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HOPPER FOR USE WITH A PORTABLE GRAIN AUGER

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(71) Applicant(s)
Gatco Manufacturing Inc.

(72) Inventor(s)
Schreiner, Gary

(74) Agent / Attorney
Phillips Ormonde Fitzpatrick, L 16 333 Collins St, Melbourne, VIC, 3000

(56) Related Art
US 4007821

ABSTRACT

An adjustable hopper is provided. A base structure is designed for being mounted to an intake of a conveying mechanism for conveying particulates. A bottom portion of a flexible hopper structure is mounted to the base structure. A top structure is mounted to a top portion of the flexible hopper structure. An adjusting mechanism is connected to the base structure and the top structure. The adjusting mechanism enables moving the top structure from a transport position, with the top structure being disposed in proximity to the base structure, to a loading position, with at least a substantial portion of the top structure being disposed at a predetermined distance to the base structure.

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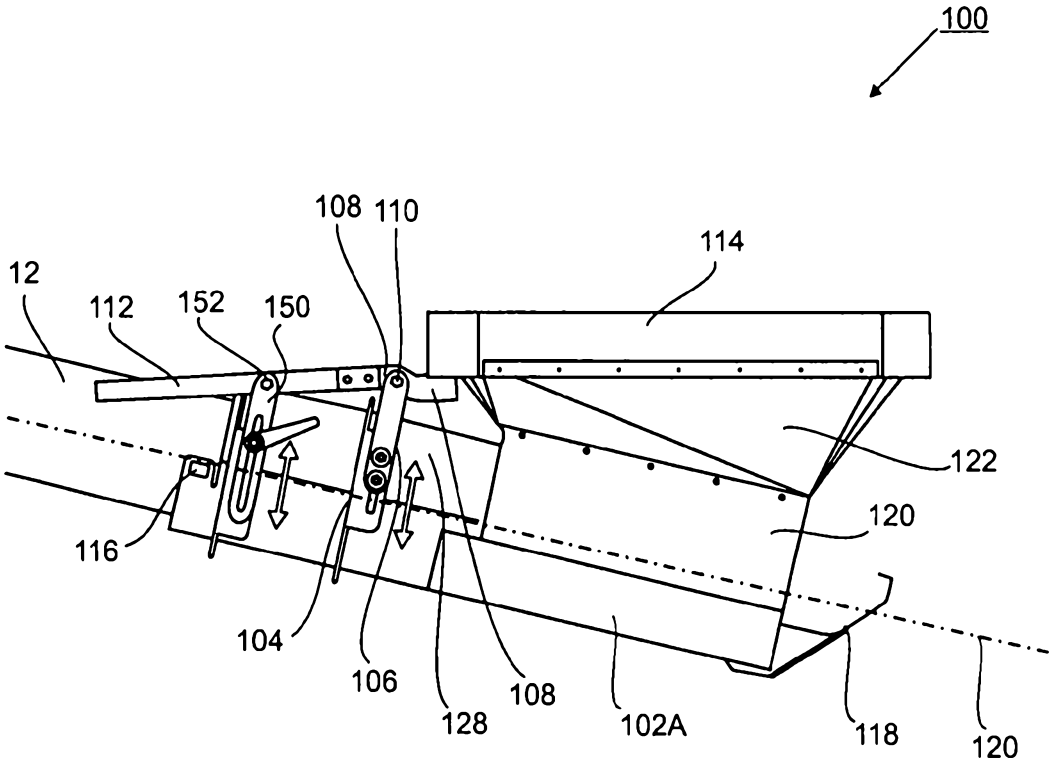

Figure. 2b

AUSTRALIA

Patents Act

COMPLETE SPECIFICATION
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Name of Applicant:

Gatco Manufacturing Inc.

Actual Inventor(s):

Gary Schreiner

Address for Service and Correspondence:

PHILLIPS ORMONDE FITZPATRICK
Patent and Trade Mark Attorneys
367 Collins Street
Melbourne 3000 AUSTRALIA

Invention Title:

DETACHABLE ADJUSTABLE HOPPER FOR USE WITH A PORTABLE GRAIN AUGER

Our Ref : 935919
POF Code: 488076/499393

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

HOPPER FOR USE WITH A PORTABLE GRAIN AUGER

This application claims priority from Canadian Application No. 2,768,953 filed on 22 February 2012, the contents of which are to be taken as incorporated herein by this reference.

FIELD OF THE INVENTION

The present invention relates to an auger for conveying of particulate material, and more particularly to a hopper for being mounted to an intake of a portable conveyor.

BACKGROUND OF THE INVENTION

A reference herein to a patent document or other matter which is given as prior art is not to be taken as an admission that that document or matter was known or that the information it contains was part of the common general knowledge as at the priority date of any of the claims.

Throughout the description and claims of the specification, the word "comprise" and variations of the word, such as "comprising" and "comprises", is not intended to exclude other additives, components, integers or steps.

In modern agriculture harvest grain such as, for example, wheat, rye, barley, canola, soybeans, is transported in hopper grain trailers with the hopper forming an unloading outlet for releasing the load disposed on the underside of the trailer for fast and simple unloading, Typically, an intake of a portable conveyer such as a top drive portable auger is disposed in a bucket-shaped nonadjustable hopper and moved under the unloading outlet for receiving the grain and conveying the same to a remote location. Alternatively, the portable grain auger is fitted with a nonadjustable hopper.

With the unloading outlet being disposed in close proximity to ground it is difficult to move the intake with the non-adjustable hopper under the unloading outlet. In some instances, a

swingaway hopper for receiving the grain and conveying the same to the portable auger intake is employed in order to facilitate positioning under the unloading outlet. Typically, the swing-away hopper has an auger and drive mechanism for conveying the grain, thus forming a rather complex mechanism for feeding the grain from the unloading outlet. to the portable auger intake.

Unfortunately, the non-adjustable hopper, as well as the swing-away hopper, does not provide a close fit between the hopper and the unloading outlet, resulting in grain being thrown out of the hopper by the rotating auger.

SUMMARY OF THE INVENTION

According to a first aspect of the invention there is provided a hopper for an intake of an auger for conveying particulate material where the auger comprises an auger tube having an open intake end and an auger flight within the tube with an intake portion of the auger flight projecting beyond the open intake end of the auger tube, the hopper comprising:

a base structure for being mounted on the intake end of the auger;

the base structure comprising a semi-cylindrical bottom wall surrounding the intake portion of the auger flight and the open intake end of the auger tube and a rectangular box-shaped structure standing upwards from a top edge of the semi-cylindrical bottom wall to an upper rectangular rim;

the base structure being defined by a rear wall, two upstanding side walls and an upstanding front wall extending to the upper rectangular rim forming said rectangular box-shaped structure;

the front wall has an opening surrounding the auger to allow the particulate material to enter the auger tube;

and an upper hopper structure with a bottom portion of the upper hopper structure mounted to the rectangular upper rim of the base structure and extending upwardly and outwardly therefrom.

According to a second aspect of the invention there is provided an auger for conveying particulate material comprising:

an auger tube having an open intake end and an auger flight within the auger tube with an intake portion of the auger flight projecting beyond the open intake end of the auger tube;

and a hopper for the intake end of the auger tube comprising:

a base structure mounted on the intake end of the auger;

the base structure comprising a semi-cylindrical bottom wall surrounding the intake portion of the auger flight and the open intake end of the auger tube and a rectangular box-shaped structure standing upwards from a top edge of the semi-cylindrical bottom wall to an upper rectangular rim;

the base structure being defined by a rear wall, two upstanding side walls and an upstanding front wall extending to the upper rectangular rim forming said rectangular box-shaped structure;

and an upper hopper structure with a bottom portion of the upper hopper structure mounted to the rectangular upper rim of the base structure and extending upwardly and outwardly therefrom.

