

(19)



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Économie

(11)

N° de publication :

LU508195

(12)

BREVET D'INVENTION**B1**

(21)

N° de dépôt: LU508195

(51)

Int. Cl.:

B02C 23/10, B02C 4/28, B03C 1/02, B02C 4/08, H01M 10/54

(22)

Date de dépôt: 10/11/2023

(30)

Priorité:

09/11/2023 CN 202311486167.9

(72)

Inventeur(s):

DENG Chaoyong – China, LI Shifeng – China, LIAO Ruixiong – China, HU Wen – China, YUAN Huiting – China, LI Yanfu – China, CENG Runze – China

(43)

Date de mise à disposition du public: 06/11/2024

(47)

Date de délivrance: 06/11/2024

(74)

Mandataire(s):

Dennemeyer & Associates S.A. – L-1274 HOWALD (Luxembourg)

(73)

Titulaire(s):

QUANNAN RUILONG TECHNOLOGY CO., LTD – Ganzhou (China)

(54)

DEVICE FOR DISASSEMBLING AND RECYCLING WASTE LITHIUM BATTERY.

(57)

Discloses a device for disassembling and recycling a waste lithium battery, includes a body, with a crushing roller mounted at the top portion of the inner portion of the body. A guide disc is fixed to the inner wall of the body through mounting strips. The first screw is driven by a motor mounted in the guide disc in an embedded manner, and the first screw is sleeved with a driving seat through threads. A limiting telescopic rod is connected between the top portion of the driving seat and the bottom portion of the guide disc. A mounting seat is rotatably mounted at the bottom portion of the driving seat, and an electromagnet is nested in the sleeve ring. A locking component is arranged at the top of the movable plate and at the flipping component, with the locking component configured to control the flipping action of the electromagnet.

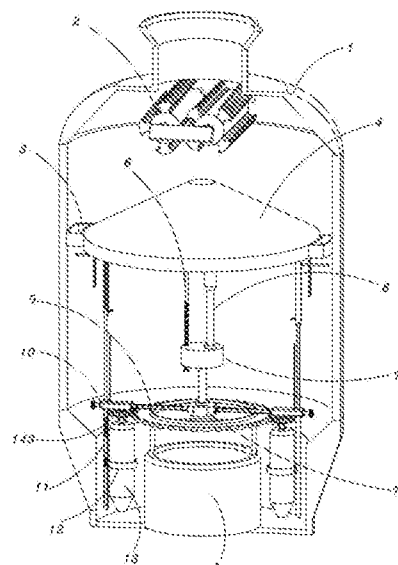


FIG 1

DEVICE FOR DISASSEMBLING AND RECYCLING WASTE LITHIUM BATTERY

TECHNICAL FIELD

[0001] The present disclosure relates to the technical field of magnetic separation for waste battery, specifically to device for disassembling and recycling waste lithium
5 battery.

BACKGROUND

[0002] Waste lithium batteries, especially those that have been in use for a long time and whose charging and discharging efficiency has decreased, contain toxic substances and some recyclable metal materials. Therefore, disassembly and
10 recycling are necessary to avoid resource waste. The main components of waste batteries include plastics, copper, iron, aluminum, and electrode materials with significant valuable metals. After crushing and disassembling, these materials are recycled using magnetic separation technology, which is a conventional method. However, existing devices for disassembling and recycling waste lithium batteries have
15 the following issues during use:

[0003] When crushing and disassembling waste lithium batteries, the distribution of crushed metal materials is irregular. Most existing disassembly and recycling devices use magnetic bodies to adsorb and recover metals. However, due to the irregular distribution of metal materials, if only simple contact adsorption is performed, the metal
20 materials are likely to be blocked by other materials, making it difficult to evenly adsorb the metal materials and leading to incomplete recovery. At the same time, when magnetic bodies are used for adsorption, the adsorption space decreases as the amount of adsorbed metal increases, necessitating the collection of the adsorbed metals. Existing disassembly and recycling devices do not facilitate stable and
25 centralized collection, and the metal materials crushed by them have irregular shapes. The conventional technology's use of electromagnets to turn on and off electricity for adsorption and collection can cause part of the non-metallic materials to be entrained by the metallic materials and collected together, reducing the efficiency of magnetic separation. Therefore, this invention provides a device for disassembling and recycling
30 waste lithium battery to meet these needs.

SUMMARY

[0004] The purpose of the present disclosure is to provide a device for crushing and recycling a waste lithium battery that can solve the issues of inconvenient uniform adsorption of the metal material during recovery and the difficulty in stable and
35 centralized collection.

[0005] In order to solve the above problems, the technical solution adopted by the present disclosure is as follows.

The device for disassembling and recycling a waste lithium battery, comprising: a body; wherein a crushing roller is mounted at a top portion of an inner portion of the body; a guide disc is fixed to an inner wall of the body by a mounting strip, and the guide disc is positioned below the crushing roller; a collecting barrel is fixed at a bottom portion of the inner portion of the body;

the device further comprises a first screw being rotatably mounted at a bottom portion of the guide disc, and being driven by a motor mounted in the guide disc in an embedded manner; wherein the first screw is sleeved with a driving seat through threads, and a limit telescopic rod is connected between a top portion of the driving seat and the bottom portion of the guide disc; a mounting seat is rotatably mounted at a bottom portion of the driving seat, and the mounting seat is driven by a motor mounted in the driving seat in an embedded manner; a second screw is rotatably mounted at an equal angle on an outer side of the mounting seat, and the second screw is sleeved with a movable plate through threads; a mounting plate is fixed at a bottom edge of the movable plate, and a sleeve ring is rotatably mounted on an inner wall of a middle portion of the mounting plate through a torsion spring and a shaft rod; an electromagnet is nested inside the sleeve ring, and an initial position of the electromagnet is located between a lower half of the body and the collecting barrel;

a self-rotation drive component arranged between a bottom portion of the movable plate and a top portion of the collecting barrel and the self-rotation drive component being configured to achieve the self-rotation of the electromagnet;

a flipping component arranged between the guide disc and the mounting plate and configured to drive the electromagnet to flip;

a transverse movement component arranged at the bottom portion of the guide disc and at an outer end of the second screw, and the transverse movement component being configured to drive the movable plate to move laterally; and

a locking component arranged at a top portion of the movable plate and at the flipping component and configured to control a flipping action of the electromagnet.

[0006] Preferably, a top portion of the guide disc is designed as a conical structure. The guide disc and the collecting barrel share a central axis. A space in the lower half of the body is configured to be inwardly recessed.

[0007] Preferably, the self-rotation drive component includes a positioning rod, and the positioning rod is fixed to a top portion of the electromagnet. A top portion of the positioning rod is sleeved with a positioning column, and the positioning column is

rotatably mounted at the bottom portion of the movable plate. The positioning column is sleeved with a gear sleeve, and an inner side of the gear sleeve meshes with a gear ring. The bottom portion of the gear ring is fixed to the top portion of the collecting barrel through a mounting rod.

5 [0008] Preferably, the top portion of the positioning rod is designed as a rectangular structure, and the top portion of the positioning rod and a cavity at a bottom portion of the positioning column are matched in a concave and convex manner.

[0009] Preferably, the flipping component includes a contraction plate, and the contraction plate is arranged to attach to the bottom portion of the guide disc. A cavity
10 at a bottom portion of the contraction plate is connected to a gear rack through a first elastic telescopic rod. The gear rack passes through the movable plate and is vertically and slidably embedded in a cavity at a top portion of the mounting plate. One side of the gear rack is meshed with a gear roller, and the gear roller is rotatably mounted in a cavity at an inner portion of the mounting plate in an embedded manner. The gear
15 roller is connected to an outer shaft rod of the sleeve ring.

