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(54) Title: An Apparatus for sowing seed

(57) Abstract:

An apparatus for sowing seed or the like comprising a hopper having a partition separating the inlet and outlet and located above the outlet, first and second agitators located above the partition, a hole being arranged in a semicircular recess in the partition, a shutter plate being arranged to slide across the hole to vary the size of the hole and the second agitator being arranged above the hole for sweeping seed or the like into the hole, wherein the second agitator is constructed so that during its rotation its paddles extend into the recess so as to sweep seed or the like into the hole.

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US - 4 624 195

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Statement - Bent BAEK is Inventor as well as Joint Applicant.

Additional priority claimed

(2) Australian Patent Application No. PI7121 filed 4th March, 1988, in the names of the present joint applicants.

AN APPARATUS FOR SOWING SEED

Technical Field

The present invention relates to an apparatus for sowing seed.

Background of the Invention

In agricultural projects because of the cost of seed it is important to efficiently utilize seed during sowing.

However, because of the many variable characteristics of seed, such as weight, fluffiness, dryness etc., metering the required seed during sowing has always presented a problem.

At present, a suitable system does not exist which can deliver seed to a pit or furrow at a desired rate and placement.

Existing apparatuses which carry out the sowing process consist of boxes, barrels and hoppers. A typical hopper for instance, is usually rectangular at the top and trapezoidal at the bottom. The slope of the side walls is so selected that flow of seed is not hampered.

A hole or holes is provided at the bottom of the hopper and is usually circular in shape. For seed which is not free flowing (oats, grass) an agitator may be fitted to keep the seeds moving in the hopper.

Typically, the agitator is constructed to rotate on a horizontal shaft in the hopper and during rotation of the agitator, seed is swept across the hole at the bottom of the hopper. Although the use of an agitator in the hopper is advantageous, problems such as inaccurate seeding rate and inadequate seed capacity still remain, mainly due to peripheral speed of the agitator because of its large diameter.

Disclosure of the Invention

According to one aspect the present invention there is provided an apparatus for sowing seed or the like comprising a hopper having a partition separating the inlet and outlet and located above the outlet, first and

second agitators located above the partition, a hole being arranged in a semicircular recess in the partition, a shutter plate being arranged to slide across the hole to vary the size of the hole and the second agitator being arranged above the hole for sweeping seed or the like into the hole, wherein the second agitator is constructed so that during its rotation its paddles extend into the recess so as to sweep seed or the like into the hole.

It is preferred that the shutter plate be arranged to be manipulated by an arm on the outside of the hopper.

According to a preferred embodiment of the present invention, the recess is of a semi-circular configuration.

The partition plate preferably extends horizontally between the side walls of the hopper.

Preferably, the recess is in the form of a semi-circular channel extending partway along the partition in a first horizontal direction.

According to a preferred embodiment of the present invention, the second agitator comprises paddles which are spaced evenly around the perimeter of a cylindrical rotor.

The first agitator preferably comprises paddles which extend between end discs mounted on a horizontally extending axle.

The second agitator preferably is mounted on an axle which extends in the same horizontal direction as the first agitator.

It is preferred that the second agitator is constructed so that during its rotation, the paddles extend into the recess so as to sweep seed or the like into the hole.

According to a preferred form of the present invention, the recess in the form of the semi-circular channel extends in the same direction as the first and second agitators.

It is preferred that the centre of the hole and the axles of the first and second agitators are vertically coplanar.

Advantageously, the hopper has the shape of a double-truncated pyramid.

According to another aspect of the present invention there is provided an apparatus for sowing seed comprising a hopper having a partition separating an inlet and outlet, the partition having a hole therein, and a seed feeding arrangement comprising, a shutter arranged to vary the size of the hole, a first agitator being arranged above the hole for sweeping seed into the hole, a second agitator located beneath the hole and comprising a fluted roll which is arranged to receive seed falling through the hole, and a base plate extending from the partition and below the second agitator and terminating in an upwardly extending lip, wherein the second agitator is arranged to sweep seed from the base plate to the outlet.