According to a third aspect of the invention there is provided a hopper for an intake of an auger for conveying particulate material where the auger comprises an auger tube having an open intake end and an auger flight within the tube with an intake portion of the auger flight projecting beyond the open intake end of the auger tube, the hopper comprising:

a base structure for being mounted on the intake end of the auger;

the base structure comprising a semi-cylindrical bottom wall surrounding the intake portion of the auger flight and the open intake end of the auger tube and a structure standing upwards from a top edge of the semi-cylindrical bottom wall to an upper rim;

the base structure being defined by a rear wall, two side walls and an upstanding front wall extending to the upper rim;

wherein the front wall has an opening surrounding the auger to allow the particulate material to enter the auger tube;

wherein the front wall lies in a radial plane of the auger tube so that it forms a stop wall for the particulate material at the front of the base structure;

and wherein the front wall includes wall portions which extend from the opening outwardly to the semi-cylindrical bottom structure and upwardly to the upper rim.

According to a fourth aspect of the invention there is provided an auger for conveying particulate material comprising:

an auger tube having an open intake end and an auger flight within the auger tube with an intake portion of the auger flight projecting beyond the open intake end of the auger tube;

and a hopper for the intake end of the auger tube comprising:

a base structure mounted on the intake end of the auger;

the base structure comprising a semi-cylindrical bottom wall surrounding the intake portion of the auger flight and the open intake end of the auger tube and a structure standing upwards from a top edge of the semi-cylindrical bottom wall to an upper rim;

the base structure being defined by a rear wall, two side walls and an upstanding front wall extending to the upper rim;

wherein the front wall has an opening surrounding the auger to allow the particulate material to enter the auger tube;

wherein the front wall lies in a radial plane of the auger tube so that it forms a stop wall for the particulate material at the front of the base structure;

and wherein the front wall includes wall portions which extend from the opening outwardly to the semi-cylindrical bottom structure and upwardly to the upper rim.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention is described below with reference to the accompanying drawings, in which:

Figure 1a is an isometric view of a state of the art portable grain auger for use with the adjustable hopper according to a preferred embodiment of the invention;

Figure 1b is a an isometric view of an intake of the portable grain auger shown in Figure 1 a;

Figures 2a and 2b are side elevational views of the adjustable hopper according to a preferred embodiment of the invention with the hopper in a collapsed and an extended position, respectively;

Figures 2c to 2e are isometric views of the adjustable hopper according to the preferred embodiment of the invention with the hopper in an extended position;

Figures 2f and 2g are cross sectional views of the adjustable hopper according to another preferred embodiment of the invention with the hopper in a collapsed and an extended position, respectively; and,

Figure 3 is a cross sectional view of a holding mechanism for use with the adjustable hopper according to the preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention belongs. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, the preferred methods and materials are now described.

While the description of the preferred embodiments herein below is with reference to an adjustable hopper for use with a portable grain auger, it will become evident to those skilled in the art that the embodiments of the invention are not limited thereto, but are also applicable for other types of conveyors such as, for example, belt conveyors and other types of particulate materials.

Referring to Figures 1a and 1b, a conventional portable grain auger 10 is shown. Typically, auger 26 is disposed in tubular auger housing 12 and extends a predetermined distance therefrom into intake 16. The auger housing 12 is adjustable mounted to chassis 14 such that a height of discharge housing 24 above ground is variable. The auger 26 is driven by a gas engine 18 via drive mechanism 20 and gear 22. The intake 16 comprises shielding 28 mounted to the auger housing 12 and having auger bearing 30 mounted thereto.

Referring to Figures 2a to 2e, an adjustable hopper 100 according to a preferred embodiment of the invention is provided. Base structure 102 of the adjustable hopper 100 is designed for being mounted to an intake 16 of the portable grain auger 10 such that the shielding 28 is, preferably, disposed therein. The base structure 102 is mounted, for example, to the bearing housing 30 via mounting mechanism 126, as illustrated in Figure 2e. For example screw bolts are disposed in respective threaded bores of the mounting mechanism 126 for affixing the mounting mechanism 126 to the bearing housing 30 by abutting the same. Furthermore, attachment mechanism 116 is provided for affixing the adjustable hopper 100 to the auger housing 12 using, for example, a strap or ratchet-type tightening device, not shown. Optionally, an inside wall of the base structure 102 is shaped such that is provides a snug fit with a portion of the shielding 28 of the portable grain auger 10. Preferably, the base structure 102 has a semi-cylindrical bottom structure 102A surrounding a portion of the shielding 28 and an end portion of the auger housing 12 and a box-shaped structure 102B extending substantially upwards therefrom with an upper rim 103 surrounding, for example, rectangular shaped, an intake opening 124.

As shown in Figures 2b to 2e the box shaped structure 102B is defined by a rear wall 41, two upstanding side walls 43 and 44 and an upstanding front wall 42 extending to the upper rectangular rim 103.

As shown in Figure 2b, the front wall 42 of the box shaped structure 102B lies in a radial plane of the auger tube 12 so that it forms a stop wall for the particulate material at the front of the base structure 102.

As shown in Figure 2b the upstanding side walls and the upstanding front wall are arranged to guide the particulate material to the auger flight 26 inside the bars 28.

As shown in Figure 2d the front wall has an opening 45 surrounding the auger to allow the particulate material to enter the auger tube and extends from the opening 45 outwardly at 45A to the semi-cylindrical bottom structure 102A and upwardly at 45B and 45C to the top rim 103.

As shown in Figure 2d the semi-cylindrical wall 102A closely surrounds the longitudinally extending bars 28.

As shown in Figure 2d the opening 45 in the front wall 42 closely surrounds the longitudinally extending bars 28.

The base structure 102 is made, for example, of suitable sheet metal such as steel or aluminum using standard manufacturing technologies. Alternatively, the base structure 102 is made, for example, of a suitable plastic material such as polypropylene, polyethylene, or Nylon™ using standard molding technologies.

A bottom portion of flexible hopper structure 122 is mounted to the rim 103 of the base structure 102. Preferably, the flexible hopper structure 122 is made of a flexible material having sufficient flexibility for adjusting the flexible hopper structure 122 between a transport position - with the flexible hopper structure 122 being collapsed, as illustrated in Figure 2a - to a loading position - with the flexible hopper structure 122 being partially or fully extended, as illustrated in Figure 2b.

Preferably, the flexible hopper structure 122 is made of a suitable flexible material having sufficient abrasive resistance such as fabric reinforced rubber using, for example, cotton, fiberglass, Nylon™, or Kevlar™ for the fabric canvas and natural rubber, Silicone™, or Neoprene™ for the rubber-type material.

The flexible hopper structure 122 is mounted to the rim 103 of the base structure 102 in a conventional manner using, for example, a tight fit, an adhesive, rivets, or screws.

Preferably, top structure 114 forms a ring and is mounted to a top portion of the flexible hopper structure 122 in a conventional manner. The top structure 114 is, preferably, of rectangular shape and sized to conform to the respective unloading outlet of the hopper grain trailer. The top structure 114 is made in a conventional manner, for example, of a suitable plastic material - such as polypropylene, polyethylene, or Nylon™ – or of a suitable metal - such as steel or aluminum.