[0010] Preferably, the overall design of the gear rack is a rectangular structure, and a top portion of the gear rack slides vertically and elastically in the contraction plate through the first elastic telescopic rod.

[0011] Preferably, the transverse movement component includes a transverse rod
20 fixed to an outside of the contraction plate. The transverse rod is slidably sleeved with an adjustment frame, and the adjustment frame is mounted in a cavity at a bottom portion of the guide disc in a limited and sliding manner. A gear is arranged below the adjustment frame and is sleeved on the outer end of the second screw.

[0012] Preferably, a bottom portion of the adjustment frame is arranged as an
25 opening structure to limit a position of the gear. An inner wall of the bottom portion of the adjustment frame is arranged as a serrated structure to mesh with the gear. A protruding position of a top portion of the adjustment frame is designed in a "T" shape to slide in the cavity at the bottom portion of the guide disc.

[0013] Preferably, the locking component includes a locking rod, and the locking rod
30 is transversely mounted on the outside of the contraction plate through a second elastic telescopic rod. An outer end of the locking rod passes through the contraction plate and is positioned in a locking slot. The locking slot is arranged at a side edge of the gear rack. A middle portion of the locking rod is provided with a release chamber, and the release chamber is positioned above the release rod fixed at the top portion
35 of the movable plate.

[0014] Preferably, the outer end of the locking rod is designed as a right-angled

trapezoidal structure and is provided with an upward slanted surface. The outer end of the locking rod and the locking slot are matched in a concave and convex manner, and an inner end of the release chamber is designed as a slanted structure.

[0015] Compared with the prior art, the present disclosure has at least the following benefits:

In the above scheme, a self-rotation drive component is provided. When the crushed waste lithium battery enters an area between the body and the collecting barrel, a rotation of the mounting seat, the second screw, and the movable plate drives the electromagnet to revolve. This allows the electromagnet to self-rotate, which, on the one hand, increases the adsorption range of the electromagnet and, on the other hand, increases the adsorption area. The electromagnet rotates within an annular space, stirring the metal material. This, combined with the self-rotation of the electromagnet, facilitates the uniform adsorption of the metal material. Additionally, subsequent collection of the metal material on the electromagnet allows the electromagnet to perform repeated magnetic separation operations, significantly improving the separation efficiency of the metal material and reducing omissions.

[0016] By providing the flipping component, after a certain amount of the metal material is adsorbed onto the electromagnet, it needs to be collected. At this point, the first screw drives the driving seat to move upward, thereby lifting the movable plate and the electromagnet. During this process, under the action of the locking component, the position of the gear rack remains temporarily stable, allowing the gear roller to drive the sleeve ring and the electromagnet to rotate, flipping the electromagnet. At this time, a plurality of non-metallic materials that were blocked by the metal material can fall off, leaving only the metal material on the electromagnet. This prevents the plurality of non-metallic materials from being collected together with the metal material, thereby improving the efficiency of magnetic separation.

[0017] By providing a locking component and a transverse movement component, the position of the gear rack is released after the electromagnet is flipped, making it easier for the driving seat, the movable plate, and the electromagnet to continue moving upward. At this time, the gear reaches the adjustment frame, driving the second screw to rotate. Under the restraining action of the contraction plate and the gear rack, the movable plate can be driven to move transversely, bringing the electromagnet above the collecting barrel. At this point, the electromagnet is powered off, causing the metal material to fall into the collecting barrel, completing the centralized collection of the metal material. Then, by reversing the first screw, the electromagnet and all components can return to their original positions, facilitating

repeated operations.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The drawings incorporated herein and constituting part of this specification illustrate embodiments of the present disclosure and, together with the description,
5 further serve to explain the principles of the disclosure and to enable those skilled in the art to implement and use the disclosure.

[0019] FIG. 1 is a perspective cross-sectional structural schematic diagram of a device for crushing and recycling waste lithium battery according to the present disclosure.

10 [0020] FIG. 2 is a schematic bottom view of the internal structure of the device according to the present disclosure.

[0021] FIG. 3 is a perspective structural schematic diagram of the device according to the present disclosure.

15 [0022] FIG. 4 is a schematic diagram of the structure of the self-rotation drive component of the device according to the present disclosure.

[0023] FIG. 5 is a structural schematic diagram of the top portion of the electromagnet of the device according to the present disclosure.

[0024] FIG. 6 is a structural schematic diagram of the flipping component of the device according to the present disclosure.

20 [0025] FIG. 7 is a structural schematic diagram of the adjustment frame of the device according to the present disclosure.

[0026] FIG. 8 is an enlarged structural schematic diagram of part A in FIG. 6 according to the present disclosure.

[0027] Brief description of reference numbers: 1 Body, 2 Crushing roller, 3 Mounting strip, 4 Guide disc, 5 Collecting barrel, 6 First screw, 7 driving seat, 71 Mounting seat, 25 8 Limit telescopic rod, 9 Second screw, 10 Movable plate, 11 Mounting plate, 12 Sleeve ring, 13 Electromagnet, 14 Self-rotation drive component, 141 Positioning rod, 142 Positioning column, 143 Gear sleeve, 144 Gear ring, 145 Mounting rod, 15 Flipping component, 151 Contraction plate, 152 First elastic telescopic rod, 153 Gear rack, 154 30 Gear roller, 16 Transverse movement component, 161 Transverse rod, 162 Adjustment frame, 163 Gear, 17 Locking component, 171 Locking rod, 172 Second elastic telescopic rod, 173 Locking slot, 174 Release chamber, 175 Release rod

[0028] As shown in the figures, specific structures and components have been labeled to clarify the implementation of the embodiments of the present disclosure.

35 However, these are provided for illustrative purposes only and are not intended to limit the disclosure to the specific structures, components, or environments depicted.

Based on specific needs, those skilled in the art can adjust or modify these components and environments, and such adjustments or modifications will still fall within the scope of the appended claims.

DETAILED DESCRIPTION OF THE EMBODIMENTS

5 [0029] The following is a detailed description of a device for disassembling and recycling a waste lithium battery provided by the present disclosure, in conjunction with the accompanying drawings and specific embodiments. It should be noted here that, to make the embodiments more comprehensive, the following embodiments represent the best and preferred embodiments. However, those skilled in the art may adopt other
10 alternative methods for implementation based on well-known techniques; moreover, the drawings are provided only to describe the embodiments more specifically and are not intended to specifically limit the disclosure.

[0030] It should be noted that the terms "an embodiment," "embodiment," "exemplary embodiment," and "some embodiments" as used in this specification mean that the
15 described embodiments may include specific features, structures, or characteristics, but not necessarily every embodiment includes these specific features, structures, or characteristics. Furthermore, when specific features, structures, or characteristics are described in conjunction with an embodiment, it should be understood that such features, structures, or characteristics can be implemented in combination with other
20 embodiments (whether explicitly described or not), as would be understood by those skilled in the relevant art.

[0031] Typically, the meaning of the terms can be understood at least partially from their usage in context. For example, depending on the context, the term "one or more" as used herein can refer to any single characteristic, structure, or feature, or it can
25 refer to a combination of characteristics, structures, or features in the plural sense. Additionally, the term "based on" can be understood not necessarily to convey an exclusive set of factors, but rather to allow the inclusion of other factors not necessarily explicitly described, depending on the context.

