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AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
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(54) Title: AUTOMATED ANIMAL FEEDING APPARATUS

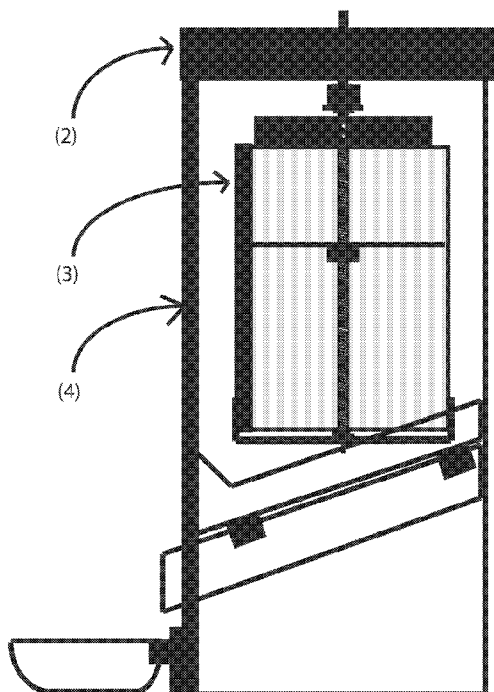


FIG. 2

(57) Abstract: The present invention relates generally to an
animal feeder and methods of using same. The animal feeder
is configured to resist clogging, enable user cleaning of the
feed hopper assembly and resist pest intrusion. The animal
feeder includes an outer shell assembly detachably connected
to a hopper assembly configured to push the feed over the top
of the hopper assembly into the outer shell assembly. The ex-
pelled feed is collected into a feed tube and delivered to a
feed receptacle.

AUTOMATED ANIMAL FEEDING APPARATUS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of priority to U.S. Provisional Patent Application Ser. No. 61/676,304, filed July 26, 2012 and entitled “Automated Animal Feeding Apparatus”; the entirety of which is incorporated by reference

FIELD OF THE INVENTION

[0002] The disclosure relates generally to an animal feeder that resists clogging by the feed and related uses. The feeder can be automatically controlled. The animal feeder has a hopper assembly that can be readily removed from the feeder housing and associated electronics for cleaning. The hopper assembly is configured to resist pest access.

BACKGROUND OF THE INVENTION

[0003] Numerous conventional livestock feeders, deer feeders, bird feeders, and pet feed dispensers are known to those of ordinary skill in the art. Most of these devices operate by gravity or in a rotary manner, and dispense, either on-demand or in a timed manner, bulk feed items, pellets, or seeds to animals in proximity to the devices.

[0004] For example, U.S. Patent Application Publication No. 2006/0191486 to Mishler discloses a feeder that dispenses bulk feed items from multiple bins using, in one case, a single, moving solenoid release mechanism. This device, however, operates by gravity. U.S. Patent Application Publication No. 2009/0145365 to Mahle et al. discloses a pet pantry that includes a feed dispensing mechanism that operates manually through the use of a vertically-oriented, linearly-actuated spring mechanism that does not isolate the feed from pests.

[0005] Prior disclosed apparatuses are subject to clogging/jamming by the animal feed. None of the prior art disclosures describe an animal feeder that suitably isolates the feed from pests. Nor do the prior art disclosures describe an animal feeder wherein the feed-contacting parts can be readily removed by the operator for cleaning.

SUMMARY OF THE INVENTION

[0006] The present invention provides an animal feeder having (a) a top assembly with a motor; (b) an outer shell assembly comprising a bounce plate and feed tube; and (c) a hopper

assembly including a hopper assembly shell configured to contain feed, a pusher plate coupled to a screw extending the length of the hopper assembly shell that vertically drives the plate structure within the feed hopper and wherein the screw is operably connected to the motor, wherein the outer shell assembly is detachably connected to the hopper assembly. In some embodiments the hopper assembly is cylindrical. In some embodiments, the animal feeder also has an electronic control mechanism. In some embodiments, the bounce plate is in at least two parts. In some embodiments, the animal feeder also has a feed receptacle assembly. In some embodiments, the animal feeder also has a paddle that broadcasts the feed from the top over the sides of the hopper assembly. In some embodiments, the hopper assembly also has a holder assembly with arms and the outer shell assembly includes receiving ends for the arms. In some embodiments, the arms and/or receiving ends include a pest barrier.

[0007] The present invention also provides an animal feeder having (a) an outer shell assembly including a bounce plate and feed tube; and (b) a hopper assembly including a hopper assembly shell configured to contain feed, a pusher plate coupled to a screw extending the length of the hopper assembly shell that vertically drives the plate structure within the feed hopper, wherein the outer shell assembly is detachably connected to the hopper assembly. In some embodiments the hopper assembly is cylindrical. In some embodiments, the animal feeder also has an electronic control mechanism. In some embodiments, the bounce plate is in at least two parts. In some embodiments, the animal feeder also has a feed receptacle assembly. In some embodiments, the animal feeder also has a paddle that broadcasts the feed from the top over the sides of the hopper assembly. In some embodiments, the animal feeder includes a motor operably connected to the screw. In some embodiments, the animal feeder includes a top assembly. In some embodiments, the hopper assembly also has a holder assembly with arms and the outer shell assembly includes receiving ends for the arms. In some embodiments, the arms and/or receiving ends include a pest barrier,

[0008] The present invention also provides an animal feeder having (a) a top assembly including a motor, a motor coupler and an electronic control mechanism, (b) an outer shell assembly including receiving ends for a hopper assembly, a bounce plate having at least two parts, a feed tube and a feed receptacle assembly; and (c) the hopper assembly including a hopper assembly shell configured to contain feed, a holder assembly with arms, a pusher plate coupled to a screw extending the length of the hopper assembly shell that vertically drives the plate structure within the feed hopper and wherein the screw is operably connected to the motor, and a paddle that broadcasts the feed from the top over the sides of the hopper assembly. The

electronic control mechanism can further implement software to provide functions such as automated scheduled feeding, camera operation, and internet or telephony communication.

[0009] The present invention also provides methods using all embodiments of the animal feeder described above for providing feed to an animal by adding the feed to the animal feeder and directing the animal feeder to dispense the feed.

[0010] The present invention also provides methods of cleaning all embodiments of the animal feeder described above by removing one of the components from animal feeder, cleaning the component, and optionally returning the cleaned component to the animal feeder. The component can be, for example, the hopper assembly, the bounce plate, or the feed tube.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The present invention is illustrated and described herein with reference to the various drawings, in which like reference numbers are used to denote like system components/method steps, as appropriate, and in which:

[0012] FIG. 1 is a frontal view illustrating one exemplary embodiment of the feeder apparatus of the present invention;

[0013] FIG. 2 is a cutaway side view illustrating one exemplary embodiment of the feeder system of the present invention;

[0014] FIG. 3 is a cutaway side view illustrating one exemplary embodiment of the hopper assembly of the feeder apparatus;

[0015] FIG. 4 is a bottom view illustrating one exemplary embodiment of the hopper assembly of the feeder apparatus;

[0016] FIG. 5 is a top view illustrating one exemplary embodiment of the hopper assembly of the feeder apparatus;

[0017] FIG. 6 is a side cutaway view illustrating one exemplary embodiment of the outer shell assembly of the feeder apparatus;

[0018] FIG. 7 is a top view illustrating one exemplary embodiment of the outer shell assembly of the feeder apparatus;

[0019] FIG. 8 is a bottom view illustrating one exemplary embodiment of the outer shell assembly of the feeder apparatus;

[0020] FIG. 9 is a side view illustrating one exemplary embodiment of the top assembly of the feeder apparatus and a bottom view illustrating one exemplary embodiment of the top assembly of the feeder apparatus; and,

[0021] FIG. 10 is a top view illustrating one exemplary embodiment of the top assembly of the feeder apparatus.