Alternatively, the top structure 114 is of a different shape such as, for example, circular shape or oval shape.

Further alternatively, the flexible hopper structure 122 is realized using nested ring shaped hopper elements 122A, 122B, 122C made of a substantially rigid material - such as, for example,

a suitable sheet metal or plastic material – as illustrated in Figures 2f and 2g, showing the collapsed and extended hopper structure, respectively.

An adjusting mechanism is connected to the base structure 102 and the top structure 114. The adjusting mechanism enables movement of the top structure 114 from the transport position with the top structure being disposed in proximity to the base structure 102, as illustrated in Figure 2a, to the loading position with at least a substantial portion of the top structure 114 being disposed at a predetermined distance to the base structure 102. Preferably, the adjusting mechanism enables linear movement of the top structure 114 in a direction substantially perpendicular to the longitudinal axis 120 of the auger housing 12 and pivotal movement around pivot 110, as illustrated by the arrows in Figure 2a. Further preferably, the adjusting mechanism is capable of holding the top structure 114 in one of a plurality of predetermined loading positions.

The linear movement is enabled, for example, by linear guiding elements 104 mounted to opposite sides of the base structure 102 in a conventional manner using, for example, welds or rivets. Linear adjusting elements 106 are linear movable mounted to the respective linear guiding elements 104 using, for example, screw bolts accommodated in elongated apertures 105 disposed in the linear guiding elements 104 and the linear adjusting elements 106. The linear adjusting elements 106 are then affixed to the linear guiding elements 104 at a predetermined position using respective screw nuts or wing nuts 107.

The pivotal movement is enabled, for example, by pivotal adjusting elements 108 pivotally movable mounted to the respective linear adjusting elements 106 at pivots 110 in a conventional manner using, for example, bolts mounted to the linear adjusting elements 106 and disposed in respective bores of the pivotal adjusting elements 108. Furthermore, one of the pivotal adjusting elements 108 forms a hand lever 112 extending therefrom for enabling an operator to adjust the position of the top structure 114. The top structure 114 is locked in various predetermined positions in a conventional manner using, for example, a second linear adjusting element 150 having the pivotal adjusting element 108 pivotally movable mounted thereto at pivot 152 and being linear movable mounted to second linear guiding element 154 using, for example, screw bolts accommodated in elongated apertures 156 disposed in the second linear guiding element

154 and the second linear adjusting element 150. The second linear adjusting element 150 is then affixed to the second linear guiding element 154 at a predetermined position using a respective screw nut 158 having lever 160 connected thereto.

Alternatively, a ratchet type holding mechanism with a gear 134 disposed on one of the pivotal adjusting elements 108 and a pawl 130 pivotally mounted to the respective linear adjusting element 106 at pivot 132, as illustrated in Figure 3. Pivotal movement of the pawl using lever 128 releases or locks the pivotal adjusting elements 108. Optionally, the pawl is spring loaded for holding the same in a locking position. The linear movement is locked, for example, in a similar fashion using a linear rack instead of gear 134. Further alternatively other mechanisms such as, for example, a bolt disposed in one of a plurality of bores, each associated with a predetermined position of the top structure 114, are employed.

Optionally, the adjusting mechanism is designed for enabling only one of the longitudinal movement and the pivotal movement of the top structure 114, thus simplifying the adjusting mechanism but also limiting the capability of adjusting the hopper. For example, pivotal movement is omitted in case the auger housing 12 is oriented at a fixed angle to the horizontal, i.e. the discharge housing is disposed at a fixed height above ground.

Further optionally, actuators such as, for example, step motors are connected to the adjusting mechanism for enabling remote controlled adjustment of the hopper.

Preferably, the base structure 102 has a skid 118 connected thereto for facilitating movement of the portable auger 10 with the adjustable hopper 100 under the unloading outlet of the hopper grain trailer.

The present invention has been described herein with regard to preferred embodiments. However, it will be obvious to persons skilled in the art that a number of variations and modifications can be made without departing from the scope of the invention as described herein.

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The claims defining the invention are as follows:

1. A hopper for an intake of an auger for conveying particulate material where the auger comprises an auger tube having an open intake end and an auger flight within the tube with an intake portion of the auger flight projecting beyond the open intake end of the auger tube, the hopper comprising:

a base structure for being mounted on the intake end of the auger;

a base structure comprising a semi-cylindrical bottom wall surrounding the intake portion of the auger flight and the open intake end of the auger tube and rectangular box-shaped structure standing upwards from a top edge of the semi-cylindrical bottom wall to and upper rectangular rim;

the base structure being defined by a rear wall, two upstanding side walls and an upstanding front wall extending to the upper rectangular rim forming said rectangular box-shaped structure;

the front wall has an opening surrounding the auger to allow the particulate material to enter the auger tube;

and an upper hopper structure with a bottom portion of the upper hopper structure mounted to the rectangular upper rim of the base structure and extending upwardly and outwardly therefrom.

2. The hopper as claimed in claim 1, wherein the upstanding side walls and the upstanding front wall are arranged to guide the particulate material to the auger flight.

3. The hopper as claimed in claim 1 or 2, wherein the upper hopper structure is made of a flexible material.

4. The hopper as claimed in any one of claims 1 to 3, wherein the upper hopper structure comprises a ring surrounding a top portion of the upper hopper structure.

5. The hopper as claimed in any one of claims 1 to 4, wherein the base structure is adapted for being mounted to an intake of a portable grain auger.

6. The hopper as claimed in any one of claims 1 to 5, wherein the auger tube includes a plurality of longitudinally extending bars surrounding the auger flight and wherein the semi-cylindrical bottom wall closely surrounds the longitudinally extending bars.

7. The hopper as claimed in any one of claims 1 to 5, wherein the auger tube includes a plurality of longitudinally extending bars surrounding the auger flight and wherein the opening in the front wall closely surrounds the longitudinally extending bars.

8. The hopper as claimed in any one of claims 1 to 7, wherein the front wall lies in a radial plane of the auger tube so that it forms a stop wall for the particulate material at the front of the base structure.

9. The hopper as claimed in any one of claims 1 to 8, wherein the front wall includes wall portions which extend from the opening outwardly to the semi-cylindrical bottom structure and upwardly to the upper rim.

10. An auger for conveying particulate material comprising:

an auger tube having an open intake end and an auger flight within the auger tube with an intake portion of the auger flight projecting beyond the open intake end of the auger tube;

and a hopper for the intake end of the auger tube comprising:

a base structure mounted on the intake end of the auger;

the base structure comprising a semi-cylindrical bottom wall surrounding the intake portion of the auger flight and the open intake end of the auger tube and a rectangular box-shaped structure standing upwards from a top edge of the semi-cylindrical bottom wall to an upper rectangular rim;

the base structure being defined by a rear wall, two upstanding side walls and an upstanding front wall extending to the upper rectangular rim forming said rectangular box-shaped structure;

and an upper hopper structure with a bottom portion of the upper hopper structure mounted to the rectangular upper rim of the base structure and extending upwardly and outwardly therefrom.

11. The auger as claimed in claim 10, wherein the upstanding side walls and the upstanding front wall are arranged to guide the particulate material to the auger flight and the front wall having an opening surrounding the auger to allow the particulate material to enter the auger tube.

12. The auger as claimed in claim 10 or 11, wherein the upper hopper structure is made of a flexible material.

13. The auger as claimed in any one of claims 10 to 12, wherein the upper hopper structure comprises a ring surrounding the top portion of the upper hopper structure.

