(11) Application No. AU 2007201262 A1

(19) AUSTRALIAN PATENT OFFICE

(54) Title
Dispenser

(51)[6] International Patent Classification(s)
A01B 49/06 (2006.01) 20060101AFI20070327
A01B 49/06 BHAU

(21) Application No: **2007201262** (22) Application Date: **2007 .03 .06**

(43) Publication Date : **2007 .04 .19**
(43) Publication Journal Date : **2007 .04 .19**

(62) Divisional of:
10045/02

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ABSTRACT

A device for metering particulate materials, said device having a hopper disposed above a dispenser wherein said hopper is separated from said dispenser by a pair of opposed rollers, the rollers being mounted for counter-rotation such that during rotation the upper surfaces of the rollers rotate away from each other, and each of said rollers has at least one chamber therein which during rotation of the roller collects material from the hopper and transfers the material to the dispenser.

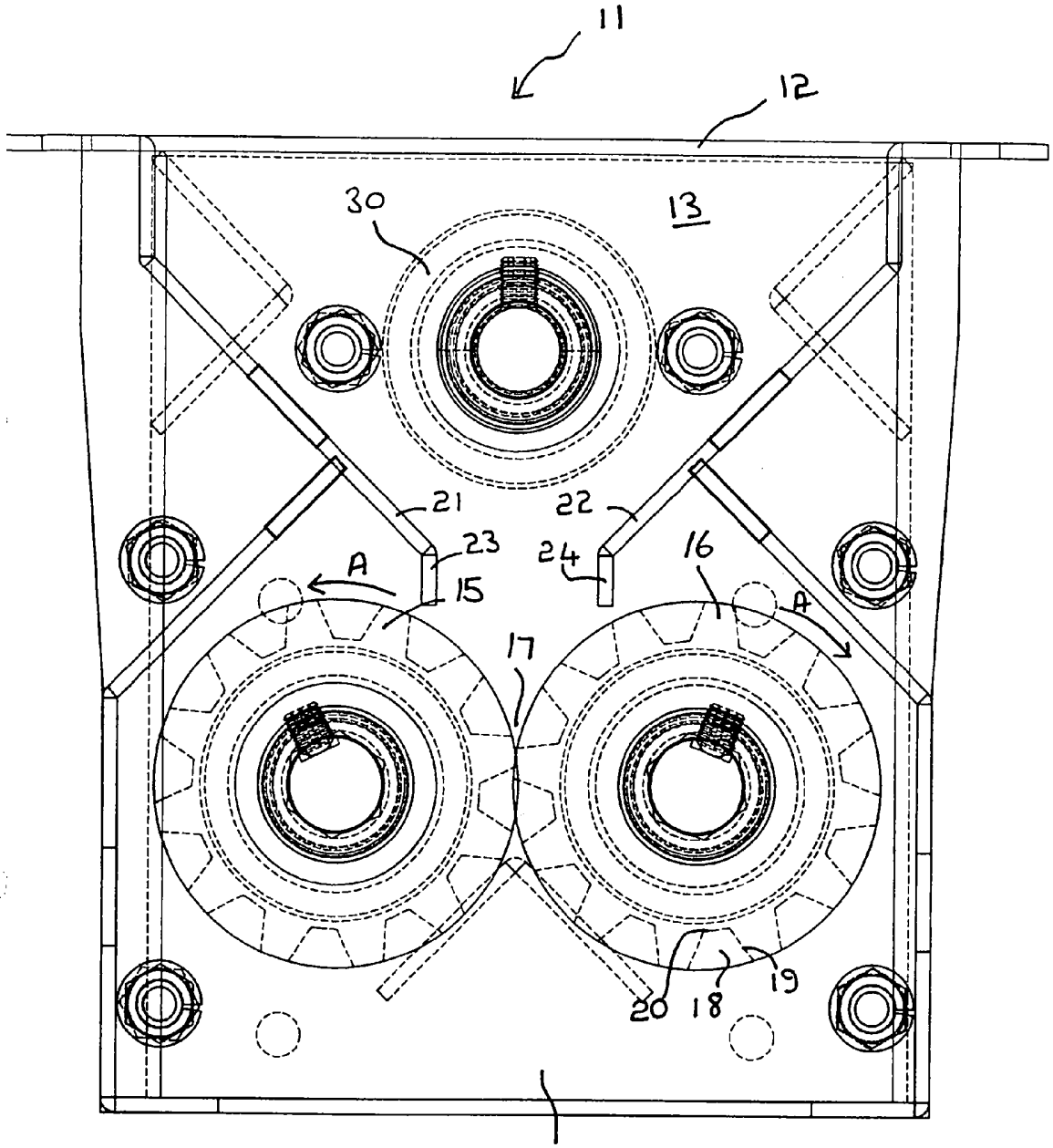

Fig. 1

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The present invention relates to a device for dispensing particulate materials. The present invention is particularly directed towards a device which may be used to meter seeds and/or fertilisers in an agricultural cultivator during planting.

The present invention will be described with particular reference to a device for metering seeds and/or fertiliser during crop planting. However, it will be appreciated that the device may have other applications and no limitation is intended thereby.

Large scale planting of seeds is typically conducted by a cultivator towed by a tractor. The cultivator has a number of tynes for creating furrows and means for dispensing seeds into the furrows. Preferably the seeds are dispensed such that they are sown in the furrows at an optimum spacing. Missed seeds or multiple plantings are undesirable and result in decreased production.

The spacings between plantings are relatively small compared with the distance covered by the cultivator. In order to ensure seeds are sown at regular intervals it is important that seeds are dispensed at a constant rate. Also, as the sizes of seeds and their seed placings vary, it is desirable that a seed meter can handle these varying requirements.

Known seed meters typically have a peg tooth or gear roller. The teeth collect one or more seeds as the roller revolves and then dispenses the collected seed through an outlet. A disadvantage of this system is that it relies upon a constant flow of grain to the pegs or gears to provide accuracy in grain delivery. The rate at which seed is delivered to the pegs or gears can vary as a result of contamination in the product such as seed dressing, moisture or in the case of fertiliser, powder residue. This variance in flow typically results in variations in sowing rates. Further, as the teeth are of a fixed size, it is not possible for the one drum to be able to deliver seeds of different sizes with the same accuracy.