[0032] It is to be understood that the meanings of "on," "above," and "over" as used
30 in this disclosure should be interpreted broadly to include not only "directly on" something but also "on" something with intervening features or layers. Similarly, "above" or "over" should not only imply "on top of" something but also "over" something without any intervening features or layers.

[0033] Moreover, spatially related terms such as "under," "below," "lower," "above,"
35 "upper," etc., are used herein for convenience to describe the relationship of one component or feature to another or multiple components or features as shown in the

accompanying drawings. These spatially related terms are intended to cover different orientations in the use or operation of the device other than those depicted in the accompanying drawings. The device may be oriented in other ways, and the spatially related descriptions herein are to be similarly interpreted.

5 [0034] As shown in FIG.1, the embodiment of this invention provides the device for disassembling and recycling a waste lithium battery, which includes a body 1. A crushing roller 2 is mounted at a top portion of an inner portion of the body 1. A guide disc 4 is fixed to an inner wall of the body 1 by a mounting strip 3, and the guide disc 4 is positioned below the crushing roller 2. A collecting barrel 5 is fixed at a bottom
10 portion of the inner portion of the body 1.

[0035] As shown in FIGS. 1-3, a first screw 6 is rotatably mounted at a bottom portion of the guide disc 4, and the first screw 6 is driven by a motor mounted in the guide disc 4 in an embedded manner. The first screw 6 is sleeved with a driving seat 7 through threads, and a limit telescopic rod 8 is connected between a top portion of the driving
15 seat 7 and the bottom portion of the guide disc 4. A mounting seat 71 is rotatably mounted at a bottom portion of the driving seat 7, and the mounting seat 71 is driven by a motor mounted in the driving seat 7 in an embedded manner. A second screw 9 is rotatably mounted at an equal angle on an outer side of the mounting seat 71, and the second screw 9 is sleeved with a movable plate 10 through threads. A mounting
20 plate 11 is fixed at a bottom edge of the movable plate 10, and a sleeve ring 12 is rotatably mounted on an inner wall of a middle portion of the mounting plate 11 through a torsion spring and a shaft rod. An electromagnet 13 is nested inside the sleeve ring 12, and an initial position of the electromagnet 13 is located between a lower half of the body 1 and the collecting barrel 5. A top portion of the guide disc 4 is designed as
25 a conical structure. The guide disc 4 and the collecting barrel 5 share a central axis. A space in the lower half of the body 1 is configured to be inwardly recessed. A waste lithium battery is poured into the device through the feed hopper at the top portion of the body 1, and the crushing roller 2 is activated to crush and disassemble the waste lithium battery. A plurality of crushed battery fragments fall through the guide disc 4
30 into the lower half of the body 1, such that the plurality of battery fragments are positioned between the main body 1 and the collecting barrel 5. The motor inside the driving seat 7 drives the mounting seat 71 to rotate, causing the second screw 9 to rotate the movable plate 10, which in turn rotates the electromagnet 13 within the annular region, allowing it to adsorb a metal material from the plurality of battery
35 fragments.

[0036] As shown in FIGS. 1-4, a self-rotation drive component 14 is arranged

between a bottom portion of the movable plate 10 and a top portion of the collecting barrel 5, and the self-rotation drive component 14 is configured to achieve the self-rotation of the electromagnet 13. The self-rotation drive component 14 includes a positioning rod 141, and the positioning rod 141 is fixed to a top portion of the electromagnet 13. A top portion of the positioning rod 141 is sleeved with a positioning column 142, and the positioning column 142 is rotatably mounted at the bottom portion of the movable plate 10. The positioning column 142 is sleeved with a gear sleeve 143, and an inner side of the gear sleeve 143 meshes with a gear ring 144. The bottom portion of the gear ring 144 is fixed to the top portion of the collecting barrel 5 through a mounting rod 145. The top portion of the positioning rod 141 is designed as a rectangular structure, and the top portion of the positioning rod 141 and a cavity at a bottom portion of the positioning column 142 are matched in a concave and convex manner. When the electromagnet 13 revolves with the movable plate 10, the gear sleeve 143 on the positioning column 142 engages with the gear ring 144 to rotate, which in turn drives the positioning column 142 to rotate at the bottom portion of the movable plate 10. The electromagnet 13 is driven to rotate within the sleeve ring 12 by the limiting effect of the positioning column 142 and the top of the positioning rod 141, which in turn enables the electromagnet 13 to perform synchronized self-rotation on top of its revolution, thereby enhancing the magnetic adsorption effect.

[0037] As shown in FIGS. 1, 2, 6, and 8, a flipping component 15 is arranged between the guide disc 4 and the mounting plate 11 to drive the electromagnet 13 to flip. The flipping component 15 includes a contraction plate 151, and the contraction plate 151 is arranged to attach to the bottom portion of the guide disc 4. A cavity at a bottom portion of the contraction plate 151 is connected to a gear rack 153 through a first elastic telescopic rod 152. The gear rack 153 passes through the movable plate 10 and is vertically and slidably embedded in a cavity at a top portion of the mounting plate 11. One side of the gear rack 153 is meshed with a gear roller 154, and the gear roller 154 is rotatably mounted in a cavity at an inner portion of the mounting plate 11. The gear roller 154 is connected to an outer shaft rod of the sleeve ring 12. The overall design of the gear rack 153 is a rectangular structure, and a top portion of the gear rack 153 slides vertically and elastically in the contraction plate 151 through the first elastic telescopic rod 152. A locking component 17 is arranged at a top portion of the movable plate 10 and at the flipping component 15 to control a flipping action of the electromagnet 13. The locking component 17 includes a locking rod 171, and the locking rod 171 is transversely mounted on the outside of the contraction plate 151 through a second elastic telescopic rod 172. An outer end of the locking rod 171 passes through the contraction plate 151 and is positioned in a locking slot 173. The

locking slot 173 is arranged at a side edge of the gear rack 153. A middle portion of the locking rod 171 is provided with a release chamber 174, and the release chamber 174 is positioned above the release rod 175 fixed at the top portion of the movable plate 10. The outer end of the locking rod 171 is designed as a right-angled trapezoidal structure and is provided with an upward slanted surface. The outer end of the locking rod 171 and the locking slot 173 are matched in a concave and convex manner, and an inner end of the release chamber 174 is designed as a slanted structure. After one cycle of magnetic adsorption is completed, the motor inside the guide disc 4 drives the first screw 6 to rotate. Under the limiting effect of the limit telescopic rod 8, the driving seat 7 is driven to move upward, which in turn causes the movable plate 10 to move upward. At this point, the locking rod 171 is inserted into the locking slot 173. As the movable plate 10 moves upward, the mounting plate 11 is also lifted at the position of the gear rack 153, while the position of the gear rack 153 remains unchanged. This allows the gear rack 153 to drive the gear roller 154 to rotate, which in turn drives the sleeve ring 12 and the electromagnet 13 to rotate, flipping the electromagnet 13 over. During this process, other materials that were blocked by the metal material fall off under the influence of gravity, preventing these non-metallic materials from being collected together with the metal material.