14. The auger as claimed in any one of claims 10 to 13, wherein the base structure is adapted for being mounted to an intake of a portable grain auger.

15. The auger as claimed in any one of claims 10 to 14, wherein the auger tube includes a plurality of longitudinally extending bars surrounding the auger flight and wherein the semi-cylindrical wall closely surrounds the longitudinally extending bars.

16. The auger as claimed in any one of claims 10 to 15, wherein the auger tube includes a plurality of longitudinally extending bars surrounding the auger flight and wherein the opening in the front wall closely surrounds the longitudinally extending bars.

17. The auger as claimed in any one of claims 10 to 16, wherein the front wall of the box shaped structure lies in a radial plane of the auger tube so that it forms a stop wall for the particulate material at the front of the base structure.

18. The auger as claimed in any one of claims 10 to 17, wherein the front wall has an opening surrounding the auger to allow the particulate material to enter the auger tube and wherein the front wall includes wall portions which extend from the opening outwardly to the semi-cylindrical bottom structure and upwardly to the upper rim.

19. A hopper for an intake of an auger for conveying particulate material where the auger comprises an auger tube having an open intake end and an auger flight within the tube with an intake portion of the auger flight projecting beyond the open intake end of the auger tube, the hopper comprising:

a base structure for being mounted on the intake end of the auger;

the base structure comprising a semi-cylindrical bottom wall surrounding the intake portion of the auger flight and the open intake end of the auger tube and a structure standing upwards from a top edge of the semi-cylindrical bottom wall to an upper rim;

the base structure being defined by a rear wall, two side walls and an upstanding front wall extending to the upper rim;

wherein the front wall has an opening surrounding the auger to allow the particulate material to enter the auger tube;

wherein the front wall lies in a radial plane of the auger tube so that it forms a stop wall for the particulate material at the front of the base structure;

and wherein the front wall includes wall portions which extend from the opening outwardly to the semi-cylindrical bottom structure and upwardly to the upper rim.

20. The hopper as claimed in claim 19, including an upper hopper structure with a bottom portion of the upper hopper structure mounted to the upper rim of the base structure and extending upwardly and outwardly therefrom.

21. The hopper as claimed in claim 20, wherein the upper hopper structure is made of a flexible material.

22. The hopper as claimed in any one of claims 19 to 21, wherein the base strcutre is adapted for being mounted to an intake of a portable grain auger.

23. The hopper as claimed in any one of claims 19 to 22, wherein the auger tube includes a plurality of longitudinally extending bars surrounding the auger flight and wherein the semi-cylindrical wall closely surrounds the longitudinally extending bars.

24. The hopper as claimed in any one of claims 19 to 23, wherein the auger tube includes a plurality of longitudinally extending bars surrounding the auger flight and wherein the opening in the front wall closely surrounds the longitudinally extending bars.

25. An auger for conveying particulate material comprising:

an auger tube having an open intake end and an auger flight within the auger tube with an intake portion of the auger flight projecting beyond the open intake end of the auger tube;

and a hopper for the intake end of the auger tube comprising:

a base structure mounted on the intake end of the auger;

the base structure comprising a semi-cylindrical bottom wall surrounding the intake portion of the auger flight and the open intake end of the auger tube and a structure standing upwards from a top edge of the semi-cylindrical bottom wall to an upper rim;

the base structure being defined by a rear wall, two side walls and an upstanding front wall extending to the upper rim;

wherein the front wall has an opening surrounding the auger to allow the particulate material to enter the auger tube;

wherein the front wall lies in a radial plane of the auger tube so that is forms a stop wall for the particulate material at the front of the base structure;

and wherein the front wall includes wall portions which extend from the opening outwardly to the semi-cylindrical bottom structure and upwardly to the upper rim.

26. The auger as claimed in claim 25, including an upper hopper structure with a bottom portion of the upper hopper structure mounted to the upper rim of the base structure and extending upwardly and outwardly therefrom.

27. The auger as claimed in claim 26, wherein the upper hopper structure is made of a flexible material.

28. The auger as claimed in any one of claims 25 to 27, wherein the auger tube includes a plurality of longitudinally extending bars surrounding the auger flight and wherein the semi-cylindrical wall closely surrounds the longitudinally extending bars.

29. The auger as claimed in any one of claims 20 to 28, wherein the auger tube includes a plurality of longitudinally extending bars surrounding the auger flight and wherein the opening in the front wall closely surrounds the longitudinally extending bars.

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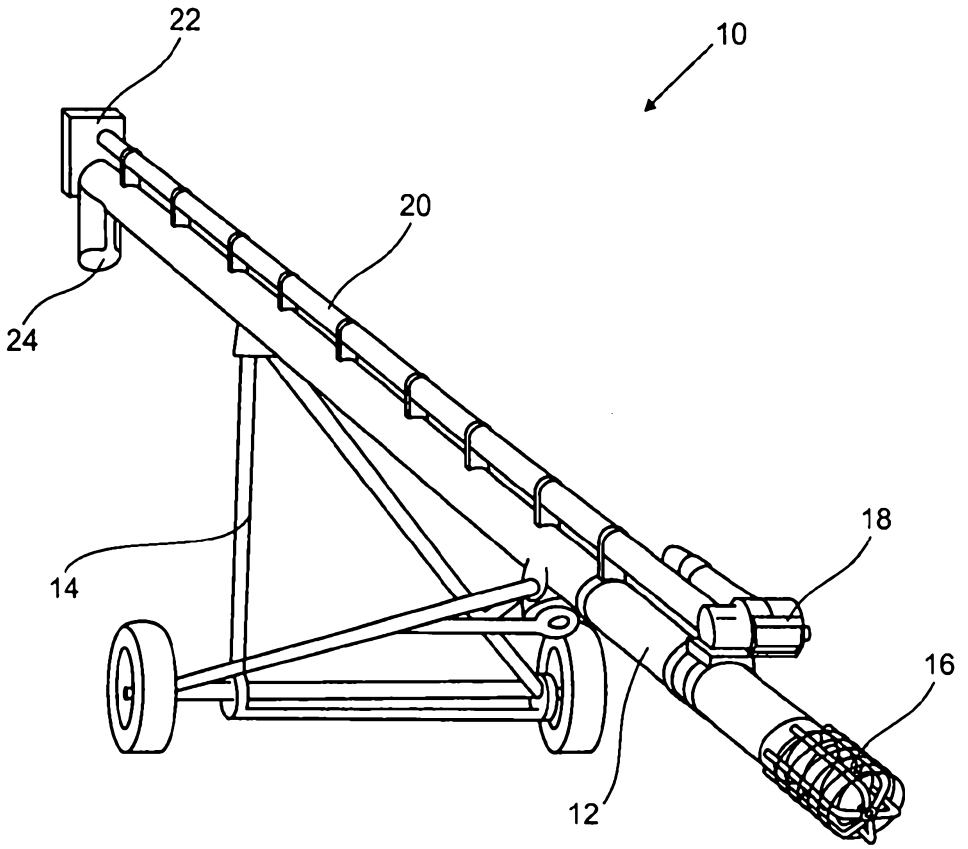

Figure. 1a
(PRIOR ART)