It is preferred the apparatus is provided with a base plate which extends from the partition and below the second agitator and the second agitator is arranged to sweep seed from the base plate to the outlet.

Preferably, the second agitator is a fluted roll.

In a preferred form of the present invention the base plate has a substantially semi-circular section below the second agitator.

The base plate preferably has an upwardly extending lip portion at its free end.

The hole in the partition is preferably located in a horizontal part of the partition.

The shutter plate preferably is located beneath the partition and may be operated from outside the hopper.

The base plate preferably is connected to the partition.

The fluted roll preferably comprises six evenly spaced flutes.

According to one embodiment the second agirator comprises a cylindrical roll having holes located therein around its periphery.

The first agitator preferably is arranged on a horizontal axle located between opposing side faces of the hopper.

The second agitator preferably is arranged on an axle in the same horizontal direction as the first agitator and is located between opposite side faces of the hopper.

The partition preferably extends in the same horizontal direction as the second agitator.

According to a preferred embodiment of the present invention there is provided an apparatus for sowing seed comprising a hopper having a first compartment for light seed and a second compartment for heavy seed, first and second partitions forming the bottom of the respective compartments and having first and second holes respectively located therein, first and second shutters being arranged to vary the size of the first and second holes respectively and a main agitator being arranged above the first hole for sweeping light seed into the first hole, first and second compartment agitators being arranged beneath the first and second holes respectively and being arranged above first and second base plates respectively which extend from the first and second partitions respectively, and the first and second compartment agitators being arranged to sweep light and heavy seed from the first and second base plates respectively to the outlet.

Preferably, seed fed from the first and second compartments through the first and second holes feeds into a common outlet.

Brief Description of the Drawings

Preferred embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 shows a sectioned side view of an apparatus for sowing seed according to the present invention and

Figure 2 shows the apparatus of Figure 1 taken along the section line B-B.

Figure 3 shows an apparatus for sowing seed having separate compartments for heavy and light seed.

Figure 4 shows a detailed view of the seed feeding arrangement shown in the dotted circle 'A' in Figure 1.

Figure 5a shows another embodiment of the seed feeding arrangement of the apparatus.

Figure 5b shows a top view of the seed feeding arrangement of Figure 5a.

Best Mode of Carrying out the Invention

In Figures 1 and 2, the hopper 20 is similar in shape to a double-truncated pyramid.

The hopper can be divided into five different sections. The first section 21 at the top of the hopper has rectangular walls, while walls of the the second section 22 taper to the third section 23. Opposing faces of the second section 22 taper from the first section 21 at the same angle of inclination. Adjacent faces however, taper at different angles of inclination.

The third section 23 is trapezoidal, while the four sides of the fourth section 24 taper at the same angle down from the third section 23 to the fifth section 25.

The fifth section 25 has parallel rectangular faces and forms the outlet of the hopper 20.

A first agitator 26 is positioned approximately in the center of the hopper and is mounted on an axle 27 which extends horizontally and through the parallel faces of section 23. The axle 27 is mounted on bearings 28 in a conventional manner.

The first agitator 26 comprises paddles 26a which extend between end discs 26b and 26c which are mounted on the axle 27 by means of bosses 26d and 26e respectively. The paddles 26a are in the form of rectangular strips of metal or wood.

Located below the first agitator 26 and in the same vertical plane, a second agitator 11 is provided which also extends horizontally between the parallel faces of section 23.

The agitator 11 is positioned partly in a semi-circular channel 12 located in a horizontal partition plate 13 which is located above section 24. The semi-circular channel 12 extends between the parallel faces of section 23 and has a rectangular hole 14 located in the bottom and approximately in its centre.

A semi-circular shutter plate 15 is provided above the hole and can be manipulated by an arm 16 which extends through the wall of the hopper, to slide over the hole to vary its size.

The second agitator 11 has its axle 11a coplanar with the hole 14 in partition plate 13, and extending parallel to the channel 12. The axle 11a is mounted on bearings 17 in a conventional manner.

