATION AND ADJUSTMENT

Maintenance: Ease of maintenance of the Vern Seed Boot and Banding Knife was very good. The only maintenance required was to coat the knives with oil or grease to inhibit rusting, when they were stored outside for extended periods.

Transporting: Mounting the Vern Seed Boots and Banding Knives on the test cultivator had no effect on the transportation of the cultivator.

Plugging: Plugging of the seed boot or fertilizer boot was not a problem during the test.

POWER REQUIREMENTS

Draft: Draft (drawbar pull) requirements depended on depth, field preparation, ground speed, soil type and moisture content. Draft measurements were done with a single opener in primary silt loam soil at 5 mph (8 km/h). FIGURE 3 shows the draft of a 16 in (406 mm) chisel sweep (reference), the same sweep with a Vern Knife attached and a worn Vern Knife attached. Under primary conditions the draft with the Vern knife was 12 to 18% greater than without the knife attached. Under primary conditions a new Vern Knife pulled 6 to 10% more than a worn Vern Knife. Under secondary conditions and suitable seedbed conditions, it was observed that the addition of the Vern Knife had no significant effect on draft.

Tractor Size: Maximum tractor power requirements in primary conditions for one Vern Banding Knife with a 16 in (406 mm) sweep ranged from 4.7 to 7.2 hp (3.5 to 5.4 kW) in the seeding depth range of 2 in (51 mm) to 3 in (76 mm). This compares to 4.0 to 6.1 hp (3 to 4.6 kW) for the 16 in (406 mm) sweep seeding in the same depth range in primary conditions. These tractor sizes have been adjusted to include tractive efficiency and represent a tractor operating at 80% of maximum power take-off ratings as determined by Nebraska tests or as represented by the tractor manufacturer. The tractor sizes given will have ample power reserve to operate in the stated conditions.

EASE OF INSTALLATION

Installation: Ease of installing the Vern Seed Boot and Banding Knife was very good. The seed boot was held onto the back of the shank with the sweep plow bolts. The banding knives were attached to the seed boot with two 1.25 in (32 mm) x 0.5 in (13 mm) plow bolts.

The seed boot allowed up to a 1.5 in (38 mm) diameter hose to fit inside the inlet of the boot. The hoses were held in place by hose clamps as shown in FIGURE 4. The fertilizer tube

required a 1.25 in (32 mm) diameter hose to fit over the inlet. The distribution system used came with 1 in (25 mm) diameter fertilizer hoses. To connect the two together, 6 in (152 mm) lengths of 1.25 in (32 mm) diameter hose were mounted as adaptors between the fertilizer tubes and the distribution hoses. It is recommended that the manufacturer consider modifying the fertilizer tubes to accommodate different sizes of delivery hoses.

The Vern Seed Boot and banding knife could be mounted on a 43 or 50 degree shank. The lower holes on the banding knife (FIGURE 5) were used when attaching the banding knife to the seed boot on a43 degree shank. The top holes were used when attaching the banding knife to the seed boot on a 50 degree shank.

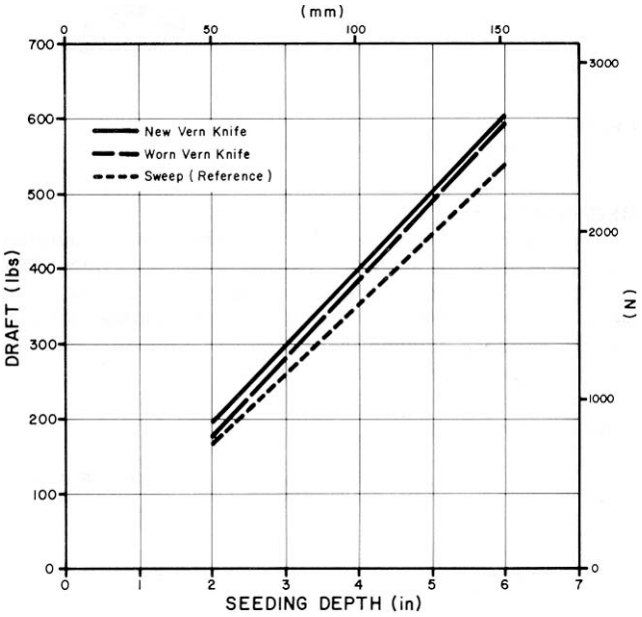

FIGURE 3. Average Drawbar Pull, at 5 mph (8 km/h), of a Single Opener in Primary Soil Conditions.

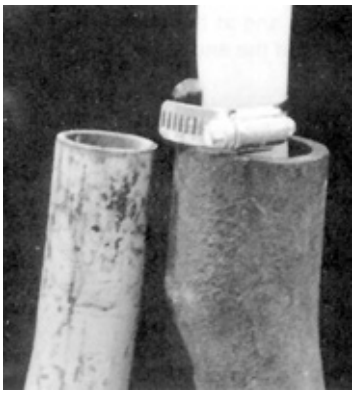

FIGURE 4. Connection of Delivery Hose to Seed Boot.