DETAILED DESCRIPTION OF THE INVENTION

[0022] In various exemplary embodiments, the present invention provides generally an animal feeding apparatus and related methods. Provided herein is an animal feeder configured to resist clogging by the feed, enables user cleaning of the feed hopper assembly and resist pest intrusion. In an embodiment, the animal feeder includes an outer shell assembly detachably connected to a hopper assembly configured to push the feed over the top of the hopper assembly into the outer shell assembly. The expelled feed is collected into a feed tube and delivered to a feed receptacle. The feed can be dry food or kibble.

[0023] FIG. 1 shows a front view of an exemplary embodiment of the apparatus with a feed dish.

[0024] Referring to FIG. 2, in one exemplary embodiment of the present invention, the animal feeder apparatus **1** comprises a top assembly **2**, a hopper assembly **3**, and an outer shell assembly **4**. The component parts can be made of any suitable materials that resist contamination and rust, including stainless steel, ceramics, carbon fiber composite and plastics. Suitable plastics include ABS, polypropylene, polyethylene, polycarbonate, polyimide, polyamide, melamine resins, cyclic polyolefins, composites or reinforced plastics such as fiberglass, and other thermoplastics known in the art.

[0025] FIG. 3 shows a cutaway side view of the hopper assembly **3** in an embodiment of the present invention. The hopper assembly shell **4** is a canister that retains the feed within the hopper assembly **3** until the feed is dispensed. Within the hopper assembly shell **4** is a pusher plate **5** disposed to retain the feed (feed in the hopper assembly **3** is inhibited from passing under the pusher plate) threaded on a screw **6**, where the pusher plate is raised or lowered via a nut **7** or other suitable fastener below the pusher plate **5** driven by rotation of the screw **6**. The screw **6** is held in place by a top holder assembly **8** and a bottom holder assembly **9**. The top holder

assembly **8** has hanger arms or other suitable connectors that allow the user to detach the hopper assembly **3** from the outer shell assembly **4**. The rotation stop **10** prevents rotational movement of the hopper assembly shell **4** when the screw **6** turns. A pin **11** is disposed on the bottom end of the screw underneath the hopper assembly shell **4** to limit the downward displacement of the nut **7**. As feed is pushed up by the rotation of the screw **6** driving up the pusher plate **5** via the nut, the upwardly displaced feed comes into contact with a paddle **12** which broadcasts the feed from the top over the sides of the hopper assembly **3**. At the top end of the screw **6**, is connected a coupler assembly **13**. The coupler assembly **13** can be attached to the drive of a motor or a hand crank or other suitable rotational force-generating mechanism. While the hopper assembly shell **4** is shown as a right cylinder, it is appreciated by those in the art that other suitable shapes can be substituted, e.g. elliptical cylinder or rectangular (polyhedral). One skilled in the art realizes that a rotation stop **10** is not necessary for some of these other hopper assembly shell **4** configurations. While the exemplary embodiment shows the top holder assembly **8** with hanger arms or other suitable connectors that allow the user to detach the hopper assembly **3** from the outer shell assembly **4**, it is appreciated by those in the art that the hanger arms can be disposed on the bottom holder assembly **9** or both. Furthermore, it is appreciated by those in the art that any number of connectors between the hopper assembly **3** and the outer shell assembly **4** can be used, as long as the a hopper assembly **3** is suitably stabilized within the outer shell assembly **4**. Additionally, the connectors can include a pest barrier to prevent pests from entering the hopper assembly **4**. Pest barriers can include, for example, pest tape such as FITO brand ANT STOPPA® TAPE double-sided tape (Spotless Punch Ltd., Redhill, UK). Pests can include ants, cockroaches, rodents and the like.

[0026] Moving to FIG. 4, the bottom of the hopper assembly **3** in an embodiment of the present invention is shown.

[0027] Moving to FIG. 5, the top of the hopper assembly **3** in an embodiment of the present invention is shown.

[0028] FIG. 6 shows a cutaway side view of the outer shell assembly **4** in an embodiment of the present invention. The outer assembly shell **14** is a canister that contains the hopper assembly **3** and directs the feed pushed out from the hopper assembly **3** to a feed receptacle **15** or other suitable feed receptacle. The guide pins **16** are disposed on the outer assembly shell **14** to receive the hanger arms or other suitable connectors of the top holder assembly **8** (FIG. 5) of the hopper assembly **3**. A bounce plate **17**, which is disposed within the outer shell assembly **4** below the hopper assembly **3** when the hopper assembly **3** is inserted into the outer shell

assembly **4**, directs the feed that drops from the hopper assembly **3** to an opening to the feed tube **18**. The bounce plate **17** can be angled such that the feed is unlikely to be retained on the bounce plate **17** and instead travel into the feed tube **18** opening. The feed tube **18** can be angled such that the feed is dispensed without interruption to the feed receptacle **15**. The bounce plate **17** can be held in place relative to the feed tube **18** by bounce plate holders **19**. Optionally, the outer shell assembly **4** can have a feed receptacle assembly **21** to prevent the feed receptacle **15** from moving due to the force of feed dispensing or the users or animals displacing the feed receptacle and causing the dispensed feed to spill on the floor. While shown as separate parts, it is appreciated by those in the art that the feed tube **18** and bounce plate **17** can be of unitary construction.

[0029] Moving to FIG. 7, the top of the outer shell assembly **4** in an embodiment of the present invention is shown. As shown in the embodiment herein, the bounce plate **17** (see FIG. 6) can be made of two or more components. In the drawing is shown a right bounce plate **23** and a left bounce plate **24**. Where the bounce plate is comprised of more than one part, the user can more easily remove the bounce plate **17** for cleaning. As shown in the embodiment herein, the bounce plate(s) can further include a bend **99** to further prevent feed from being retained on the bounce plate(s). Furthermore, it is appreciated by those in the art that other configurations of bounce plate(s) (e.g. a funnel configuration) can be used to direct feed to the feed tube.

[0030] Moving to FIG. 8, the bottom of the outer shell assembly **4** in an embodiment of the present invention is shown.