The agitator 11 comprises a cylindrical roll 11b which is mounted on the axle 11a, and has four paddles 11C evenly spaced around its perimeter.

When the hopper is filled with seed for a sowing operation, the first agitator 26 is operated to agitate the seed located above the partition plate 13. Seed which is close to second agitator 11 is then swept into the hole by paddles 11c, down through section 24 and out through the outlet 25.

The setting of the size of the hole is determined by the type of seed which is contained within the hopper and on the desired seeding rate (kilograms of seed which are required per hectare of land being sown).

Typically, a graph and its equation is constructed for the type seed being sown and the shutter is manipulated to adjust the size of the hole for the desired seeding rate.

Referring to a second embodiment of the invention shown in Figure 3, a hopper 101 is shown comprising three separate compartments 102, 103 and 104.

The hopper 101 has an inlet at the top which is covered by a lid 106 and an outlet 105 at the bottom.

The compartment 102 is much larger than the compartment 113 and has approximately twice its depth.

The compartment 103 is located in the top half of the hopper 101 and to a side thereof. A wall 107 separates compartments 102 and 103 and has a movable top section 108 which acts as a lid for the compartment 103 which may be opened and closed.

The compartment 102 has the shape of a small hopper within the hopper 101 and comprises side wall 101a of hopper 101, wall 107, and partition 109 which extends from side 101a below and around an agitator 110 and joins with wall 107.

The partition 109 has a horizontal section at the bottom of the compartment 102, wherein a rectangular slot 111 is provided. Directly below this is a fluted roll 112 and a base plate 113 which help form a seed feeding arrangement shown in more detail in Figure 4 (agitator 110 has been omitted for convenience).

With regard to compartment 103, this has a horizontal partition 114 which forms the bottom of the compartment. A rectangular slot 115 is provided in this partition 114 and directly below the partition 114 a fluted roll 116 and base plate 117 are provided (shown in detail in Figure 4).

Section 104 which is located beneath partitions 109 and 115 comprises a narrow channel 118 which extends from below the compartment 103 and opens into the area directly below the bottom of compartment 102. The area below the second compartment then feeds directly to outlet 105.

Referring to Figure 4, a detailed view is provided of the seed feeding arrangement 'A' located at the bottom of compartments 102 and 103.

Partitions 111 and 115 correspond to the horizontal metal plate section 121 which as shown has a rectangular channel separating the partition 121 into parts 121a and 121b. A shutter plate 122 is provided in the channel

and is held beneath parts 121a and 121b of partition 121 by base plate 123a and securing plate 124. Base plate portion 123a and securing plate 124 are secured to the partition 121 by means of nut and bolt arrangements 125 and 126 respectively.

The base plate 123 comprises a vertical section 123b and curved section 123c.

The fluted roll 127 comprises six evenly spaced flutes 127a, and is supported on an axle 127b which extends horizontally and in the same direction as the shutter plate 122. The fluted roll 127 is arranged so that half of it is located directly beneath shutter plate 122, which is slidable horizontally to vary the size of the rectangular slot in the partition 121.

In operation, light seed is arranged to be held in compartment 102, and heavy seed is arranged to be held in compartment 103. The agitator 110 at the bottom of compartment 102 is arranged to sweep light seed into the rectangular slot provided in partition 111. Because heavier seed is held in compartment 103, an agitator is not required to insure that this seed falls through the rectangular slot provided in partition 115.

Heavier seed usually can flow easily, however this is dependent on the seed characteristics such as fluffiness, size, stickiness, etc.

Referring to Figure 4, by adjusting the shutter plate 122, the seeding rate can be adjusted as required. Seeds falling through the rectangular slot are swept (carried) by the fluted roll 127 along the base plate 123 and over end 123d of base plate 123 and from there fall by gravity to the outlet 105.

The light seeds are metered out at 113 just above outlet 105. The heavier seeds are metered out at 117 and flow along channel section 118.

Because heavy seed flows more easily due to gravitational force than light seed, the channel section 118 although quite long and narrow does not require an

agitator to move seed towards the outlet 105. Light seed and heavy seed therefore fall through the outlet 105 together.