OPERATOR SAFETY

The Vern Seed Boots and Banding Knives presented no safety hazard. Care should be taken though, when manuever-lng underneath the cultivator, because of the protruding banding knives.

OPERATOR'S MANUAL

No operator's manual was provided. It is recommended that the manufacturer consider providing an operator's manual with information on installation and operation.

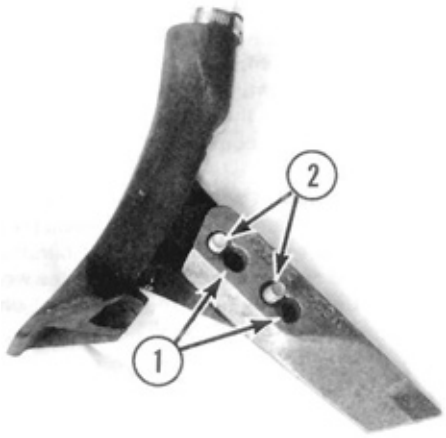

FIGURE 5. (1) Lower Holes Used for 43 Degree Shank.
(2) Upper Holes Used for 50 Degree Shank.

MECHANICAL HISTORY

The Vern Seed Boots and Banding Knives were operated for 103.5 hours while each seeding and/or fertilizing about 48.1 ac (19.2 ha). The intent of the test was evaluation of functional performance and an extended durability evaluation was not conducted. TABLE 2 outlines the mechanical problems that did occur during the functional testing.

TABLE 2. Mechanical History

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA ac	(ha)
- a fertilizer tube broke off and was replaced at	70.5	34.2	(13.7)
- banding knives wore out at	end of test		

DISCUSSION OF MECHANICAL PROBLEMS

Banding Knive Wear: FIGURE 5 shows the wear on the banding knives at the start of the test, 20 ac (8 ha) per knife, 30 ac (12 ha) per knife and at the end of the test. The banding knives were worn out at the end of the test or after 48.1 ac (19.2 ha) per knife.

FIGURE 6. Wear on the Banding Knives After 20 ac (8 ha) per Knife, 30 ac (12 ha) per Knife and at the End of the Test.

APPENDIX I

SPECIFICATIONS

MAKE AND MODEL:	Vern Seed Boot and Banding Knife
MANUFACTURER:	Dutch Industries Ltd. 705 - 1st Avenue Regina, Saskatchewan S4N 4M4
DIMENSIONS:	
- width	4.6 in (117 mm)
- height	10.8 in (274 mm)
- length	12 in (305 mm)
MOUNTED DIMENSIONS:	
Cutting Width	
- Banding Knife	0.5 in (13 mm)
Cutting Depth Below Shank	
- To Cultivator Shovel	1.1 in (28 mm)
- To Banding Knife	2.3 in (58 mm)
Knife Tip to Frame Bottom (Flexi-coil Shank)	30 in (762 mm)
INSTALLATION:	
Attaching Bolts	one - 3.5 in (89 mm) x 0.5 in (13 mm)
- Plow Bolts	one - 2.25 in (57 mm) x 0.5 in (13 mm)
- Spacing	2 to 2.5 in (51 to 64 mm)
Banding Knife Bolts	two - 1.25 in (32 mm) x 0.5 in (13 mm)
Feed Tubes	
- Number	2
- Size - Seed	1.5 in (38 mm) or smaller
- Fertilizer	1.25 in (32 mm)
WEIGHT:	
- Seed Boot	6.2 lb (2.8 kg)
- Banding Knife	2.7 lb (1.2 kg)
- Fertilizer Tube	1.8 lb (0.8 kg)
TOTAL	10.7 lb (4.8 kg)
BANDING KNIFE POINT HARDNESS:	62 Rockwell "C"

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

Excellent
Very Good
Good
Fair
Poor
Unsatisfactory

SUMMARY CHART
VERN SEED BOOT AND BANDING KNIFE

RETAIL PRICE:	$43.75 (March, 1988, f.o.b. Lethbridge)
QUALITY OF WORK:	
Penetration:	**fair;** in hard dry soils **good;** in conditions with adequate moisture
Seed Placement:	**good;** double bandwidth of 5 in (127 mm)
Fertilizer Placement:	**fair;** 1.2 in (30 mm) average depth below seed; less under certain operating conditions
Trash Clearance:	**very good;** did not affect trash clearance of cultivator
Stony Conditions:	**very good;** no damage
EASE OF OPERATION AND ADJUSTMENT:	**very good;** easily maintained, no problems transporting and no plugging problems
POWER REQUIREMENTS:	4.7 power take-off hp (3.5 kW) to 7.2 power take-off hp (5.4 kW) per opener at seeding depths
EASE OF INSTALLATION:	**very good;** boots and knives were easily attached
OPERATOR SAFETY:	safe; presented no safety hazard
OPERATOR'S MANUAL:	none provided
MECHANICAL HISTORY:	knives wore out after 48 ac (19 ha) per knife

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