[0038] As shown in FIGS. 1, 2, 4, 7, and 8, a transverse movement component 16 is arranged at the bottom portion of the guide disc 4 and at an outer end of the second screw 9, and the transverse movement component 16 is configured to drive the movable plate 10 to move laterally. The transverse movement component 16 includes a transverse rod 161 fixed to an outside of the contraction plate 151. The transverse rod 161 is slidably sleeved with an adjustment frame 162, and the adjustment frame 162 is mounted in a cavity at a bottom portion of the guide disc 4 in a limited and sliding manner. A gear 163 is arranged below the adjustment frame 162 and is sleeved on the outer end of the second screw 9. A bottom portion of the adjustment frame 162 is designed with an opening structure to limit the position of the gear 163. The inner wall of the bottom portion of the adjustment frame 162 is designed with a serrated structure that meshes with the gear 163. A protruding position of a top portion of the adjustment frame 162 is designed in a "T" shape to slide in the cavity at the bottom portion of the guide disc 4. When the electromagnet 13 has finished flipping, the release rod 175 is inserted into the release chamber 174, moving the locking rod 171 and disengaging it from the locking slot 173. At this point, the position of the gear rack 153 is released, allowing the movement of the movable plate 10 and the mounting plate 11. This movement causes the gear rack 153 to move within the contraction plate 151, compressing the first elastic telescopic rod 152 and preventing the gear rack 153 from

hindering the continued upward movement of the movable plate 10. When the gear 163 on the second screw 9 reaches the adjustment frame 162, it drives the second screw 9 to rotate, which in turn drives the movable plate 10 to move inward, bringing the electromagnet 13 above the collecting barrel 5. At this point, the electromagnet 13 is powered off, causing the metal material on it to fall into the collecting barrel 5. The first screw 6 is then driven in reverse, moving the movable plate 10 downward to reset its position, allowing the movable plate 10 to simultaneously move transversely back to its original position. Subsequently, the gear rack 153 is reset by the first elastic telescopic rod 152, rotating the electromagnet 13 back to its initial position, ready for the next cycle of magnetic adsorption. As the movable plate 10 continues to rotate during the next magnetic adsorption cycle, it drives the contraction plate 151 and the adjustment frame 162 to rotate as well, ensuring stable and coordinated operation of the structure.

[0039] The technical solution provided by the present disclosure involves the arrangement of a self-rotation drive component. When the crushed waste lithium battery enters an area between the body and the collecting barrel, a rotation of the mounting seat, the second screw, and the movable plate drives the electromagnet to revolve. This allows the electromagnet to self-rotate, which, on the one hand, increases the adsorption range of the electromagnet and, on the other hand, increases the adsorption area. The electromagnet rotates within an annular space, stirring the metal material. This, combined with the self-rotation of the electromagnet, facilitates the uniform adsorption of metal materials. Additionally, subsequent collection of the metal material on the electromagnet allows the electromagnet to perform repeated magnetic separation operations, significantly improving the separation efficiency of the metal material and reducing omissions.

[0040] By providing the flipping component, after a certain amount of the metal material is adsorbed onto the electromagnet, it needs to be collected. At this point, the first screw drives the driving seat to move upward, thereby lifting the movable plate and the electromagnet. During this process, under the action of the locking component, the position of the gear rack remains temporarily stable, allowing the gear roller to drive the sleeve ring and the electromagnet to rotate, flipping the electromagnet. At this time, a plurality of non-metallic materials that were blocked by the metal material can fall off, leaving only the metal material on the electromagnet. This prevents the plurality of non-metallic materials from being collected together with the metal material, thereby improving the efficiency of magnetic separation.

[0041] By providing a locking component and a transverse movement component,

the position of the gear rack is released after the electromagnet is flipped, making it easier for the driving seat, the movable plate, and the electromagnet to continue moving upward. At this time, the gear reaches the adjustment frame, driving the second screw to rotate. Under the restraining action of the contraction plate and the gear rack, the movable plate can be driven to move transversely, bringing the electromagnet above the collecting barrel. At this point, the electromagnet is powered off, causing the metal material to fall into the collecting barrel, completing the centralized collection of the metal material. Then, by reversing the first screw, the electromagnet and all components can return to their original positions, facilitating repeated operations.

[0042] The present disclosure covers any alternatives, modifications, equivalent methods, and solutions within the essence and scope of the disclosure. For a thorough understanding of the disclosure by the public, the specific details of the preferred embodiment are described in detail in the following preferred embodiments. Those skilled in the art can fully understand the disclosure even without these detailed descriptions. Moreover, to avoid unnecessary confusion with the essence of the disclosure, well-known methods, processes, procedures, components, and circuits are not described in detail.

[0043] Those skilled in the art can understand that all or part of the steps of the method in the above embodiments can be accomplished by instructing related hardware through programs, which can be stored in a computer-readable storage medium such as ROM/RAM, magnetic disks, optical disks, etc.

[0044] The above descriptions are only the preferred embodiments of the disclosure. It should be noted that for those skilled in the art, various improvements and modifications can be made without departing from the principle of the disclosure, and these improvements and modifications should also be regarded as within the scope of the disclosure

CLAIMS

What claimed is:

1. A device for disassembling and recycling a waste lithium battery, comprising: a body; wherein a crushing roller is mounted at a top portion of an inner portion of the body; a guide disc is fixed to an inner wall of the body by a mounting strip, and the guide disc is positioned below the crushing roller; a collecting barrel is fixed at a bottom portion of the inner portion of the body;

the device further comprises a first screw being rotatably mounted at a bottom portion of the guide disc, and being driven by a motor mounted in the guide disc in an embedded manner; wherein the first screw is sleeved with a driving seat through threads, and a limit telescopic rod is connected between a top portion of the driving seat and the bottom portion of the guide disc; a mounting seat is rotatably mounted at a bottom portion of the driving seat, and the mounting seat is driven by a motor mounted in the driving seat in an embedded manner; a second screw is rotatably mounted at an equal angle on an outer side of the mounting seat, and the second screw is sleeved with a movable plate through threads; a mounting plate is fixed at a bottom edge of the movable plate, and a sleeve ring is rotatably mounted on an inner wall of a middle portion of the mounting plate through a torsion spring and a shaft rod; an electromagnet is nested inside the sleeve ring, and an initial position of the electromagnet is located between a lower half of the body and the collecting barrel;

a self-rotation drive component arranged between a bottom portion of the movable plate and a top portion of the collecting barrel, and the self-rotation drive component being configured to achieve the self-rotation of the electromagnet;

a flipping component arranged between the guide disc and the mounting plate and configured to drive the electromagnet to flip;

a transverse movement component arranged at the bottom portion of the guide disc and at an outer end of the second screw, and the transverse movement component being configured to drive the movable plate to move laterally; and

a locking component arranged at a top portion of the movable plate and at the flipping component and configured to control a flipping action of the electromagnet.

2. The device for disassembling and recycling a waste lithium battery according to claim 1, wherein a top portion of the guide disc is designed as a conical structure, the guide disc and the collecting barrel share a central axis, and a space in the lower half of the body is configured to be inwardly recessed.

3. The device for disassembling and recycling a waste lithium battery

according to claim 2, wherein the self-rotation drive component includes a positioning rod, the positioning rod is fixed to a top portion of the electromagnet, a top portion of the positioning rod is sleeved with a positioning column, the positioning column is rotatably mounted at the bottom portion of the movable plate, the positioning column is sleeved with a gear sleeve, an inner side of the gear sleeve meshes with a gear ring, and the bottom portion of the gear ring is fixed to the top portion of the collecting barrel through a mounting rod.

4. The device for disassembling and recycling a waste lithium battery according to claim 3, wherein the top portion of the positioning rod is designed as a rectangular structure, and the top portion of the positioning rod and a bottom portion of the positioning column are matched in a concave and convex manner.

5. The device for disassembling and recycling a waste lithium battery according to claim 4, wherein the flipping component includes a contraction plate, the contraction plate is arranged to attach to the bottom portion of the guide disc, a cavity at a bottom portion of the contraction plate is connected to a gear rack through a first elastic telescopic rod, the gear rack passes through the movable plate and is vertically and slidably embedded in a cavity at a top portion of the mounting plate, one side of the gear rack is meshed with a gear roller, the gear roller is rotatably mounted in a cavity at an inner portion of the mounting plate in an embedded manner, and the gear roller is connected to an outer shaft rod of the sleeve ring.