For a selected fluted roll and base plate length, it is necessary to calibrate the shutter for settings which are dependent upon the type of seed which is being sowed. The calibration may be done experimentally by constructing graphs of the feeding rate of the seed (the amount of seed being sowed per hectare or per revolution of the fluted roll 127), against the size of the shutter opening for the particular seed being sowed. At present this is the only practical way of calibrating the apparatus as the characteristics of the seed being sowed can vary so much that mathematical models cannot be accurately predicted.

It should also be noted that feeding rate can also be altered by changing the speed of the agitators.

Figures 5a and 5b show another embodiment of the seed feeding arrangement A. In this embodiment the fluted roll 27 is replaced by a splined shaft or cylindrical roll having holes therein around its periphery 130. The shutter plate 122 is still arranged horizontally above the cylindrical roll 130 but has two vertical sections 122a and 122b extending down in front of and behind the cylindrical roll 130. Guides 131 and 132 allow the shutter plate to slide axially of the cylindrical roll 130.

As shown in Figure 5b the holes in the cylindrical roll 130 are effectively cylindrical and are equally spaced both axially and circumferentially there over.

By utilising the seed feeding section shown in Figure 5a and Figure 5b the seeding rate of a particular type of seed may be measured more accurately. In particular, seed is carried in each hole and is poured out as the hole becomes inverted during revolution of the cylindrical roll 130.

To adjust the feeding rate of seed from the hopper to the ground below, the speed of the cylindrical roll 130 may be adjusted or alternatively, the shutter plate may be adjusted to allow more or less seed to be filled into the holes 133.

It is preferred that in the embodiment shown in Figures 5a and 5b the plate opening 111 be smaller than the diameter of the cylindrical roller 130, this is to reduce the amount of seed that may fall through the plate opening 111 and directly to the ground without being carried in holes 133. In this respect the plate 122 may consists of two sections, a first section having perforations therethrough and another section which is adjustable to slide over the other section so as to allow the size of the perforation to be varied thus varying the amount of seed that may pass therethrough.

Claims:

1. An apparatus for sowing seed or the like comprising a hopper having a partition separating the inlet and outlet and located above the outlet, first and second agitators located above the partition, a hole being arranged in a semicircular recess in the partition, a shutter plate being arranged to slide across the hole to vary the size of the hole and the second agitator being arranged above the hole for sweeping seed or the like into the hole, wherein the second agitator is constructed so that during its rotation its paddles extend into the recess so as to sweep seed or the like into the hole.

2. An apparatus according to claim 1, wherein the recess comprises a channel extending partway along the partition.

3. An apparatus according to claim 1, wherein the hopper has the shape of a doubled truncate pyramid.

4. An apparatus according to claim 1, wherein the recess is in the form of a semi-circular channel which extends in the same direction as the axial direction of the first and second agitators.

5. An apparatus for sowing seed comprising a hopper having a partition separating an inlet and outlet, the partition having a hole therein, and a seed feeding arrangement comprising, a shutter arranged to vary the size of the hole, a first agitator being arranged above the hole for sweeping seed into the hole, a second agitator located beneath the hole and comprising a fluted roll which is arranged to receive seed falling through the hole, and a base plate extending from the partition and below the second agitator and terminating in an upwardly extending lip, wherein the second agitator is arranged to sweep seed from the base plate to the outlet.

6. An apparatus according to claim 5, wherein the second agitator comprises a splined shaft.

7. An apparatus according to claim 6, wherein the partition plate is semi-circular.

8. An apparatus according claim 7, wherein the shutter extends above the length of the second agitator.

9. An apparatus according to claim 5, wherein the second agitator comprises a cylindrical roll having holes located therein around its periphery.

10. An apparatus according to any one of claims 5 to 9, wherein the hopper has two inlets each having an associated compartment and seed feeding arrangement.