[0031] FIG. 9 shows side and bottom views of the top assembly **2**. The top assembly **2** includes a top housing **25** that can contain the electronics and motor. The top assembly **2** includes guide pin holes **26** to align the top assembly **2** with the outer shell assembly **4**. The top assembly **2** also includes an upper motor coupler **27** to operably connect a motor to the coupler assembly **13** to drive the screw **6**. It is appreciated by those in the art that the upper motor couple could be attached to a hand crank rather than a motor to drive the screw. FIG. 10 shows a top view of the top assembly **2**. The top assembly **2** includes a keypad assembly **28** or other electronic control interface to, for example dispense feed, monitor feed level and alert the user when feed is low. While the exemplary embodiment shows the top assembly **2** with guide pin holes **26** to align the top assembly **2** with the outer shell assembly **4**, it is appreciated by those in the art that other connectors are suitable for aligning the assemblies. While the embodiment show includes a motor and electronic control in the top assembly, it is appreciated by those in the art that other placements of the motor as well as of the control electronics are possible.

[0032] Provided herein are methods for feeding animals using the apparatus of the invention. These include methods using all embodiments of the animal feeder described above for providing feed to an animal by adding the feed to the animal feeder and directing the animal feeder to dispense the feed.

[0033] The electronic control mechanism can further implement software to provide functions such as automated scheduled feeding, camera operation, and internet or telephony communication. The electronic control can include software that schedules activation of the animal feeder for any number of times per day, days per week, etc. The apparatus can include a camera to allow interaction of the user with the animal via the internet, including the mobile web. The electronic control can provide alerts to the user, such as notifications for apparatus malfunction or low feed level.

[0034] The hopper assembly **3** can be removed from the outer shell assembly **4** by the user and washed. The bounce plate **17** (or left and right bounce plates, **23** and **24**, respectively) and feed tube **18** may also be removed by the user for cleaning.

[0035] The present invention also provides methods of cleaning all embodiments of the animal feeder described above by removing one of the components from animal feeder, cleaning the component, and optionally returning the cleaned component to the animal feeder. The component can be, for example, the hopper assembly, the bounce plate, or the feed tube.

[0036] Although the present invention has been illustrated and described herein with reference to preferred embodiments and specific examples thereof, it will be readily apparent to those of ordinary skill in the art that other embodiments and examples may perform similar functions and/or achieve like results. All such equivalent embodiments and examples are within the spirit and scope of the present invention, are contemplated thereby, and are intended to be covered by the following claims.

CLAIMS

I claim:

1. An animal feeder comprising,
 - a) an outer shell assembly comprising a bounce plate and feed tube; and
 - b) a hopper assembly comprising a hopper assembly shell configured to contain feed, a pusher plate coupled to a screw extending the length of the hopper assembly shell that vertically drives said pusher plate within said feed hopper,wherein said outer shell assembly is detachably connected to said hopper assembly.
2. The animal feeder according to claim 1 further comprising a top assembly.
3. The animal feeder according to any of the above claims wherein said hopper assembly is cylindrical.
4. The animal feeder according to any of the above claims wherein said bounce plate is in at least two parts.
5. The animal feeder according to any of the above claims further comprising a paddle that broadcasts the feed from the top over the sides of said hopper assembly.
6. The animal feeder according to any of the above claims further comprising a motor operably connected to said screw.
7. The animal feeder according to any of the above claims further comprising a feed receptacle assembly.
8. The animal feeder according to any of the above claims, wherein at least one component part comprises one or more materials selected from the group consisting of stainless steel, ceramics, carbon fiber composite and plastic.
9. The animal feeder according to any of the above claims further comprising an electronic control mechanism.
10. The animal feeder according to any of the above claims, wherein said electronic control mechanism comprises software that provides a function selected from the group consisting of automated scheduled feeding, camera operation, and internet or telephony communication.

11. The animal feeder according to any of the above claims wherein said hopper assembly further comprises a holder assembly with arms and said outer shell assembly further comprises receiving ends for said arms.
12. The animal feeder of claim 11 wherein said arms or receiving ends further comprise a pest barrier.
13. The animal feeder of claim 12 wherein said pest barrier prevents the entry of ants.
14. A method of providing feed to an animal comprising adding said feed to the animal feeder according to any of claims 1-13 and directing said animal feeder to dispense said feed.
15. A method of cleaning an animal feeder of any of claims 1-13 comprising:
 - a) removing one of the components from said animal feeder, said component selected from the group consisting of :
 - i) said hopper assembly;
 - ii) said bounce plate;
 - iii) said feed tube, and
 - b) cleaning said component; and
 - c) optionally replacing said component in said animal feeder.

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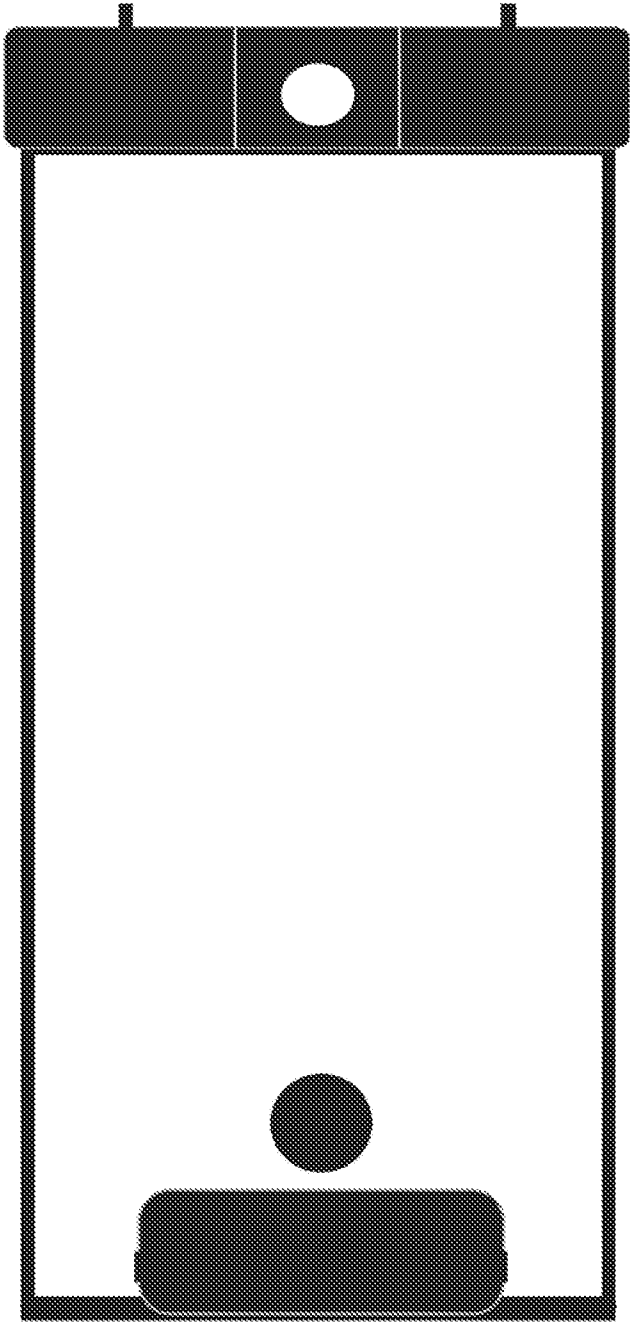