Various internal system adjustments have been used in an attempt to improve the metering accuracy. The emphasis has been on providing a variety of alternative systems for transporting the seed from the meter to the furrow, rather than changing the metering device. However,

these adjustments have failed to satisfactorily overcome the aforementioned disadvantages.

It is therefore an object of the present invention to provide a device which may at least partially overcome the above disadvantages or provide the public with a useful choice.

According to a broad form of the invention, there is provided a device for metering particulate materials, said device having a hopper disposed above a dispenser wherein said hopper is separated from said dispenser by a pair of opposed rollers, the rollers being mounted for counter-rotation such that during rotation the upper surfaces of the rollers rotate away from each other, and each of said rollers has at least one chamber therein which during rotation of the roller collects material from the hopper and transfers the material to the dispenser.

The device of the present invention particularly suitable for metering seeds or fertilisers in pellet form.

The device includes a pair of counter-rotating rollers. One or preferably both of the rollers have an elastomeric surface. The elasticity of the surface of the rollers minimises crushing or damaging of the material. The elastomer may be any suitable elastomer including natural rubbers, synthetic rubbers such as neoprene, styrene-butadiene rubbers, silicone rubbers and polyurethane. A particularly preferred elastomer is polyurethane. The elastomer is preferably sufficiently elastomeric such that the roller surface does not crush or damage the material. The desired softness of the roller surface may depend upon the hardness of the material to be dispersed. Typically, for metering seed the material from which the roller surface is made has a softness of between about 20 to about 80 duro, preferably between about 30 to about 60 duro.

Preferably the clearance between the rollers is minimised to restrict or prevent material passing between the rollers.

As the rollers counter-rotate, the particulate material is collected in particle collection chambers. Typically, the chambers are in the form of lateral, inclined channels or flutes equally spaced about the circumference of the roller. Typically, the channels or flutes extend along the full length of the

rollers. Alternatively, the chambers may be in the form of spaced slots, holes or like depressions or concavities.

The rate at which the material is dispensed from the rollers can be controlled by changing the dimensions, such as the depth, of the collecting chambers and/or the speed of rotation of the rollers. The speed at which the material is dispensed may be altered for planting seeds at different spacings or to allow for different speeds of the cultivator across the ground.