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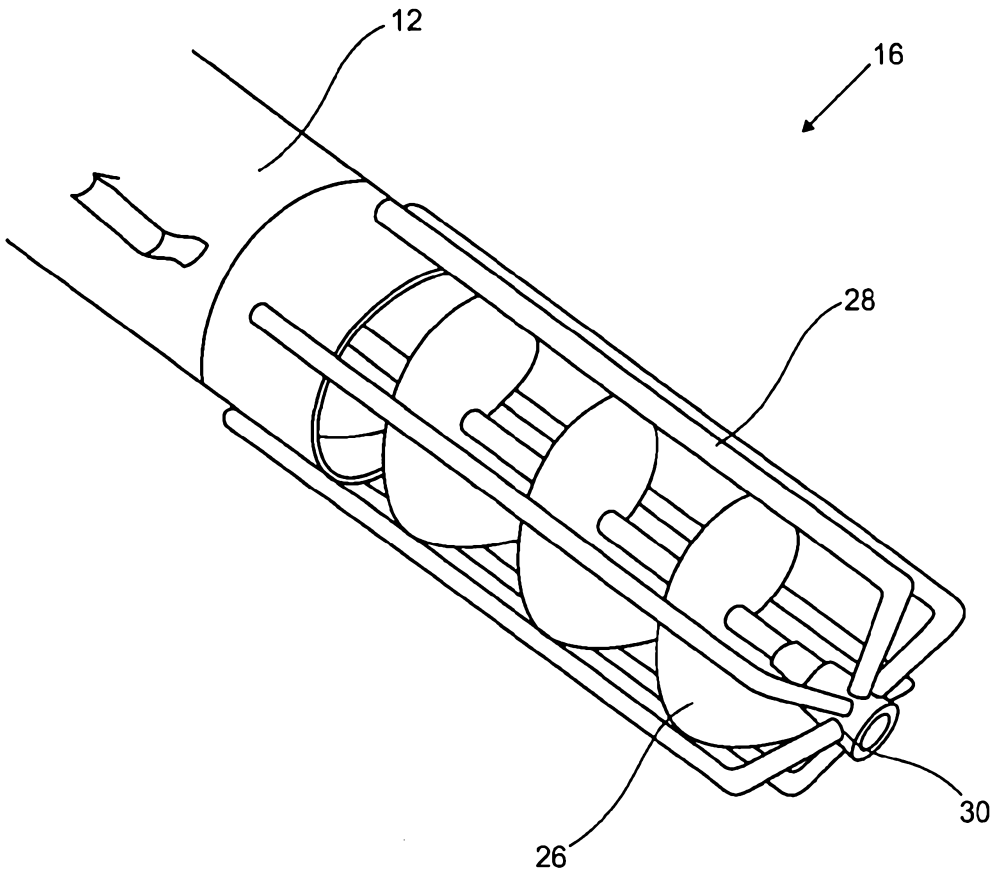

Figure. 1b
(PRIOR ART)

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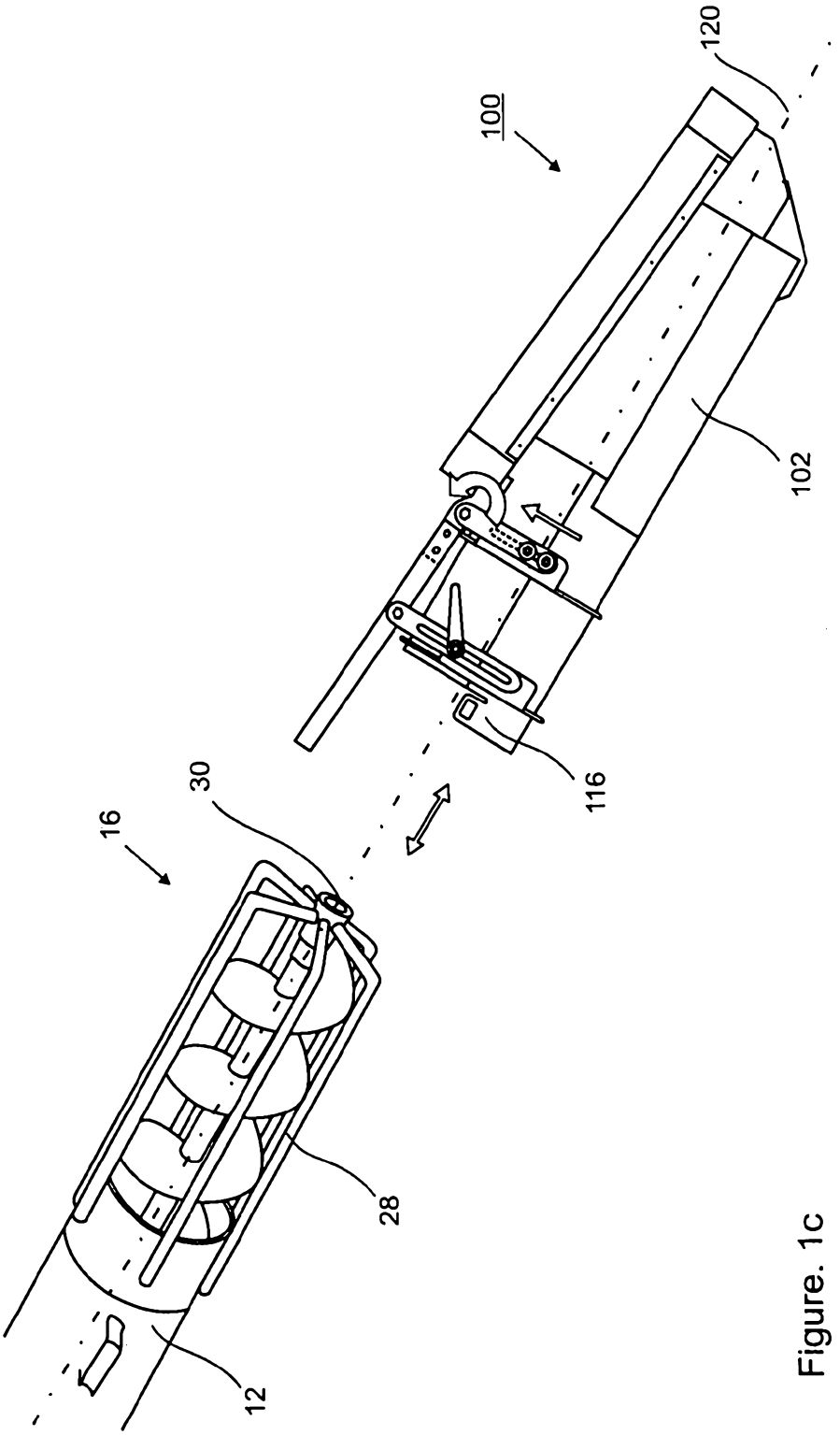

Figure. 1c

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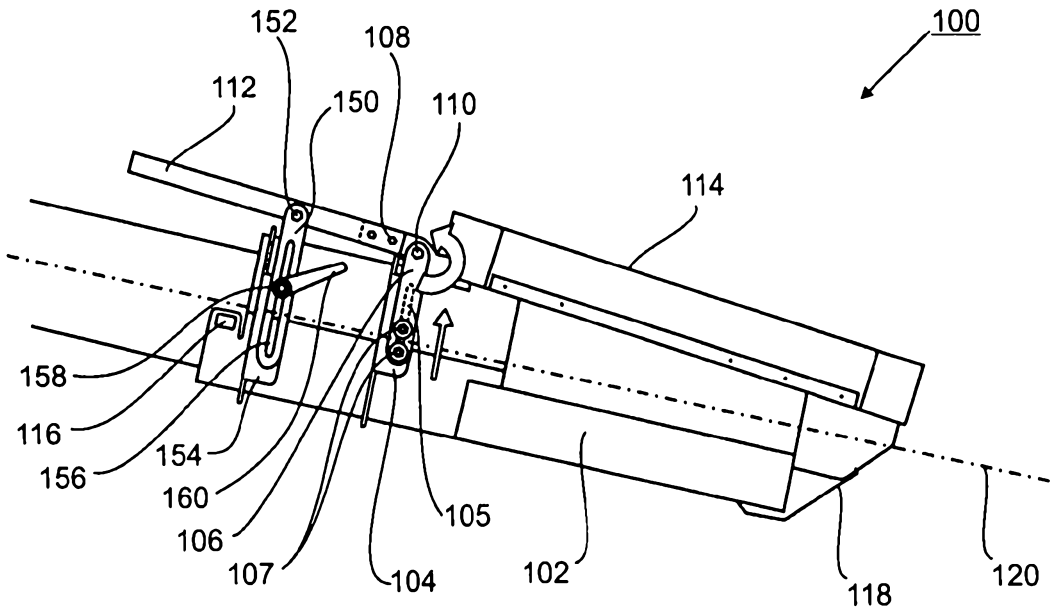