FIG. 1

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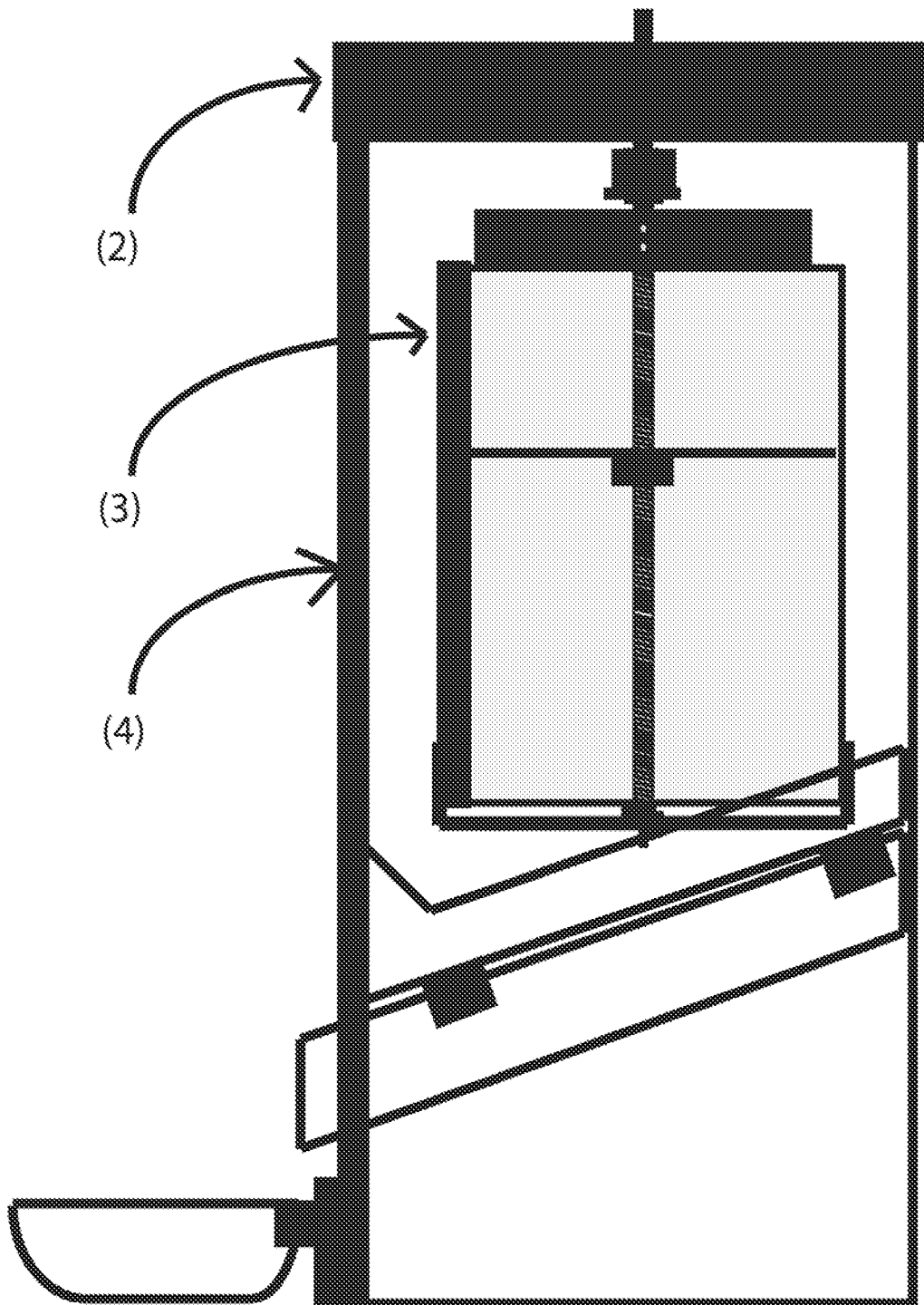


FIG. 2

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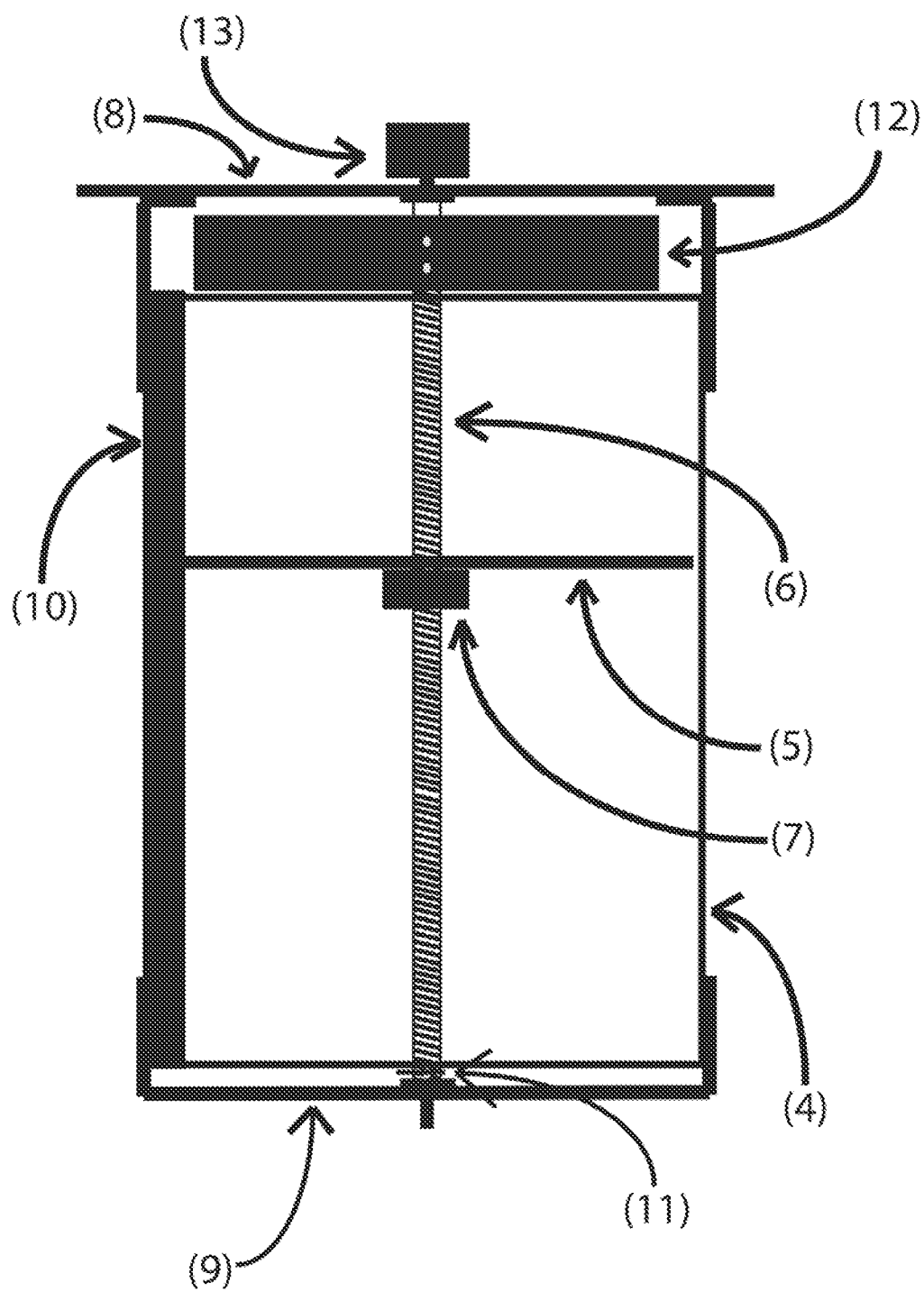