The rollers may be mounted at the base of the hopper. The shafts of the rollers may extend through walls of the hopper and be attached to suitable drive means. Preferably the ends of the rollers seal against the hopper walls.

The base of the hopper may advantageously include flanges extending parallel to the rollers. Particulate material retained within the chambers on the rollers may pass unhindered below the flanges as the rollers counter-rotate. Particulate material not disposed within the chambers on the rollers is substantially prevented from being transferred to the dispenser and is retained in the hopper.

The hopper may also include an agitator, preferably in the form of a rotating shaft adjacent to the base of the hopper. The rotating shaft may include paddles or other means to agitate the particulate material in the vicinity of the counter-rotating rollers and prevent the particulate material from aggregating and not flowing freely into the chambers of the counter-rotating rollers and being transferred to the dispenser.

Typically the device includes a seal located at each end of the rollers. Preferably the seals include a lip which extends over the top of the roller that directs material away from the roller edge.

The device of the present invention is particularly suitable for use in an agricultural cultivator for metering seeds and/or fertiliser. Typically agricultural planters have a source of air and seed is carried by an air stream from a seed meter to the desired location in a furrow. The device of the present invention is especially suited for use with such types of cultivators. In this case the device is adapted such that seed or fertiliser is dispensed into an air stream.

In a further broad form of the invention there is provided a device for metering particulate materials, said device having a hopper disposed above a dispenser wherein said hopper is separated from said dispenser by a pair of opposed rollers, the rollers being mounted for counter rotation and at least one roller has a substantially elastomeric surface, whereby rotation of the rollers causes the material to pass from the hopper to the dispenser.

In this form of the invention, the rollers may counter rotate towards each other such that the material passes between the rollers. The elastomeric surface prevents or reduces damage to the material being metered as it passes between the rollers.

By way of example only, the present invention will now be described with reference to the Figures in which

Figure 1 is a cross sectional view of a preferred device of the present invention;

Figure 2 is a side elevation of the device of Figure 1; and

Figure 3 is a schematic view of the device of Figure 1.

Figure 1 is a cross-sectional view of a preferred device of the present invention. The device is in the form of a seed meter 11 for metering seeds or fertiliser. The meter 11 has a chamber 12 with an upper holding section 13 and a lower section 14 from which seeds can be dispensed. In use the meter would typically be mounted to a cultivator having a hopper (not shown) for supplying seed or fertiliser to the chamber 13 and an air distribution system. The meter would typically deliver the metered seeds or fertiliser into an air tube for delivery to the soil.

The meter 11 has a pair of counter-rotating rollers 15, 16 which rotate in the direction of arrows A. The rollers have zero clearance at their closest point 17. The rollers have a surface of an elastomeric polyurethane surface having a hardness of between about 30-60 duro. The elasticity of the roller surface minimises damage to either the seeds or the roller surface.

The rollers 15, 16 have a series of lateral flutes 18 equally spaced about the circumference rollers. The side walls of the flutes 18 are inclined towards the base wall 20.

The upper section of chamber 13 has converging guides 21, 22. The guides terminate in lips 23, 24 depending therefrom. The guides 21, 22 direct material towards the point 17 at which the rollers 15, 16 meet.

In use, as the rollers 15, 16 rotate, seed from chamber 13 is collected in flutes 19. Lips 23, 24 scrape excess seed from the roller surface such that each flute collects substantially the same volume of seed. As the rollers 15, 16 rotate further, seed is transferred to the lower section 14 of the chamber and dispensed therefrom.

The upper section of the chamber 13 has a shaft 30 with vanes 31 mounted thereon. The shaft 30 agitates the seed in the chamber to prevent or minimise bridging which can interrupt a constant flow of seed to the rollers 15, 16.

In order to maintain a constant feed of seed to the rollers, the chamber 12 and associated bin or hopper should preferably be substantially air tight. By maintaining a constant pressure on top of the seeds, constant flow can be maintained.

During rotation of the rollers, some air will of course be drawn into the upper section 13 of chamber 12. This flow of air is simply sufficient to maintain the air pressure within the meter.

Figure 2 is a side view of the seed meter. The rollers 15, 16 and shaft 30 have shafts 32, 33, 34 extending through the end walls 35, 36 of the chamber.