6. The device for disassembling and recycling a waste lithium battery according to claim 5, wherein the overall design of the gear rack is a rectangular structure, and a top portion of the gear rack slides vertically and elastically in the contraction plate through the first elastic telescopic rod.

7. The device for disassembling and recycling a waste lithium battery according to claim 6, wherein the transverse movement component includes a transverse rod fixed to an outside of the contraction plate, the transverse rod is slidably sleeved with an adjustment frame, the adjustment frame is mounted in a cavity at a bottom portion of the guide disc in a limited and sliding manner, and a gear is arranged below the adjustment frame and is sleeved on the outer end of the second screw.

8. The device for disassembling and recycling a waste lithium battery according to claim 7, wherein a bottom portion of the adjustment frame is arranged as an opening structure to limit a position of the gear, an inner wall of the bottom portion of the adjustment frame is arranged as a serrated structure to mesh with

the gear, and a protruding position of a top portion of the adjustment frame is designed in a "T" shape to slide in the cavity at the bottom portion of the guide disc.

9. The device for disassembling and recycling a waste lithium battery according to claim 8, wherein the locking component includes a locking rod, the
5 locking rod is transversely mounted on the outside of the contraction plate through a second elastic telescopic rod, an outer end of the locking rod passes through the contraction plate and is positioned in a locking slot, the locking slot is arranged at a side edge of the gear rack, a middle portion of the locking rod is provided with a release chamber, and the release chamber is positioned above the release rod
10 fixed at the top portion of the movable plate.

10. The device for disassembling and recycling a waste lithium battery according to claim 9, wherein the outer end of the locking rod is designed as a right-angled trapezoidal structure and is provided with an upward slanted surface, the outer end of the locking rod and the locking slot are matched in a concave and
15 convex manner, and an inner end of the release chamber is designed as a slanted structure.

Ansprüche

1. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien, dadurch gekennzeichnet, dass sie umfasst: ein Gehäuse, wobei eine Brechwalze oben im Inneren des Gehäuses angeordnet ist und eine Führungsscheibe über einen Befestigungsstreifen an der Innenwand des Gehäuses befestigt ist, wobei sich die Führungsscheibe unterhalb der Brechwalze befindet und ein Sammelzylinder unten im Inneren des Körpers befestigt ist;

- eine erste Schnecke umfasst, die drehbar an der Unterseite der Führungsscheibe angebracht ist, wobei die erste Schnecke durch einen in der Führungsscheibe eingebetteten Motor angetrieben wird, wobei ein Antriebssitz auf die erste Schnecke aufgeschraubt ist und eine Begrenzungssteleskopstange zwischen der Oberseite des Antriebssitzes und der Unterseite der Führungsscheibe verbunden ist, wobei ein Montagesitz drehbar an der Unterseite des Antriebssitzes angeordnet ist und der Montagesitz durch einen im Antriebssitz eingebetteten Motor angetrieben wird, wobei eine zweite Schnecke in einem gleichen Winkel an der Außenseite des Montagesitzes drehbar angeordnet ist, und eine Bewegungsplatte auf die zweite Schnecke aufgeschraubt ist, wobei eine Montageplatte am unteren Rand der Bewegungsplatte befestigt ist und ein Kragen über eine Torsionsfeder und einen Wellenschaft an der Innenwand in der Mitte der Montageplatte angebracht ist, wobei ein Elektromagnet im Kragen untergebracht ist und sich die Ausgangsposition des Elektromagneten zwischen der unteren Hälfte des Gehäuses und dem Sammelzylinder befindet;

- eine Rotationsantriebsbaugruppe, die zwischen der Unterseite der Bewegungsplatte und der Oberseite des Sammelzylinders angeordnet ist, und die Rotationsantriebsbaugruppe dazu ausgelegt ist, den Elektromagneten in Rotation zu versetzen;

- eine Wendebaugruppe, die zwischen der Führungsscheibe und der Montageplatte angeordnet ist und dazu ausgelegt ist, den Elektromagneten zum Wenden anzutreiben;

- eine Traversenbaugruppe, die an der Unterseite der Führungsscheibe und am äußeren Ende der zweiten Schnecke angeordnet ist und dazu ausgelegt ist, die Bewegungsplatte so anzutreiben, dass sie sich seitlich bewegt; und

- eine Verriegelungsbaugruppe, die oben auf der Bewegungsplatte und der Wendebaugruppe angeordnet ist, und die Verriegelungsbaugruppe dient zur Steuerung des Wendens des Elektromagneten.

2. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien nach Anspruch 1, dadurch gekennzeichnet, dass die Oberseite der Führungsscheibe als konische Struktur ausgebildet ist, die Führungsscheibe und der Sammelzylinder

eine gemeinsame Mittelachse haben und der Raum in der unteren Hälfte des Gehäuses nach innen vertieft ist.

3. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien nach Anspruch 2, dadurch gekennzeichnet, dass die Rotationsantriebsbaugruppe eine Positionierungsstange umfasst, die an der Oberseite des Elektromagneten befestigt ist, wobei ein Positionierungspfofen oben auf der Positionierungsstange angebracht ist und der Positionierungspfofen drehbar an der Unterseite der Bewegungsplatte angebracht ist, eine Zahnradhülse auf dem Positionierungspfofen gesetzt ist, ein Zahnring mit der Innenseite der Zahnradhülse in Eingriff steht und die Unterseite des Zahnringes über eine Befestigungsstange an der Oberseite des Sammelzylinders befestigt ist.

4. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien nach Anspruch 3, dadurch gekennzeichnet, dass die Oberseite der Positionierungsstange als rechteckige Struktur ausgebildet ist und die Oberseite der Positionierungsstange und der Hohlraum an der Unterseite des Positionierungspfofens in konkaven und konvexen Passungen liegen.

5. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien nach Anspruch 4, dadurch gekennzeichnet, dass die Wendebaugruppe eine Schrumpfplatte umfasst und die Schrumpfplatte an der Unterseite der Führungsscheibe befestigt ist, der Hohlraum an der Unterseite der Schrumpfplatte über eine erste elastische Teleskopstange mit einer Zahnstange verbunden ist, die Zahnstange die Bewegungsplatte durchdringt und im Hohlraum an der Oberseite der Montageplatte eingebettet und vertikal verschiebbar angeordnet ist, wobei eine Seite der Zahnstange mit einer Zahnrolle kämmt, die Zahnrolle im inneren Hohlraum der Montageplatte eingebettet und drehbar angeordnet ist und die Zahnrolle mit dem Wellenschaft außerhalb des Kragens verbunden ist.

6. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien nach Anspruch 5, dadurch gekennzeichnet, dass die Zahnstange insgesamt als rechteckiges Gebilde ausgebildet ist, die Oberseite der Zahnstange durch die erste elastische Teleskopstange elastisch vertikal in der Schrumpfplatte gleitet.

7. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien nach Anspruch 6, dadurch gekennzeichnet, dass die Traversenbaugruppe eine Querstange umfasst, die Querstange an der Außenseite der Schrumpfplatte befestigt ist und ein Einstellrahmen verschiebbar auf der Querstange aufgesetzt ist, wobei der Einstellrahmen begrenzt und verschiebbar in dem Hohlraum an der Unterseite der Führungsscheibe angeordnet ist, ein Zahnrad unterhalb des Einstellrahmens vorgesehen ist und das Zahnrad am äußeren Ende der zweiten Schnecke aufgesetzt ist.

8. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien nach Anspruch 7, dadurch gekennzeichnet, dass die Unterseite des Einstellrahmens als Öffnungsstruktur ausgebildet ist, um die Position des Zahnrads zu begrenzen, die Innenwand an der Unterseite des Einstellrahmens mit einer Sägezahnstruktur versehen ist, die mit dem Zahnrad kämmt, die erhöhte Position an der Oberseite des Einstellrahmens als „T“-förmige Struktur zum positionsbegrenzten Gleiten in dem Hohlraum an der Unterseite der Führungsscheibe ausgebildet ist.

9. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien nach Anspruch 8, dadurch gekennzeichnet, dass die Verriegelungsbaugruppe eine Verriegelungsstange umfasst, die über eine zweite elastische Teleskopstange seitlich an der Außenseite der Schrumpfplatte angebracht ist, wobei das äußere Ende der Verriegelungsstange die Schrumpfplatte durchdringt und in einer Verriegelungsnut liegt, die Verriegelungsnut an einer Seitenposition der Zahnstange ausgebildet ist, wobei in der Mitte der Verriegelungsstange ein Freigabehohlraum vorgesehen ist, der Freigabehohlraum sich über einem Freigabehebel befindet und der Freigabehebel an der Oberseite der Bewegungsplatte befestigt ist.

10. Vorrichtung zur Demontage und zum Recycling gebrauchter Lithiumbatterien nach Anspruch 9, dadurch gekennzeichnet, dass das äußere Ende der Verriegelungsstange als rechtwinkliges Trapezgebilde ausgebildet ist und das äußere Ende der Verriegelungsstange nach oben geneigt ist, das äußere Ende der Verriegelungsstange und die Verriegelungsnut in konkaven und konvexen Passungen liegen und das innere Ende des Freigabehohlraums als Kegelstruktur ausgebildet ist.