Figure. 2a

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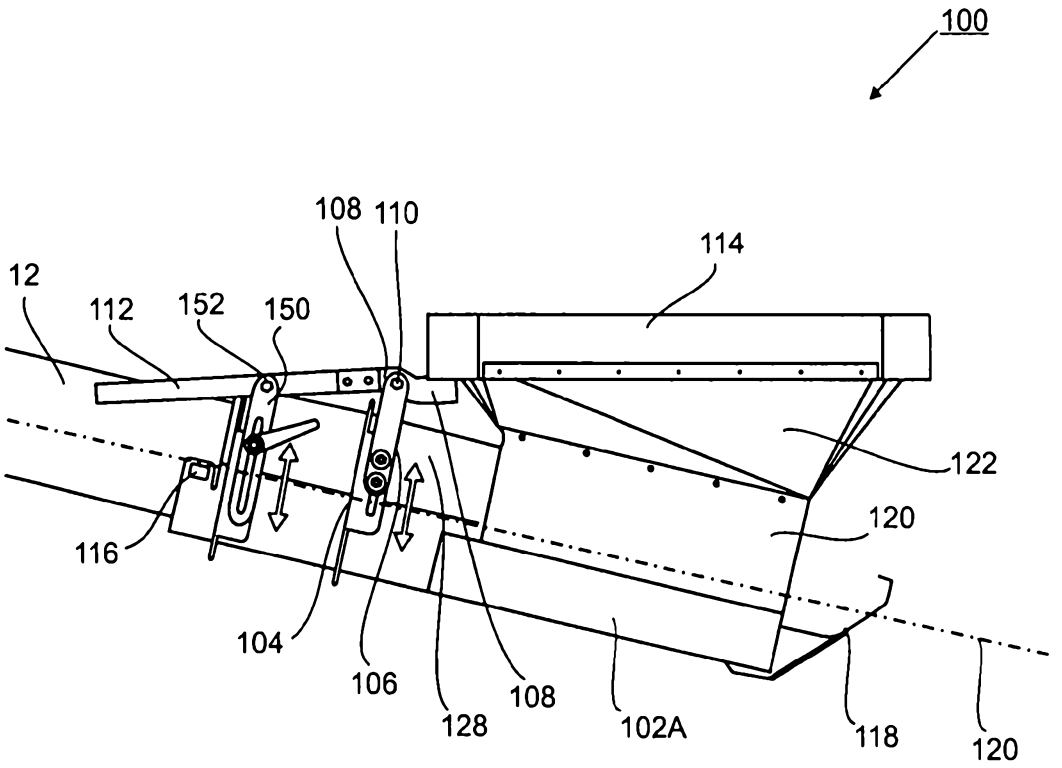

Figure. 2b

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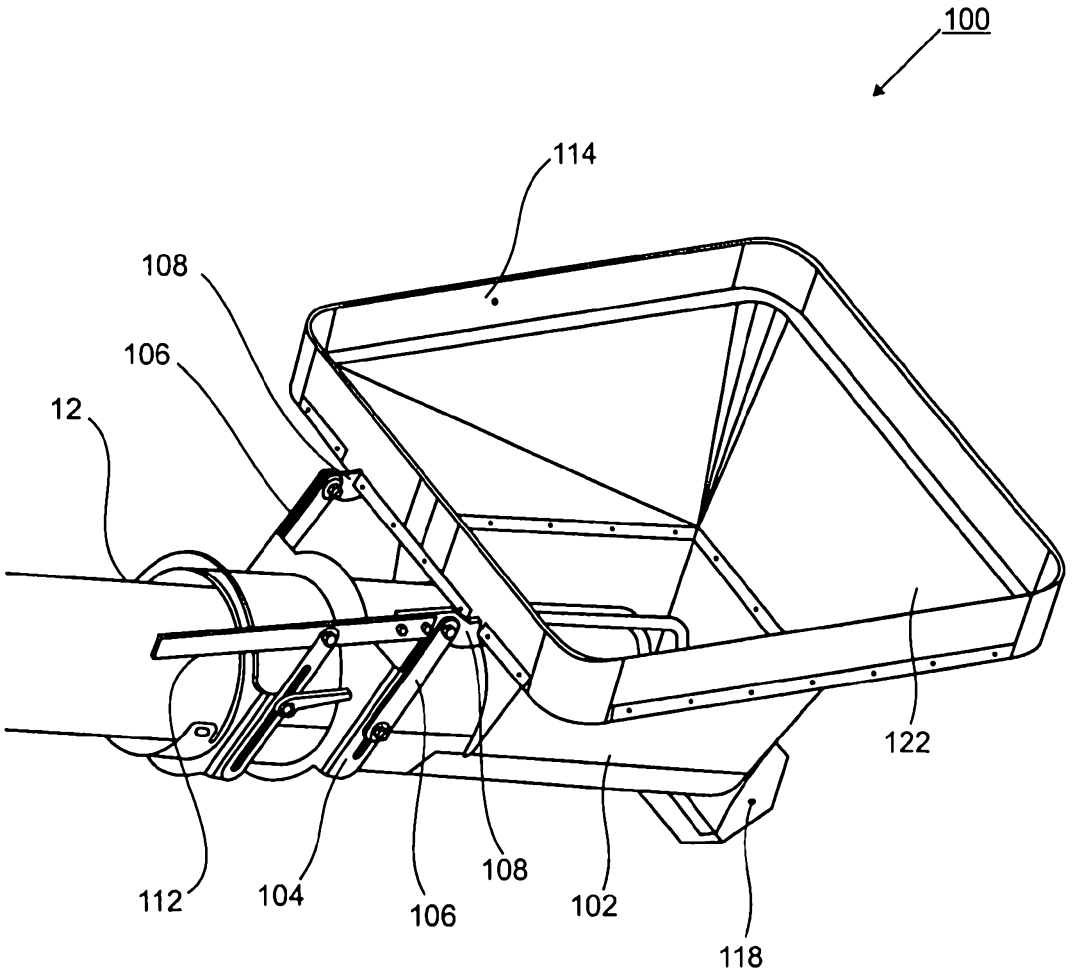