The end of rollers 15, 16 seal against end walls 35, 36 with minimal clearance. This reduces the likelihood of material passing between the roller end and the wall. A seal (not shown) may be located at each end of the rollers 15, 16. The seals have a curved plate which extends over the top of the roller. The curved plates direct material away from the roller edge. Typically, the plate is about 3 mm.

The rollers 15, 16 have sprocket teeth or gears 37, 38 at one end for driving the rollers.

The meter has a main drive shaft (not illustrated) which is operated by a variable drive gearbox, which in turn is connected to a ground drive. In this way, the speed of rotation of the rollers is proportional to the

ground speed of the planter. The rotation of the rollers relative to the ground speed may be varied by changing the gear ratio as required.

The rollers 15, 16 are able to be quickly and easily removed and replaced with further rollers having flutes of different dimensions and number thereof. In this way, the rate of seed delivery may be varied as required.

It can be seen that the device of the present invention can meter particulate materials at a constant rate. The amount of material fed through the rollers is proportional to the flute dimensions and speed of rotation of the rollers. The present inventor has surprisingly observed that the feed rate of material by rollers remains constant even in the presence of contaminants such as seed dressing, moisture, fertiliser powder residue or the like. It is known that the presence of such contaminants adversely affects the performance of conventional toothed rollers.

The rollers are also able to dispense large or small seeds with essentially the same degree of accuracy.

Still further because the rollers are directly below and in contact with the bulk of the seed, the seed is simply picked up as the roller rotates. In this way, the seed meter of the present invention is not reliant on a constant flow of seed to a dispensing device such as a peg tooth roller as in conventional seed meters. This independence of flow rate in the meter of the present invention contributes to the accuracy of seed delivery.

It will be appreciated that various changes and modifications may be made to the invention as described without departing from the spirit or scope thereof.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A device for metering particulate materials, said device having a hopper disposed above a dispenser wherein said hopper is separated from said dispenser by a pair of opposed rollers, the rollers being mounted for counter-rotation such that during rotation the upper surfaces of the rollers rotate away from each other, and each of said rollers has at least one chamber therein which during rotation of the roller collects material from the hopper and transfers the material to the dispenser.

2. A device for metering particulate materials according to claim 1 wherein one or both of said opposed rollers have an elastomeric surface.

3. A device for metering particulate materials according to either claim 1 or claim 2 wherein said at least one chamber in each of said opposed rollers is in the form of a lateral, inclined channel or flute.

4. A device for metering particulate materials according to anyone of claims 1 to 3 wherein the rollers are mounted in the base of said hopper and shafts of said rollers extend through the walls of said hopper and are attached to a drive means.

5. A device for metering particulate materials according to any one of claims 1 to 4 wherein the base of the hopper includes flanges extending parallel to the rollers wherein particulate material retained within the chambers on the rollers may pass unhindered below the flanges as the rollers counter-rotate and particulate material not disposed within the chambers on the rollers is substantially prevented from being transferred to the dispenser and is retained in the hopper.

6. A device for metering particulate materials according to any one of claims 1 to 5 wherein the hopper further includes an agitator in the form of a rotating shaft disposed adjacent to the base of the hopper wherein the rotating shaft includes paddles to agitate the particulate material in the vicinity of the counter-rotating rollers and prevent the particulate material from aggregating and not flowing freely into the chambers of the counter-rotating rollers and being transferred to the dispenser.

7. A device for metering particulate materials according to any one of claims 1 to 6 wherein said particulate materials are selected from the group

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consisting of seeds and fertilisers.

8. A device for metering particulate materials, said device having a hopper disposed above a dispenser wherein said hopper is separated from said dispenser by a pair of opposed rollers, the rollers being mounted for counter rotation and at least one roller has a substantially elastomeric surface, whereby rotation of the rollers causes the material to pass from the hopper to the dispenser.

9. A device for metering particulate materials according to claim 1 wherein the rollers counter rotate towards each other such that the material passes between the rollers.

10. A device for metering particulate material substantially as hereinbefore described with reference to the accompanying drawings.