DRAWINGS

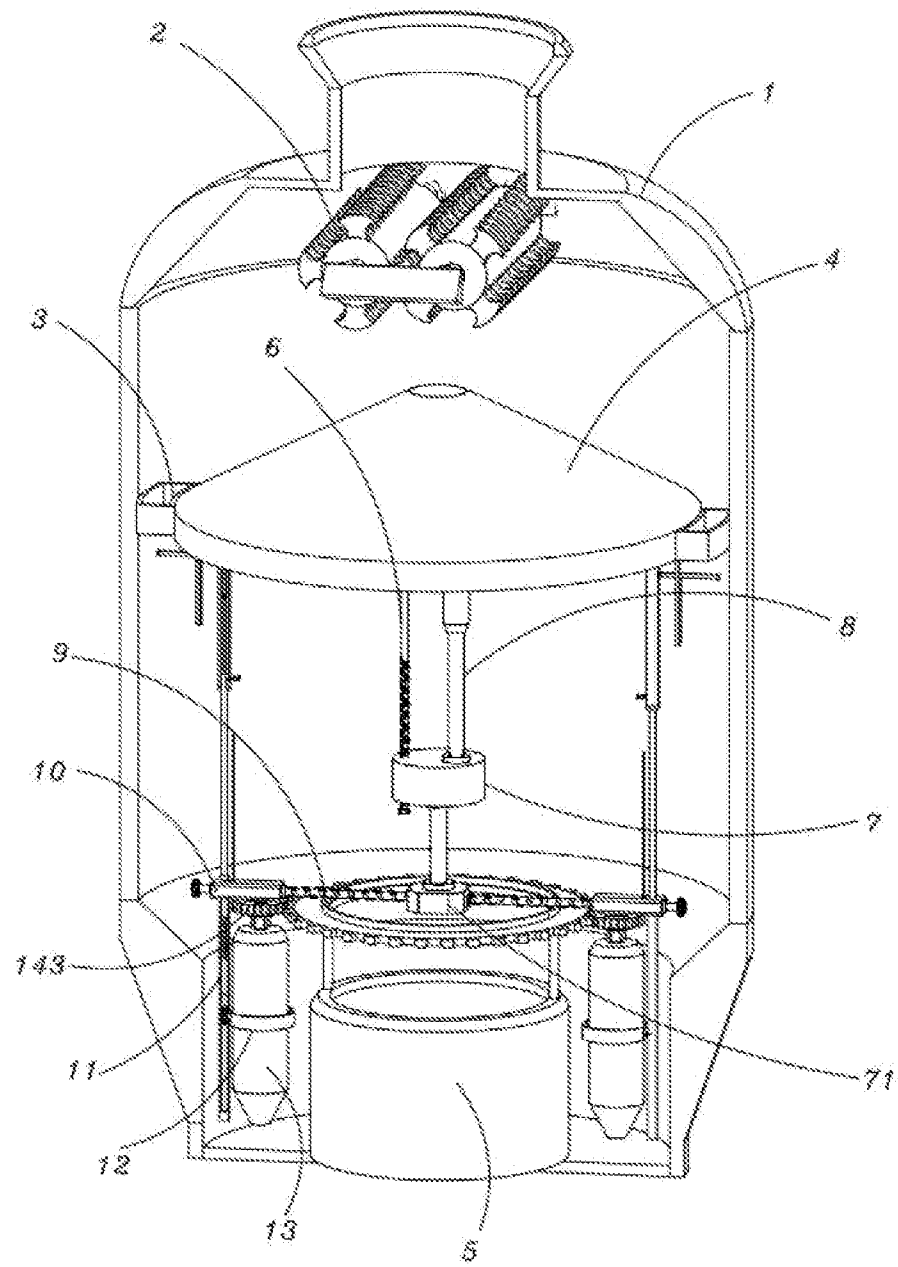


FIG. 1

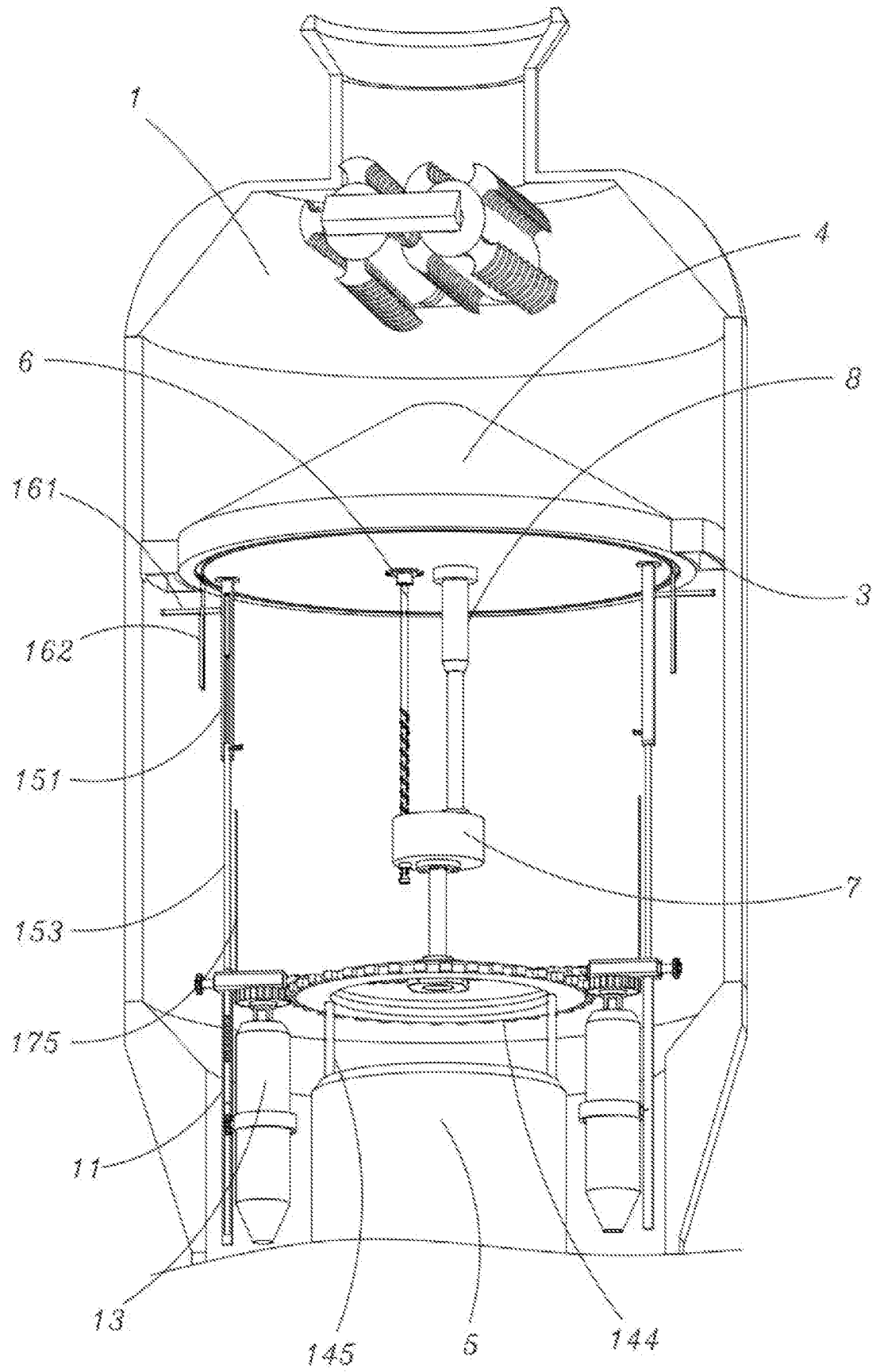


FIG.2

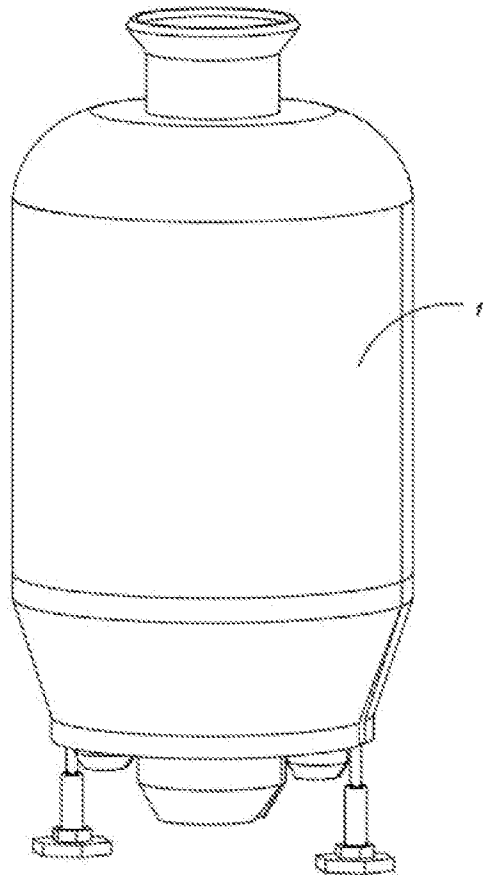


FIG. 3

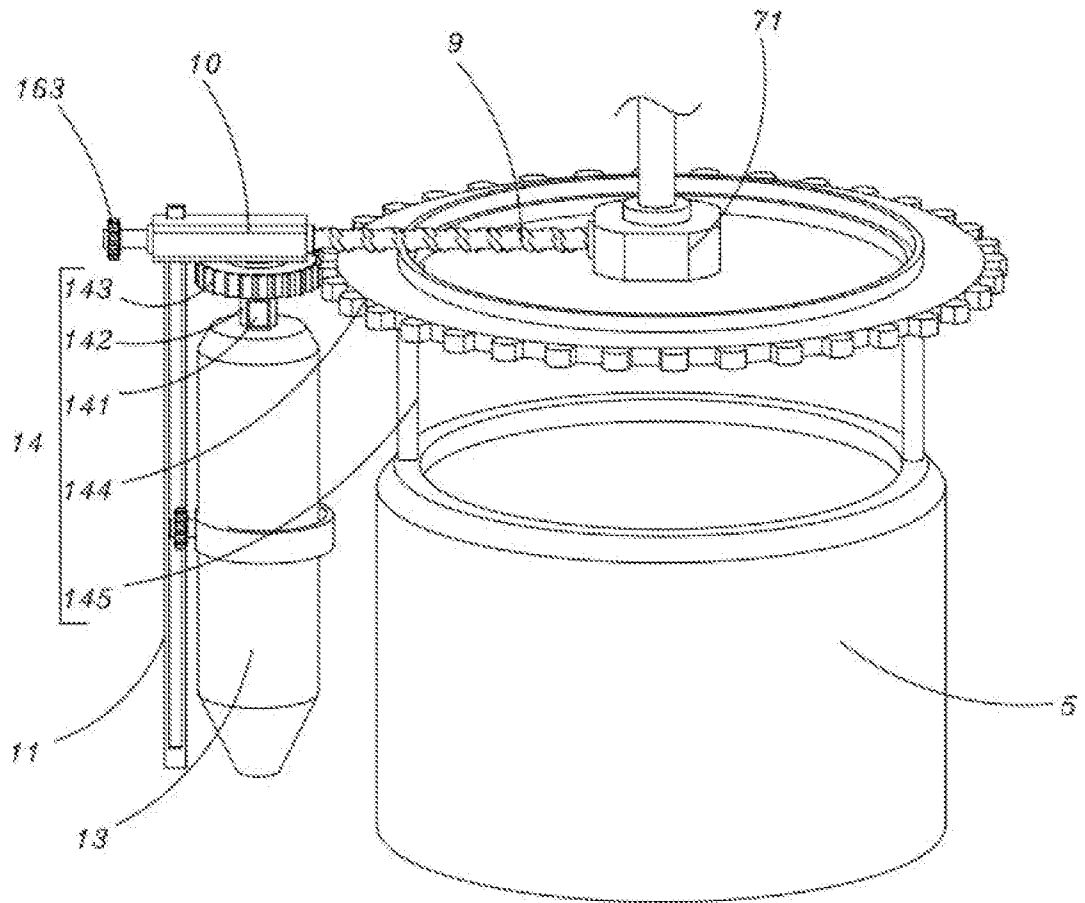


