AGRICULTURAL ROW UNIT APPARATUS, SYSTEMS AND METHODS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 61/493,200 filed Jun. 3, 2011.

BACKGROUND

In some methods of applying seed or other crop inputs to a field, a trench is opened for introduction of the crop input or inputs. In many applications, the configuration of the trench is agronomically important. Thus there is a need in the art for systems, methods and apparatus for effectively creating a trench having an improved configuration, as well as for improved product placement in or near the trench.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a rearward perspective view of an embodiment of an agricultural row unit.

FIG. **2** is a side elevation view of the agricultural row unit of FIG. **1**.

FIG. **3** is a top view of the agricultural row unit of FIG. **1**.

FIG. **4** is a rearward perspective view of the agricultural row unit of FIG. **1** with some components removed for clarity.

FIG. **5** is a side elevation view of the agricultural row unit of FIG. **1** with some components removed for clarity.

FIG. **6** is a rear elevation view of the agricultural row unit of FIG. **1** with some components removed for clarity.

FIG. **7** is a top view of the agricultural row unit of FIG. **1** with some components removed for clarity.

FIG. **8** is a partial top view of the agricultural row unit of FIG. **1** with some components removed for clarity.

FIG. **9** is a partial rear perspective view of the agricultural row unit of FIG. **1** with some components removed for clarity.

FIG. **10**A is a partial front elevation view of the agricultural row unit of FIG. **1** with some components removed for clarity.

FIG. **10**B is a partial rear elevation view of the agricultural row unit of FIG. **1** with some components removed for clarity.

FIG. **11**A illustrates an embodiment of an opener disc assembly as well as a relative angle of the opener discs of the opener disc assembly.

FIG. **11**B illustrates the opener disc assembly of FIG. **11**A.

FIG. **12**A is a schematic rear elevation view of an embodiment of the opener disc assembly of FIG. **11**A.

FIG. **12**B is a schematic side elevation view of the opener disc assembly of FIG. **11**A.

FIG. **13** is a partial side elevation view of the agricultural row unit of FIG. **1** with some components removed for clarity, further illustrating an angle of orientation of the opener disc assembly of the agricultural row unit.

FIG. **14**A is a partial rear elevation view of the agricultural row unit of FIG. **1** opening a trench.

FIG. **14**B is a rear elevation view of the trench of FIG. **14**A.

FIG. **14**C is a rear elevation view of the closing wheel of the agricultural row unit of FIG. **1** closing the trench of FIG. **14**A.

FIG. **15** is a top view of the trench of FIG. **14**A being opened and closed by the agricultural row unit of FIG. **1**.

FIG. **16**A is a front elevation view of trenches formed by the agricultural row unit of FIG. **1**.

FIG. **16**B is a front elevation view of trenches formed by another embodiment of an agricultural row unit.

FIG. **17** is a top cutaway view, with some components removed, of yet another embodiment of an agricultural row unit including a row cleaner assembly.

DETAILED DESCRIPTION

Overview

Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, FIG. **1** is a perspective view of an agricultural row unit **10**. The row unit **10** is attached to a tractor-drawn toolbar by a mounting assembly **20**, which preferably comprises a set of parallel arms pivotally connecting a forward bracket **28** to a rearward bracket **26** (FIG. **2**). Row unit **10** preferably includes a meter assembly **40**, a depth adjustment assembly **60**, gauge wheel assemblies **50**, seed tube assemblies **100**, opener disc assemblies **200** (FIG. **2**), and closing assembly **30**. Row unit **10** also preferably includes a row-unit mounted motor **70**.

Referring to FIGS. **2** and **6**, the meter assembly **40** includes a first meter **42-1** and a second meter **42-2** supported by a meter frame **46** on the row unit **10**. As best illustrated in FIG. **4**, the opener disc assemblies **200** each open a distinct trench in the soil disposed beneath each meter **42**. Each meter may comprise any metering device adapted to dispense crop inputs. In some embodiments, the seed meters **42** comprise vacuum-type seed meters. The motor **70** is preferably adapted to drive the meters **42** via a mechanical connection (not shown) with at least one of the meters; the operation of the meters **42** is preferably tied by a mechanical connection (not shown) such as a shaft connecting the seed discs of the meters. In other embodiments, the motor **70** is replaced with another meter driving mechanism such as a hydraulic drive or ground drive; in some embodiments the meter driving mechanism is mounted to the toolbar drawing the row unit **10**.

As best illustrated in FIGS. **4**, **5** and **7**, the row unit **10** includes mounting plates **300** attached to the rearward bracket **26**. Each seed tube assembly **100** is mounted to the associated mounting plate **300** by a mounting bracket **310**. As best illustrated in FIGS. **8** and **9**, each mounting plate **300** includes a downwardly extending portion **330** to which each opener disc assembly **200** is mounted by a threaded boss **230**.

Turning to FIG. **6**, each seed tube assembly **100** includes a seed tube **150** defining a seed path from each seed meter **42** to the trench created by the associated opener disc assembly **200**. Each seed tube assembly **100** preferably includes a seed tube guard **110** mounted to the downwardly extending portion **330**. The seed tube guard **110** preferably extends beneath the seed tube **150** to protect the seed tube **150** from contact with the ground. The seed tube guard **110** preferably extends to either side of the seed tube **150** to protect the seed tube **150** from contact with the opener disc assembly **200**. Closing assembly **30** includes closing wheels **35** disposed behind each seed tube **150** and configured to close the trench created by the associated opener disc assembly (FIG. **3**).

In operation, as the planter traverses the field, the meters **42** deposit seeds through the seed tubes **150** into the trench opened by the associated opener disc assembly **200**. The associated closing wheel **35** then closes the trench.

The depth of the trenches created by the opener disc assemblies **200** is set by the height of gauge wheel assemblies **50** (FIG. **1**) relative to the opener disc assemblies **200**. As best illustrated in FIG. **2**, each gauge wheel assembly **50** includes a gauge wheel **52** pivotally mounted to a gauge wheel arm **55**. Gauge wheel arm **55** is preferably pivotally mounted to the row unit **10** about a pivot **57**. Gauge wheel arm **55** includes a