11. An apparatus for sowing seed comprising a hopper having a first compartment for light seed and a second compartment for heavy seed, first and second partitions forming the bottom of the respective compartments and having first and second holes respectively located therein, first and second shutters being arranged to vary the size of the first and second holes respectively and a main agitator being arranged above the first hole for sweeping light seed into the first hole, first and second compartment agitators being arranged beneath the first and second holes respectively and being arranged above first and second base plates respectively which extend from the first and second partitions respectively, and the first and second compartment agitators being arranged to sweep light and heavy seed from the first and second base plates respectively to the outlet.

DATED THIS 27th DAY OF February 1989

FISHER CORMACK & BOTHA
Patent Agents for the Applicants

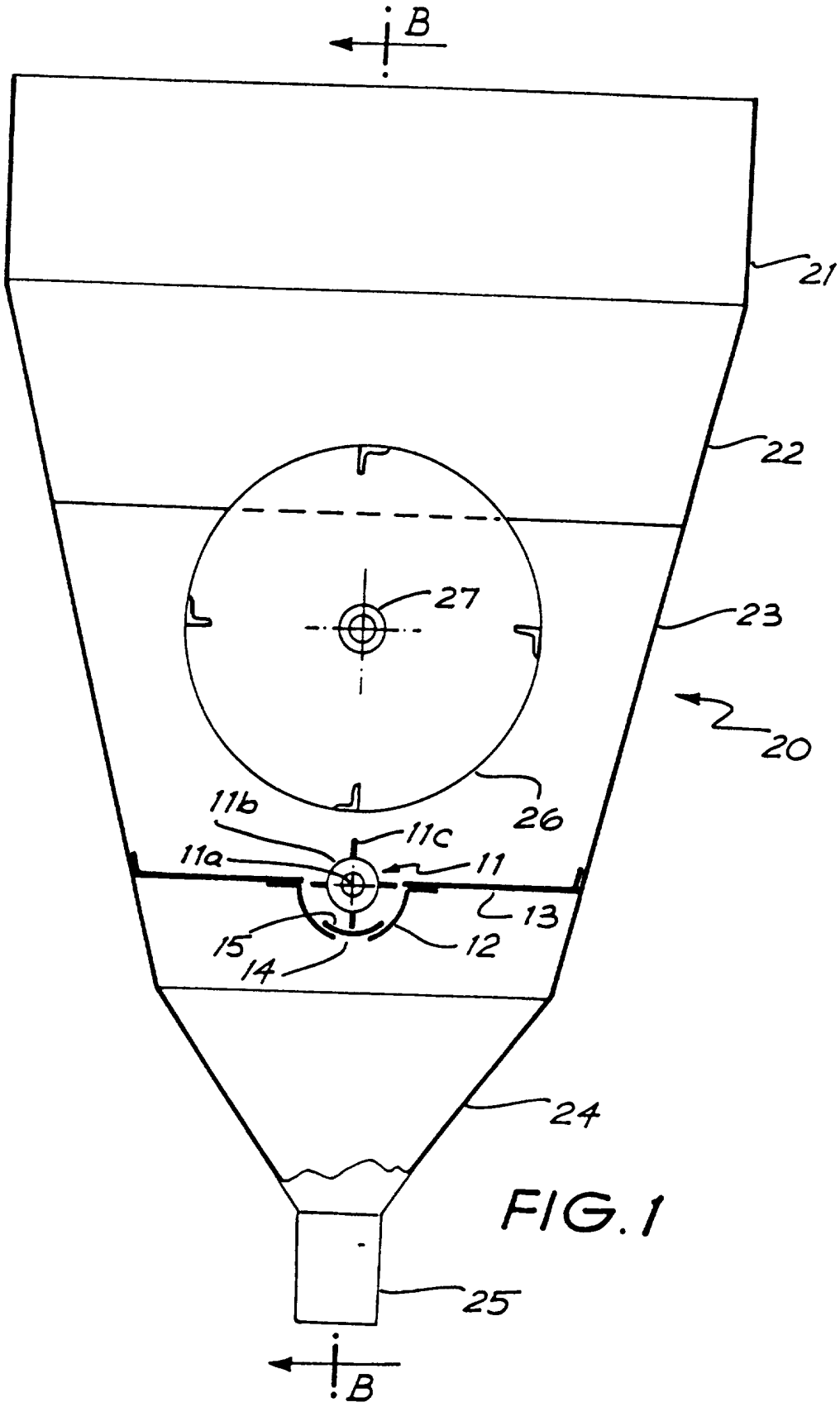

FIG. 1

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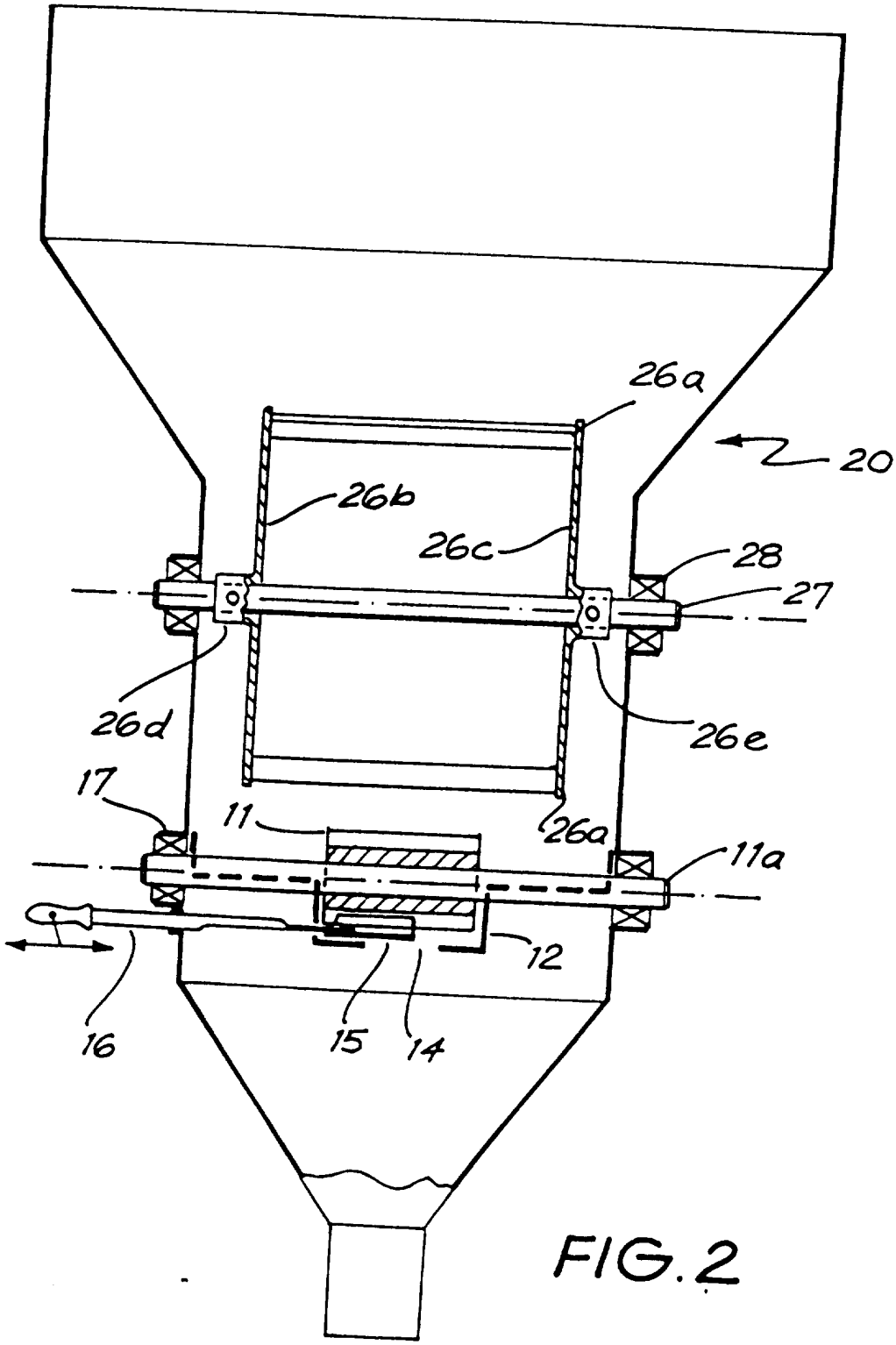