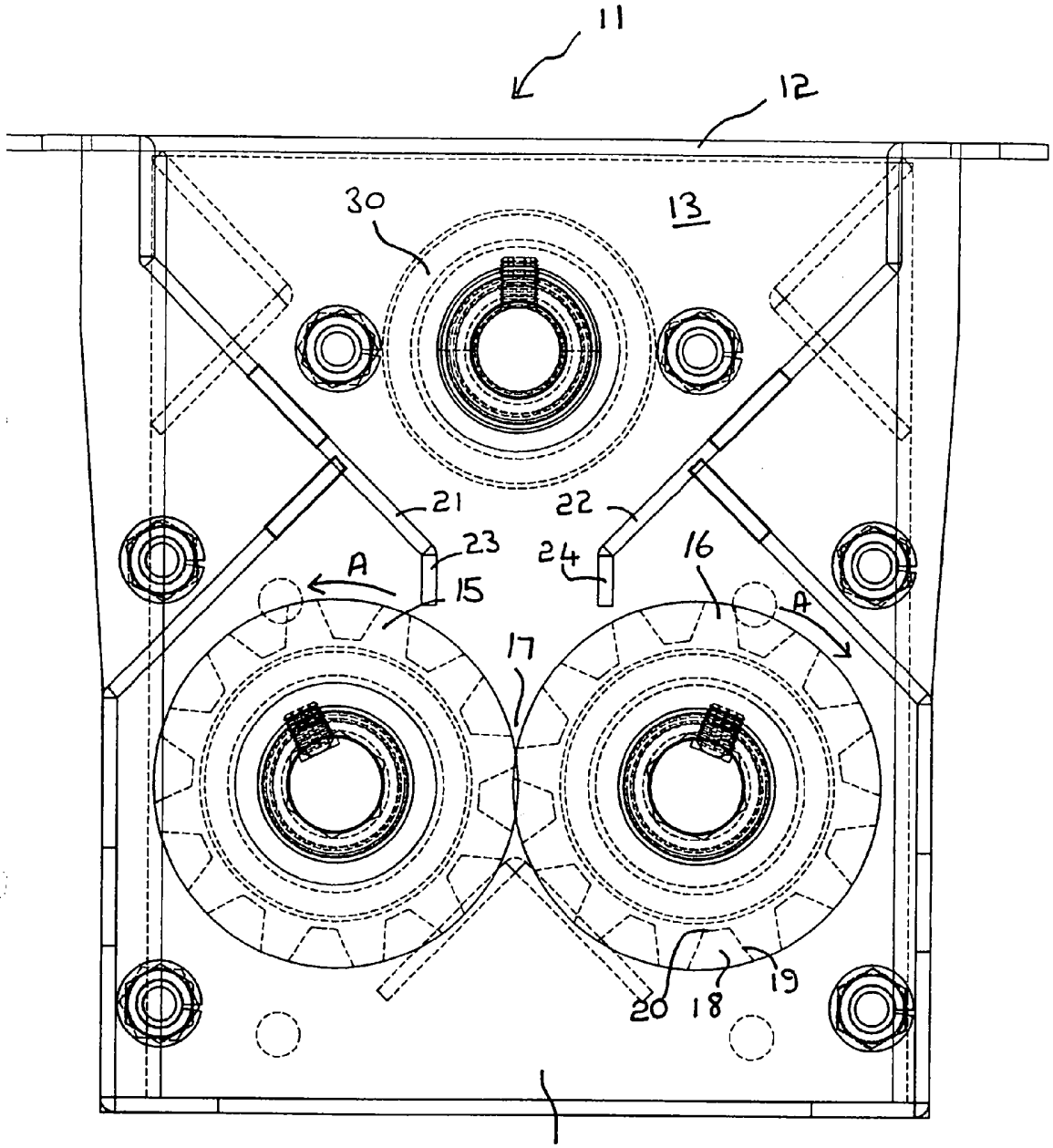

Fig. 1

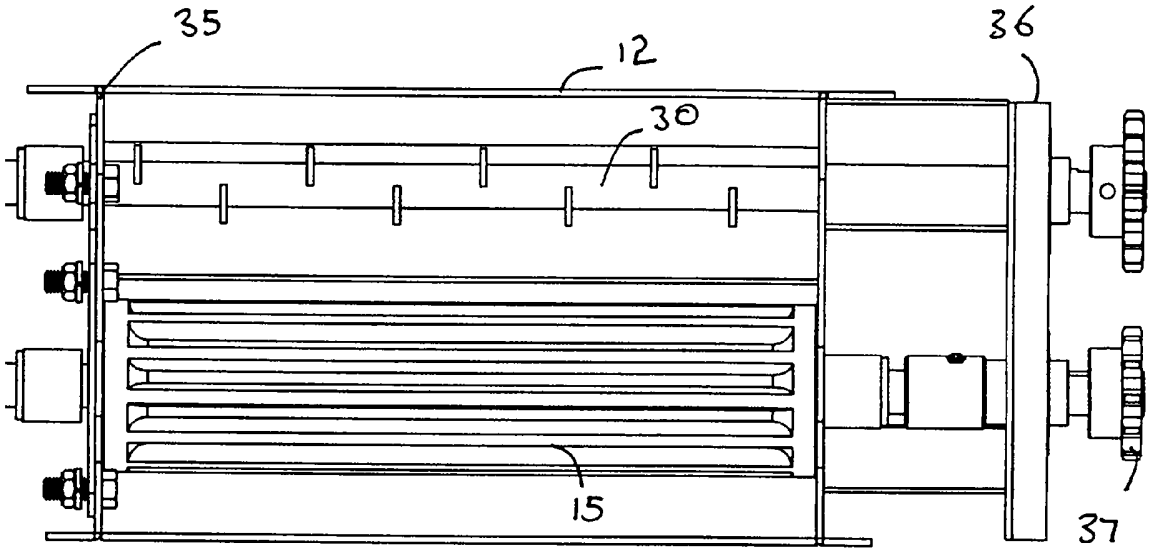