Figure. 2c

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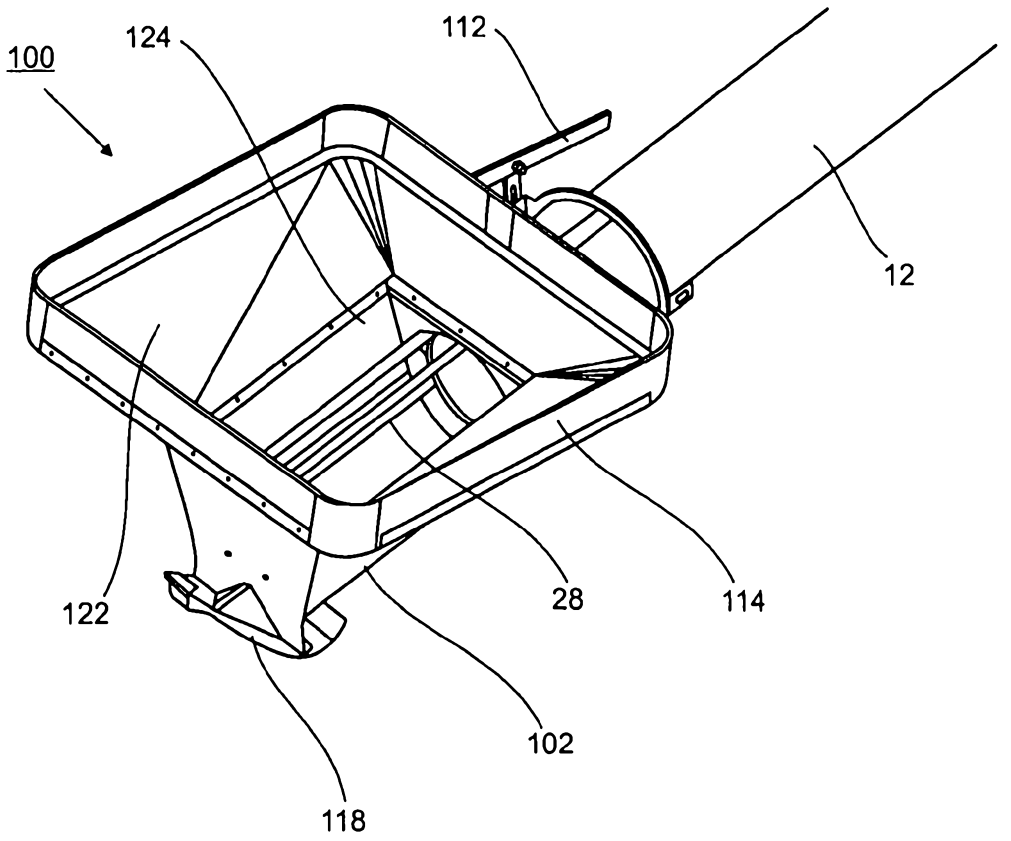

Figure. 2d

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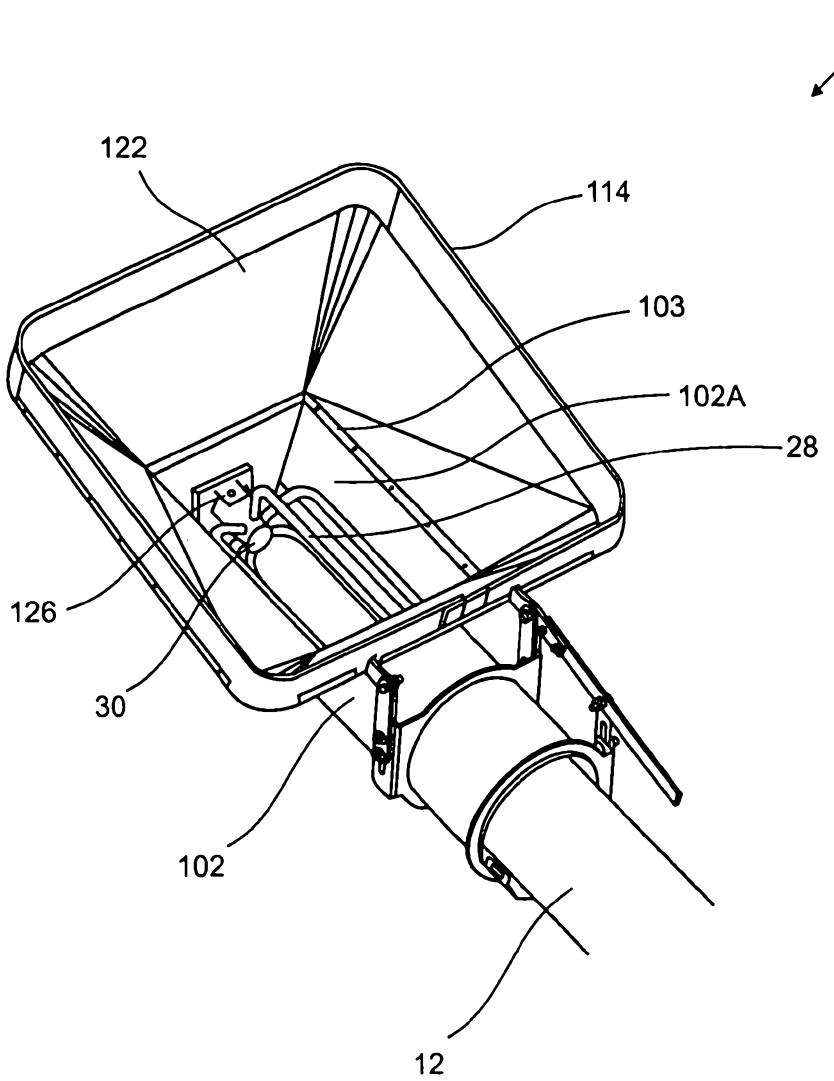

Figure. 2e

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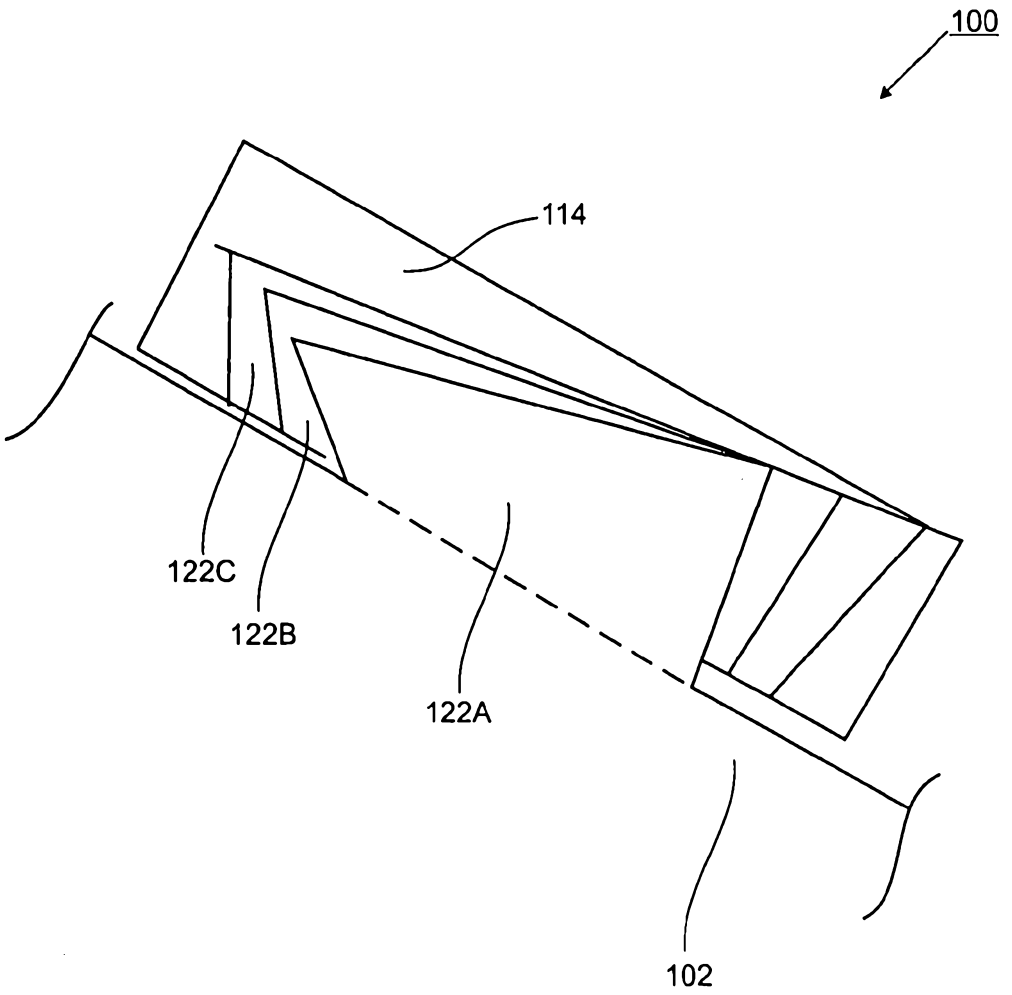