FIG. 2

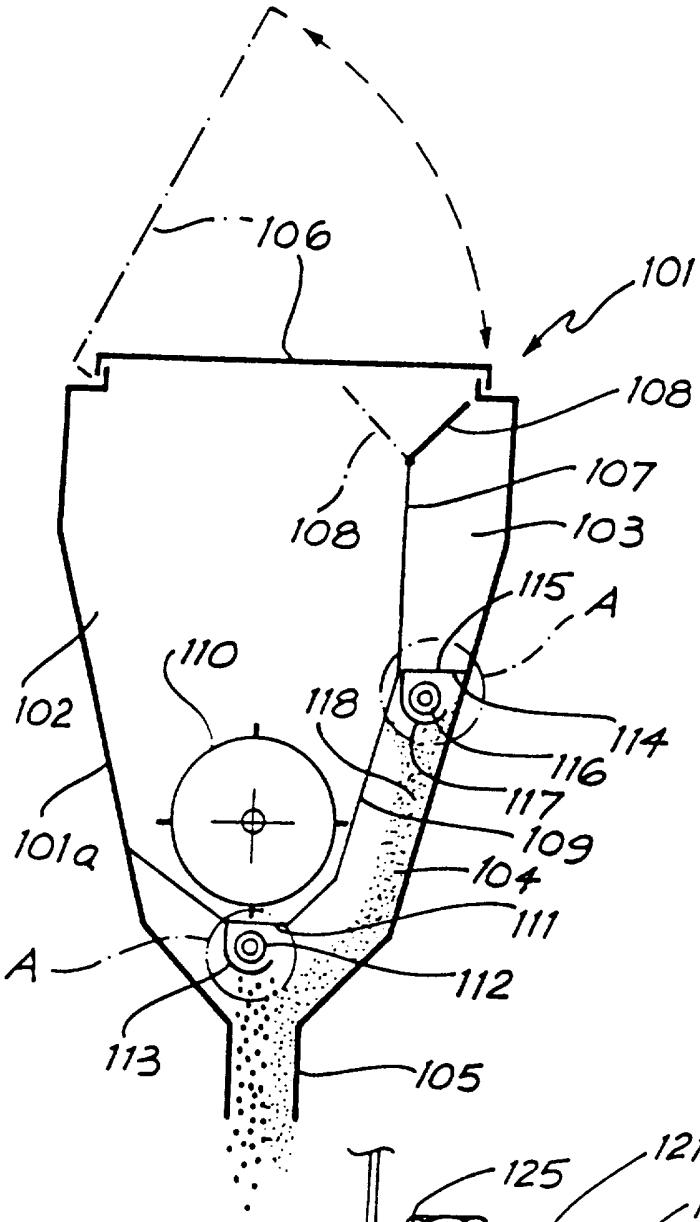

FIG. 3

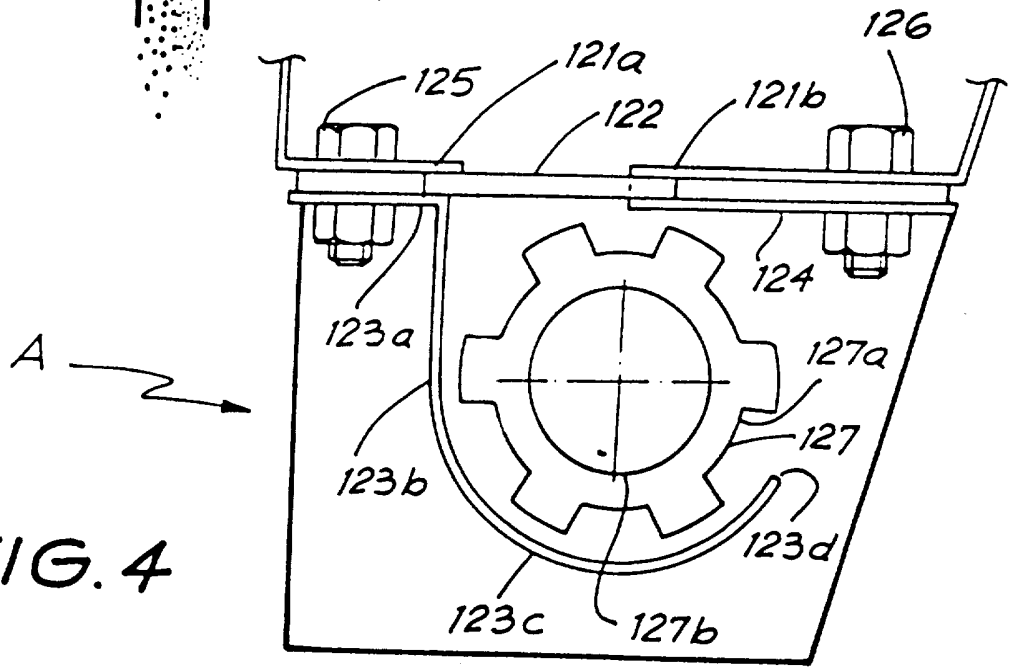

FIG. 4