FIG. 3

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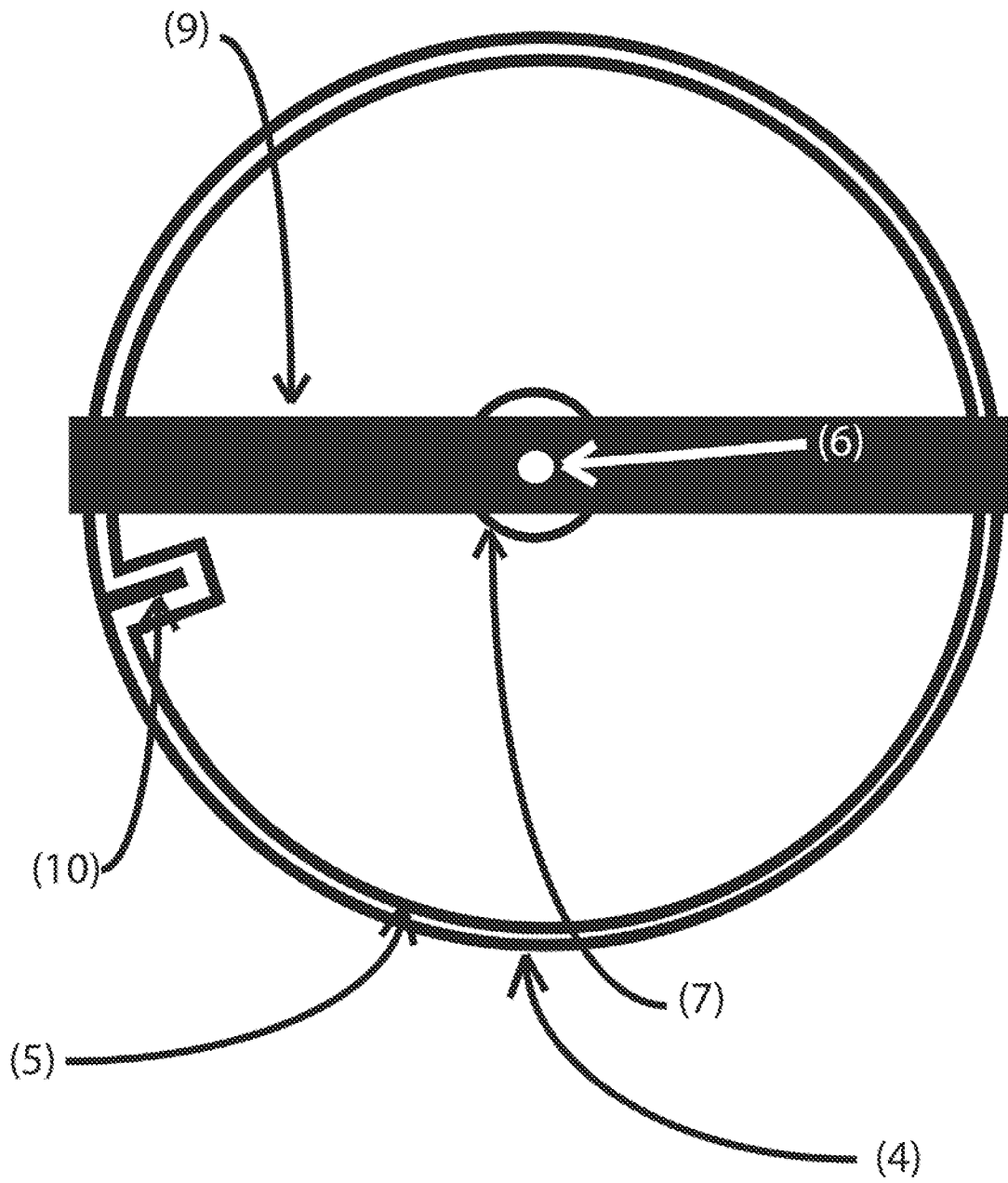


FIG. 4

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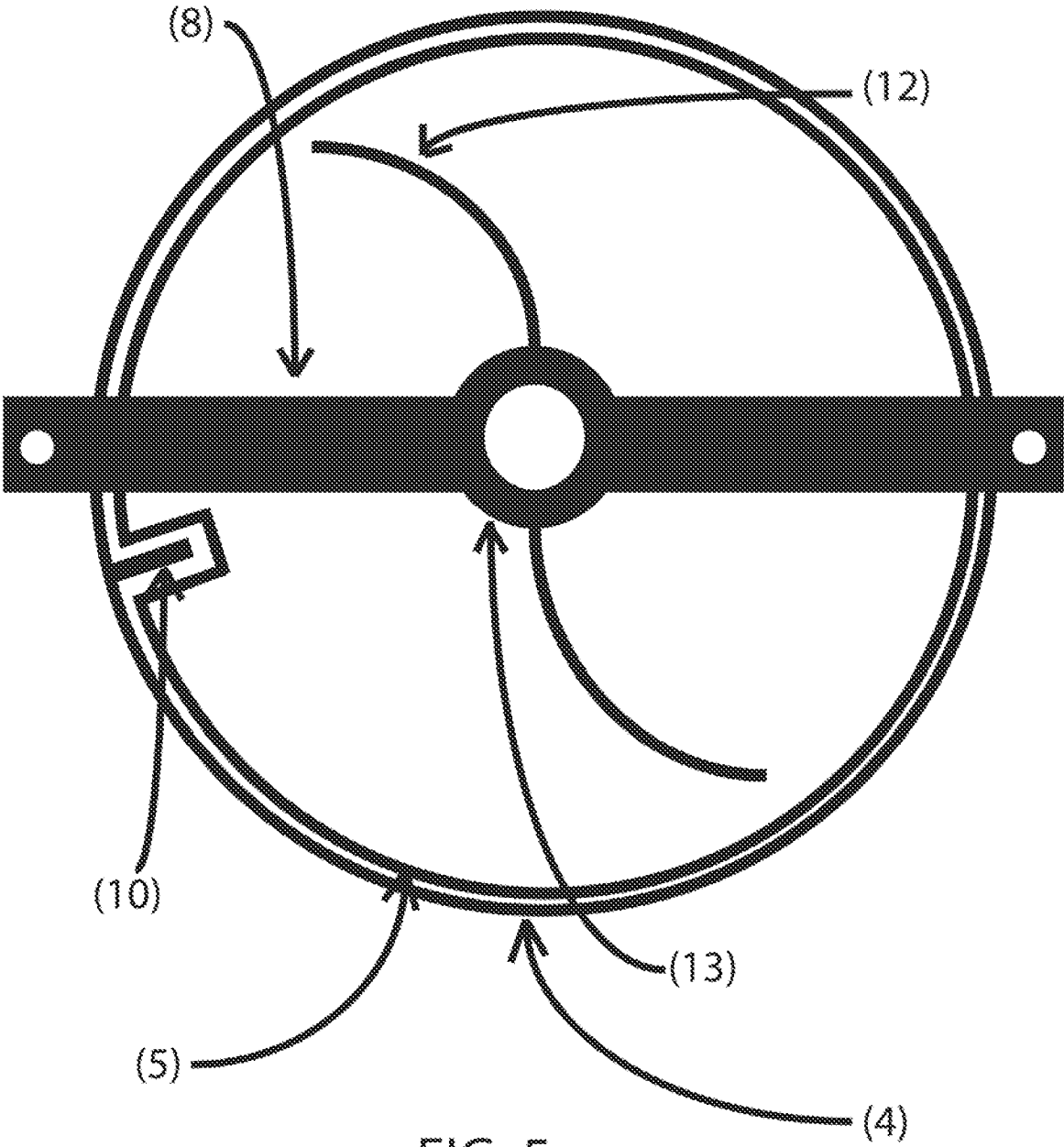