Figure. 2f

2012202078 11 Apr 2012

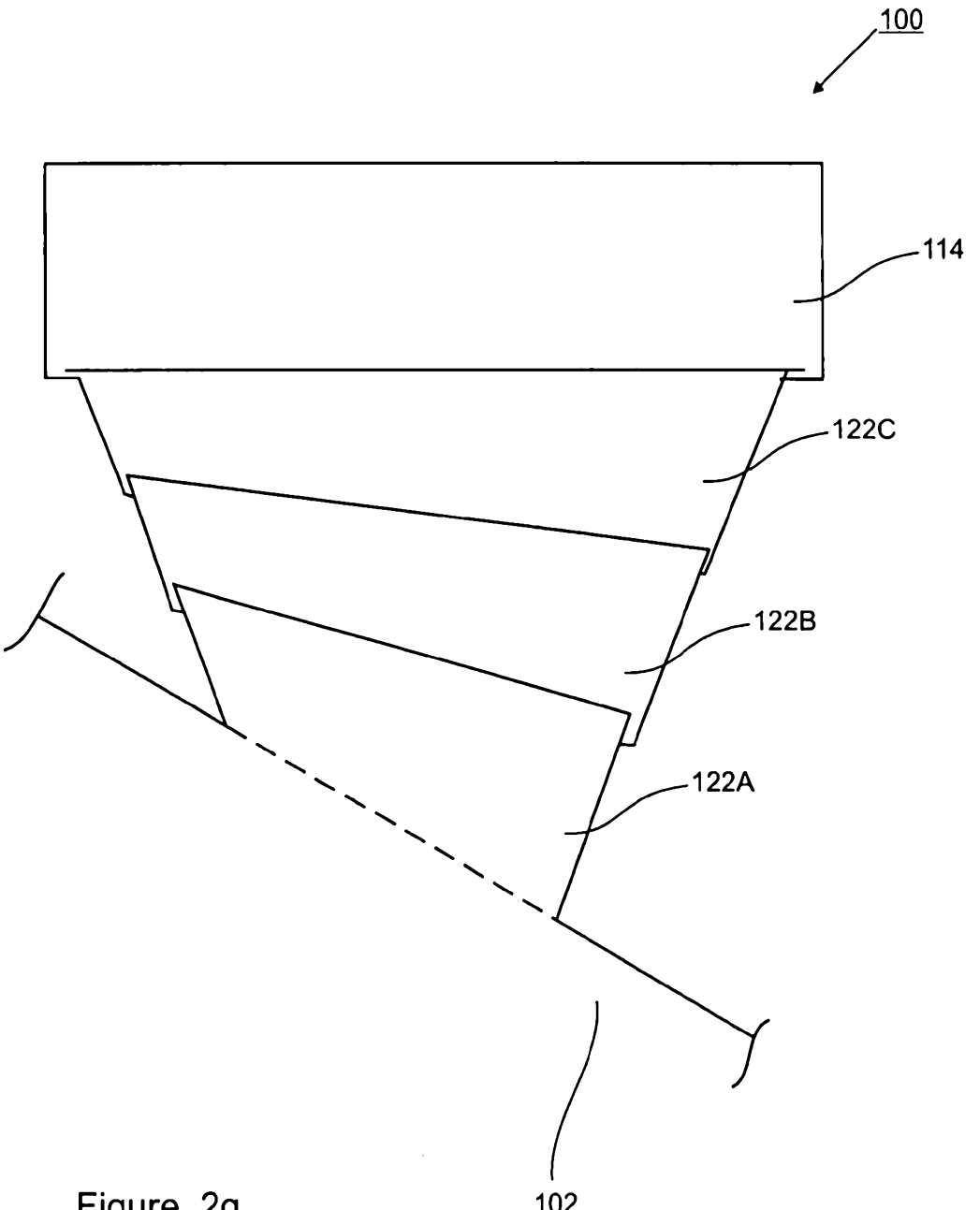

Figure. 2g

2012202078 11 Apr 2012

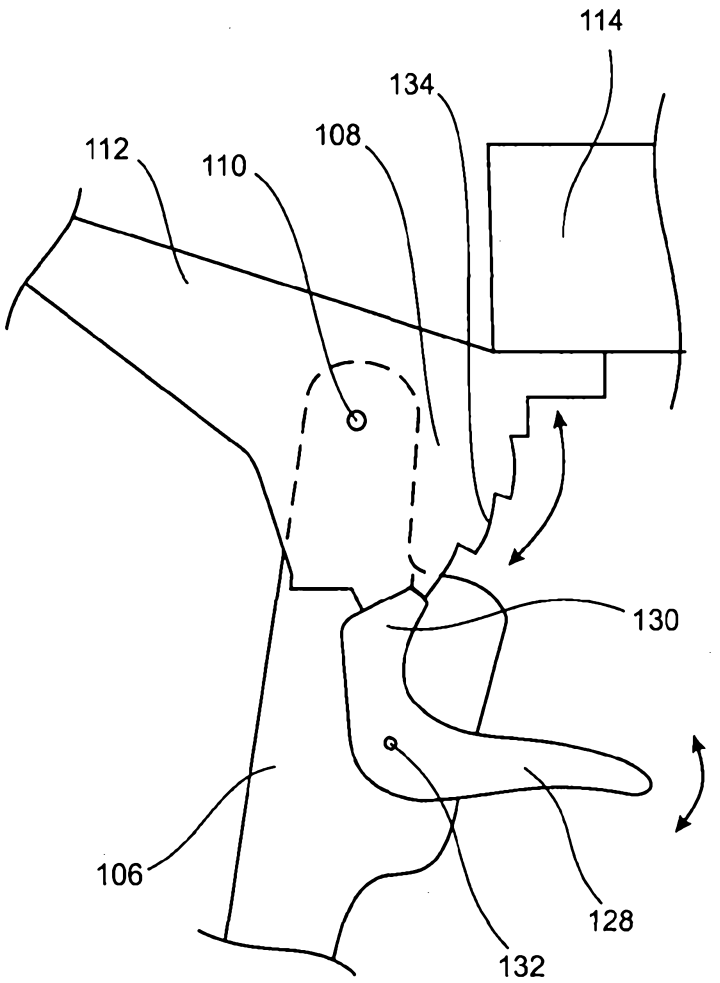

Figure. 3