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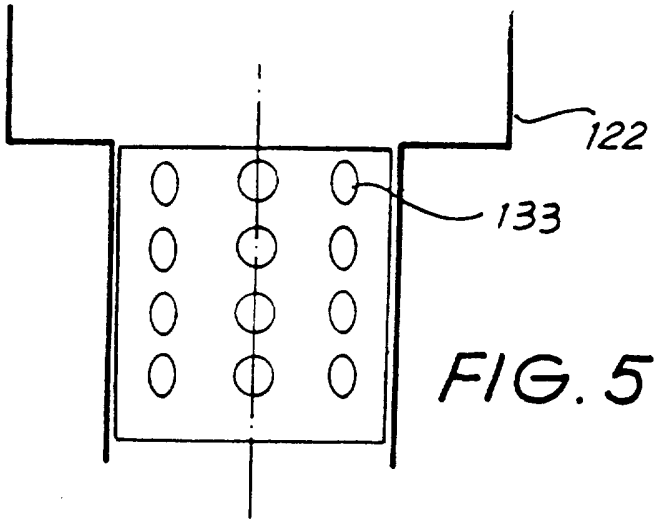

FIG. 5b

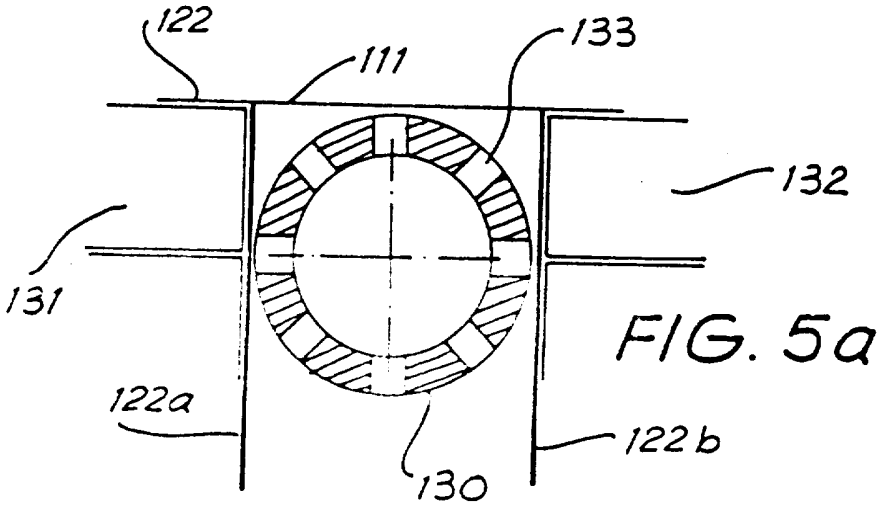

FIG. 5a