FIG. 5

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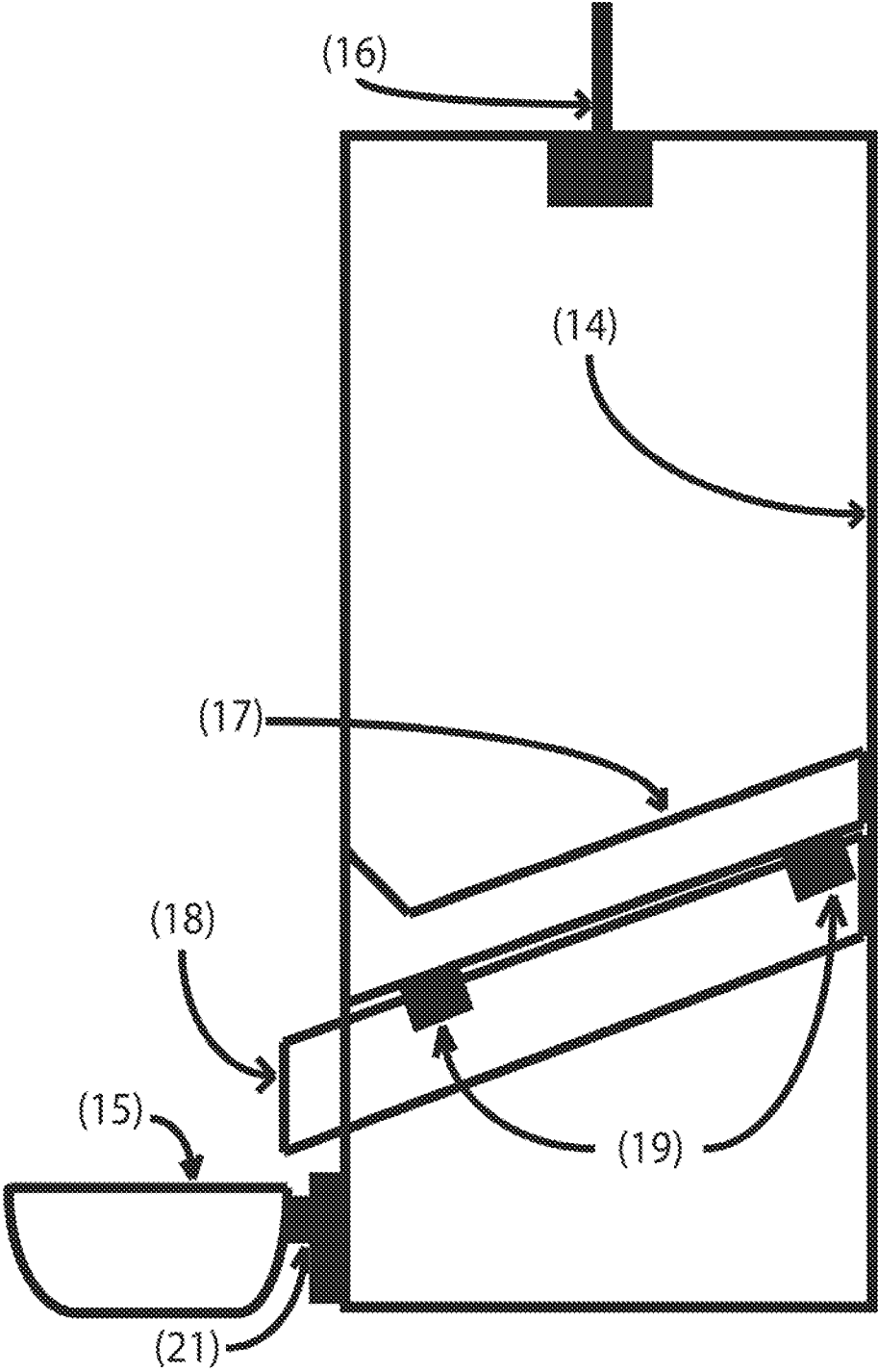