FIG. 4

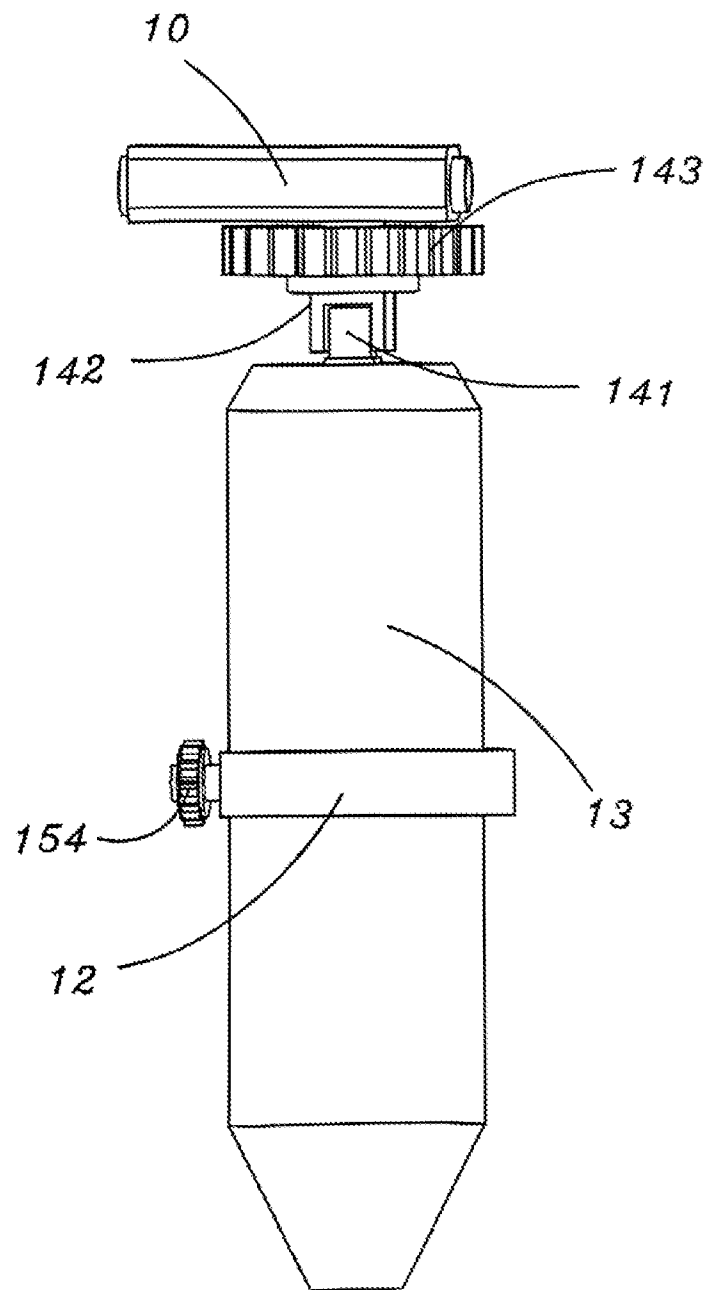


FIG. 5

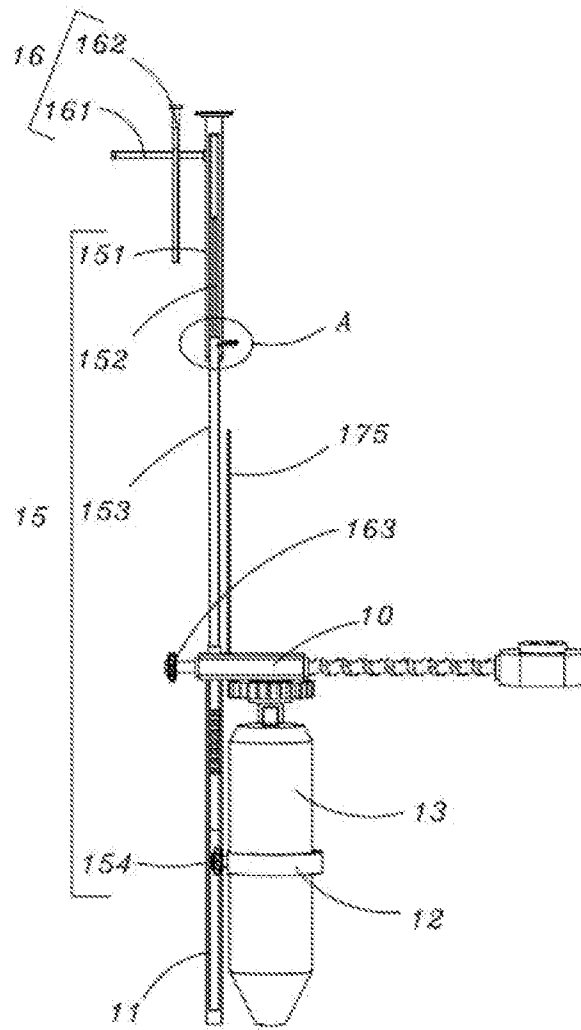


FIG. 6

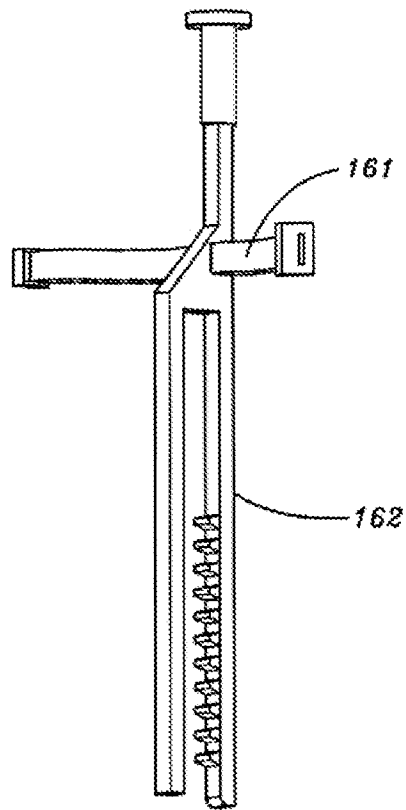


FIG. 7

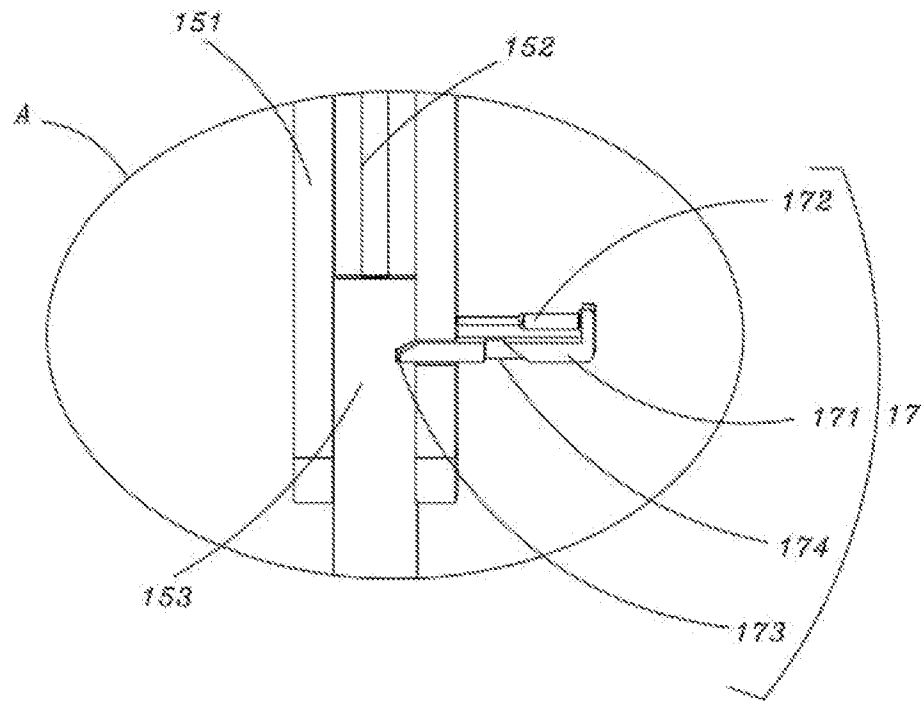


FIG. 8