Fig. 2

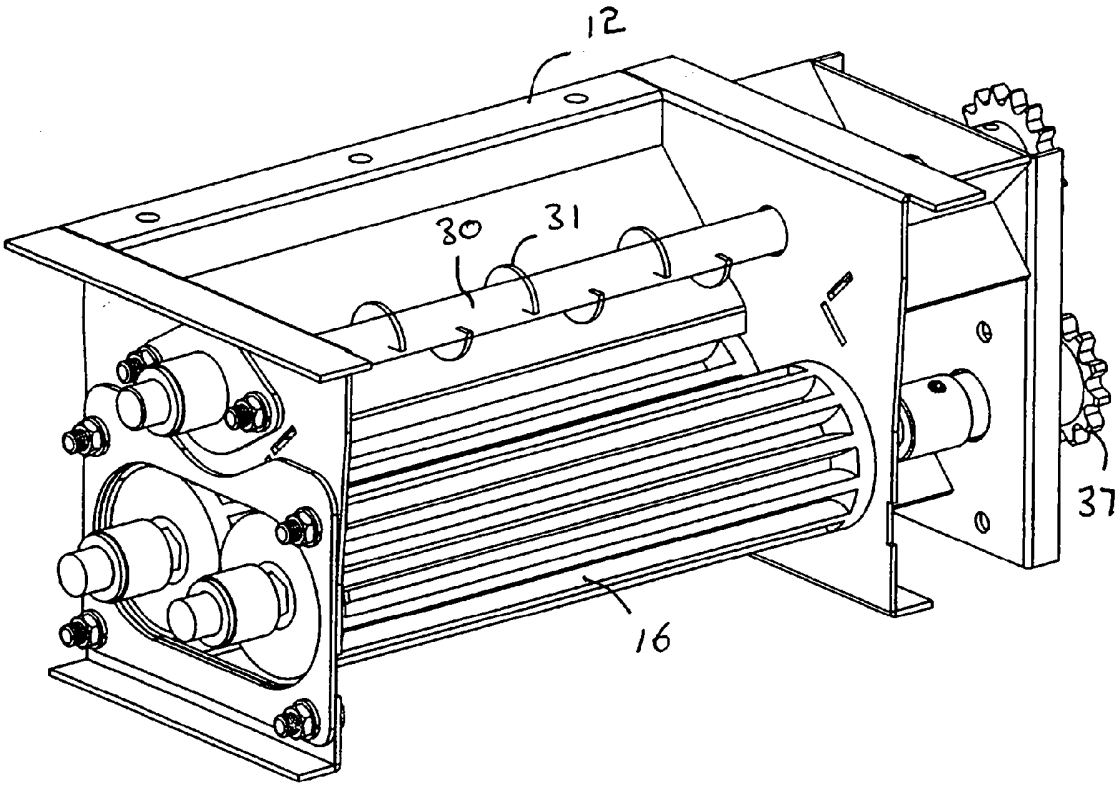

Fig. 3