FIG. 6

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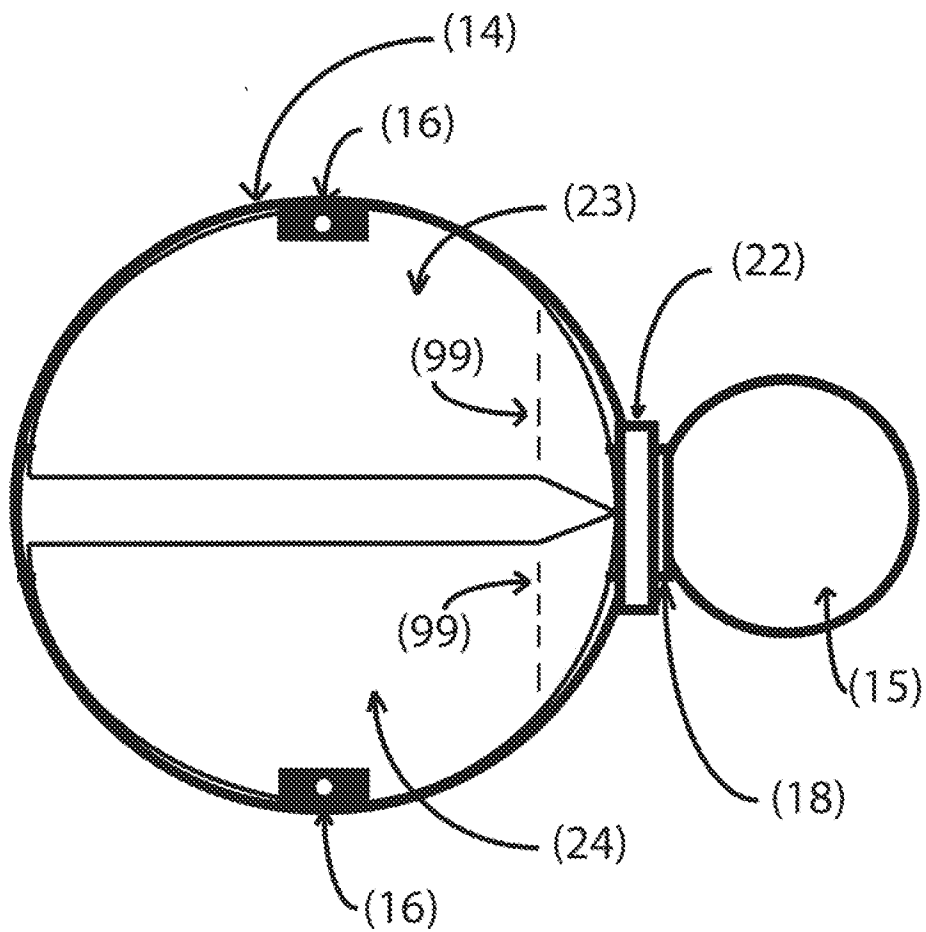
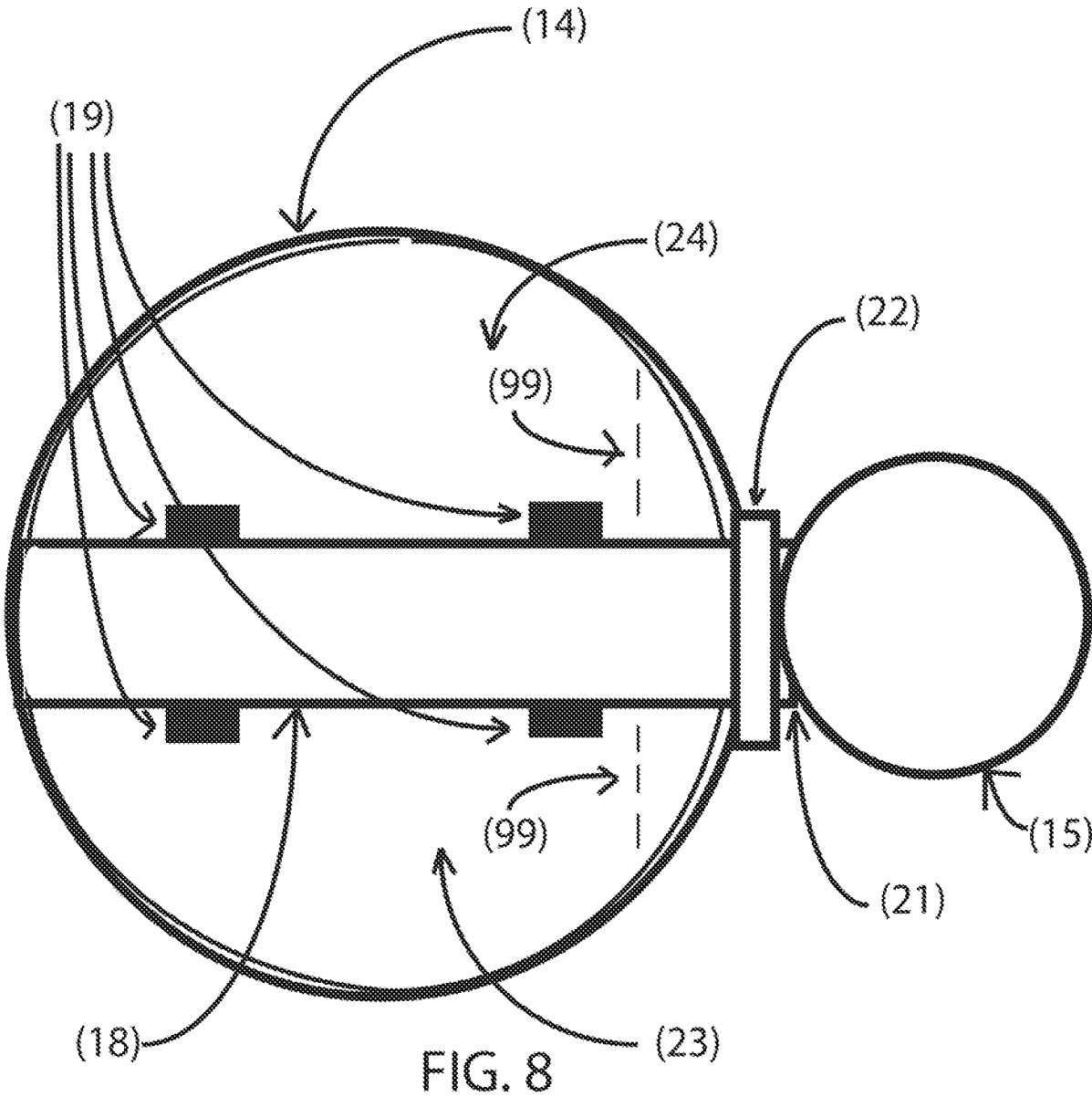


FIG. 7

8/10



9/10

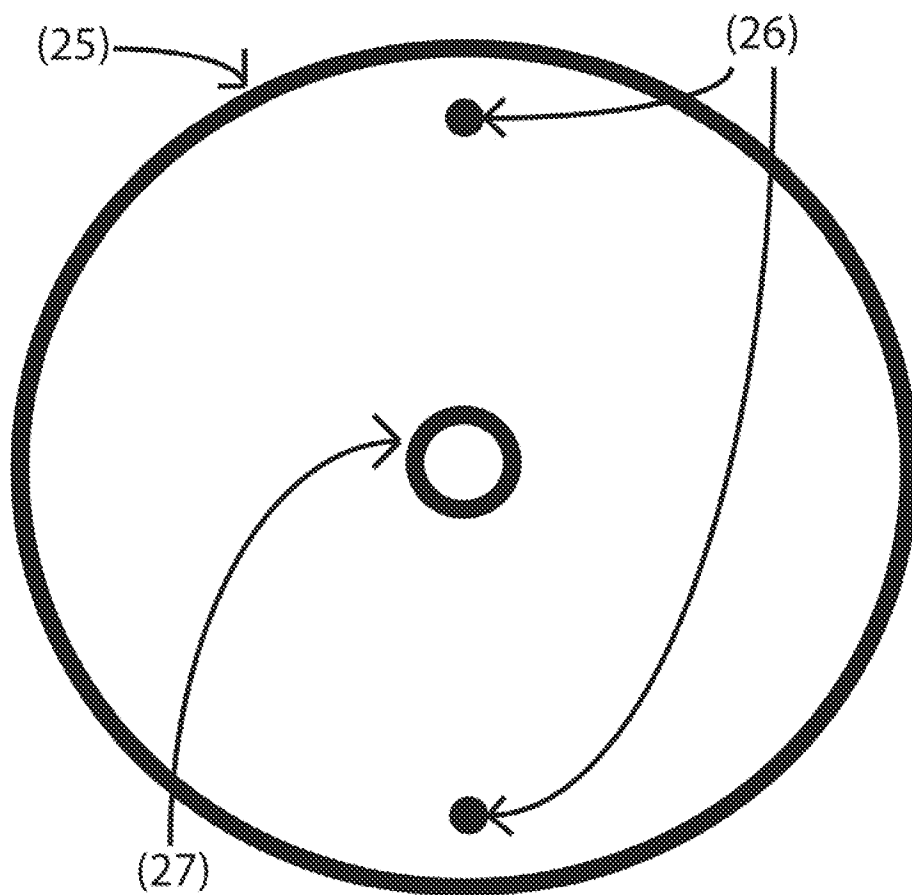
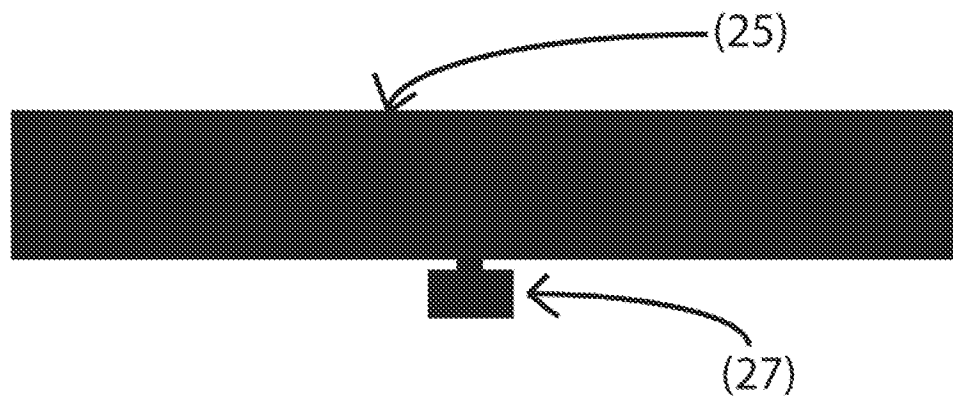


FIG. 9

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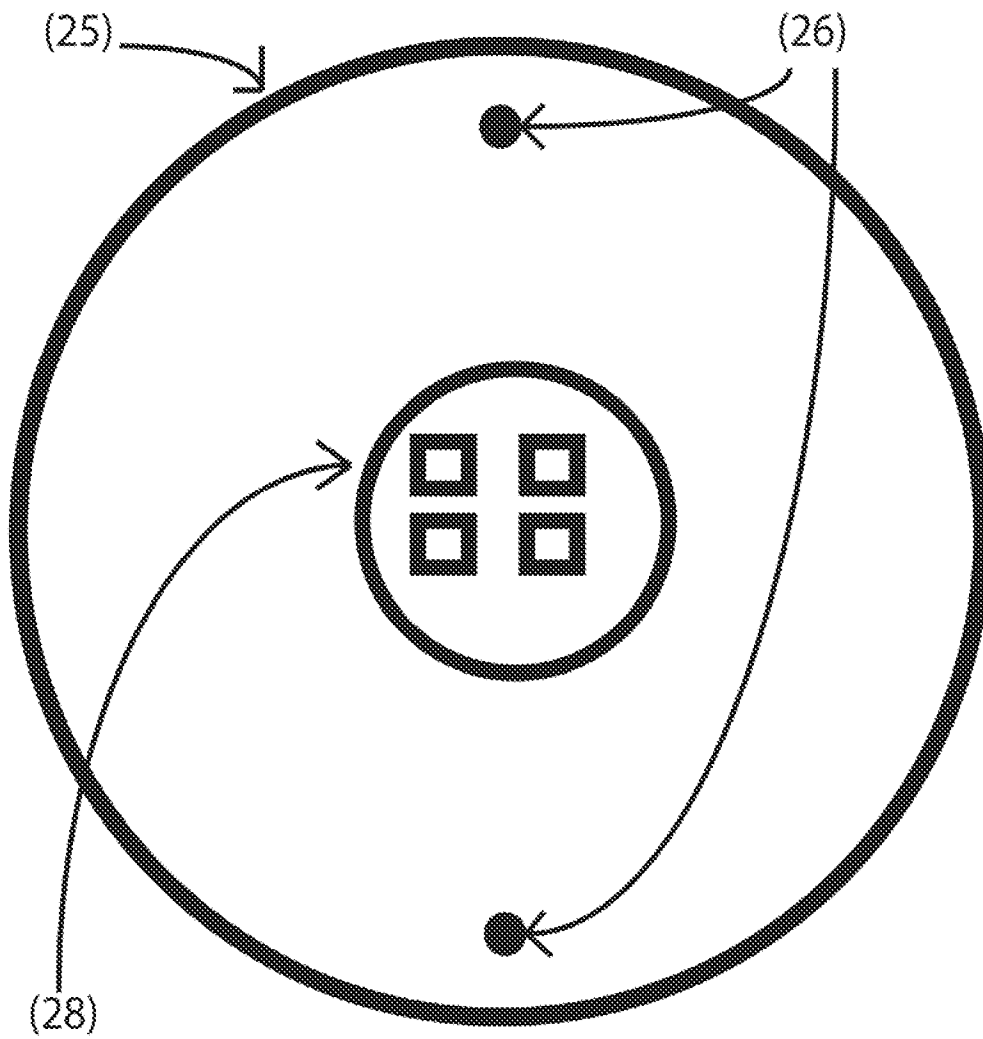


FIG. 10

A. CLASSIFICATION OF SUBJECT MATTER**A01K 5/02(2006.01)i, A01K 5/01(2006.01)i, A01K 5/00(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01K 5/02; A01K 5/00; A01K 39/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: feeder, outer shell assembly, bounce plate, feed tube, hopper assembly, pusher plate, screw

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009-0205573 A1 (BRIERE, ALAIN) 20 August 2009 See paragraphs [0017]-[0018], [0021]-[0022], [0024], [0027], [0031]; and figures 1-2, 8.	1-3
A	US 2009-0145365 A1 (MAHLE, MICHAEL S. et al.) 11 June 2009 See paragraphs [0030]-[0031], [0033]-[0036]; and figures 1, 3-6.	1-3
A	US 2007-0193524 A1 (TURNER, ROBERT MICHAEL et al.) 23 August 2007 See paragraphs [0044], [0048]-[0050], [0059]-[0060]; and figures 3-4.	1-3
A	US 5794560 A (TERENZI, BRUNO) 18 August 1998 See column 4, lines 35-48; column 5, lines 7-40; claims 1-7; and figures 1-2, 6-7A.	1-3
A	JP 2001-314133 A (MANABE, ATSUSHI) 13 November 2001 See abstract; paragraphs [0009]-[0012]; and figure 1.	1-3



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

24 June 2013 (24.06.2013)

Date of mailing of the international search report

01 July 2013 (01.07.2013)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City,
302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

YANG, In Su

Telephone No. 82-42-481-8131



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/029224

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 12-13
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
Claims 12-13 are too unclear to make meaningful opinion because they refer to claims which are not drafted in accordance with the third sentence of Rule 6.4(a).

3. ☒ Claims Nos.: 4-11, 14-15
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/029224

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