

Certainly! Below is a *well-organized and professionally translated English version* of the provided Chinese patent document (CN 121128613 A), including all claims, abstract, background, technical solution, advantages, figures description, detailed embodiments, and method descriptions. The language has been refined for clarity, consistency, and formal patent-style presentation.

Patent Document: CN 121128613 A

Title: Cat Litter Box Refill Device and Refilling Method

Technical Field

[0001] The present invention relates to the field of pet products, particularly to a cat litter box refill device and its associated refilling method.

Background Art

[0002] With improving living standards, an increasing number of people—especially single young adults in urban areas—are choosing to keep pets as companions. Due to limited space in rental housing, cats have become especially popular among pet owners. Cats naturally bury their waste in litter, which requires regular manual removal by the owner—a time-consuming and labor-intensive task.

[0003] When owners are away during the day, they often fail to clean up cat waste promptly, leading to accumulation. This not only causes unpleasant odors that degrade indoor air quality but also poses hygiene risks. To address this issue, automatic litter boxes were developed to separate feces from clean litter, thereby reducing manual cleaning efforts.

[0004] However, even with automated systems, users must periodically refill the litter manually. While seemingly simple, this process requires constant monitoring of litter levels and can be easily forgotten. If insufficient litter remains in the box, urine may not be properly absorbed or feces may fail to form clumps or become adequately covered. This results in contamination of the litter box, increased cleaning difficulty, persistent odors, and reduced user satisfaction.

[0005] Therefore, there exists a need for an improved system that enables *automatic, reliable, and quantified replenishment* of cat litter without requiring electronic sensors, motors, or complex control systems—especially during routine self-cleaning cycles.

Summary of the Invention

[0006] The present invention provides a *cat litter box refill device* and a corresponding method for automatic, quantitative refilling. It leverages purely mechanical design principles and gravity to achieve seamless integration into the cleaning cycle of an automated cat litter box system.

Key Features:

- *Fully passive operation*: No external power source or electronic components required.
 - *Automatic quantified refill*: Litter is automatically dispensed in precise amounts during each cleaning rotation.
 - *Modular design* (in some embodiments): Allows users to adjust the amount of litter replenished per cycle by changing the configuration of internal modules.
 - *Easy installation and maintenance*: Features a removable connection mechanism for simple refilling and cleaning.
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Brief Description of Claims

1. A cat litter box refill device, characterized in that it comprises:
 - A litter storage chamber (52) configured to contain cat litter; and
 - A refill channel (54) fluidly connected to the interior of the litter storage chamber, wherein the refill channel defines a path from an inlet port (542) to an outlet port (543), and includes:
 - A metering cavity (541) formed between the inlet port (542) and the outlet port (543);
 - The metering cavity (541) having a lowest point; and
 - A reference plane exists such that, on this plane, the projection of the outlet port (543) and the projection of the lowest point are separated by a predetermined distance.
2. The cat litter box refill device according to claim 1, further comprising:
 - A fixed chamber (55), connected to the litter storage chamber (52); wherein the fixed chamber (55) includes an internal cavity (551) and a flow control block (53) installed within the cavity (551); and both the refill channel (54) and the metering cavity (541) are formed inside the flow control block (53).
3. The cat litter box refill device according to claim 2, wherein:
 - There are multiple flow control blocks (53), all arranged within the cavity (551);
 - Each flow control block (53) has two installation orientations: a first orientation and a second orientation;
 - In the first orientation, the refill channel (54) forms a continuous path from the litter storage chamber (52) to the outlet port (543);

- In the second orientation, the connection between the refill channel (54) and the litter storage chamber (52) is blocked.
- 4. The cat litter box refill device according to claim 1, wherein:
 - The refill channel (54) has a lowest section;
 - Both the inlet and outlet of the refill channel are positioned higher than this lowest section in vertical direction.
- 5. The cat litter box refill device according to claim 4, wherein:
 - The profile of the refill channel (54) is selected from among U-shaped, V-shaped, arcuate shapes, or combinations thereof.
- 6. The cat litter box refill device according to claim 1, wherein:
 - Along its path from inlet port (542) to outlet port (543), the refill channel (54) includes at least two sequentially arranged lowest sections.
- 7. The cat litter box refill device according to claim 2, wherein:
 - The cavity (551) of the fixed chamber (55) has an inlet opening (552) and an outlet opening (553);
 - The inlet opening (552) is connected to the litter storage chamber (52);
 - The outlet opening (553) faces toward the main body of the cat litter box (2);
 - The inlet opening (552) and outlet opening (553) are located on non-parallel sidewalls of the cavity (551).
- 8. The cat litter box refill device according to claim 1, further comprising:
 - A releasable connecting mechanism configured to removably secure the litter storage chamber (52) onto a main body of the cat litter box (2); wherein the mechanism includes:
 - At least one protruding structure (51) formed on the litter storage chamber (52); and
 - At least one recessed structure formed on the main body (2), configured to engage with the protruding structure (51).
- 9. A method for refilling cat litter using the device of claim 1, characterized by comprising the following steps:
 - Placing the refill device in a first position: under gravity, cat litter flows from the storage chamber (52) into and fills the metering cavity (541); due to an elevated outlet structure, the litter is prevented from exiting.
 - Rotating the refill device to a second position: under gravity, the cat litter stored in the metering cavity (541) is discharged through the outlet port (543).
- 10. A method for quantitative refilling using the device of claim 1, characterized by comprising the following steps:
 - Placing the refill device in an initial position: no litter enters the refill channel from the storage chamber (52);

- Rotating the device to a material-taking position: cat litter flows from the storage chamber (52) into and fills the metering cavity (541), achieving quantitative filling;
 - Continuing rotation to a discharge position: a predetermined amount of cat litter stored in the metering cavity (541) is discharged through the outlet port (543).
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Detailed Description

Embodiment 1 – Integrated Passive Refill Device

[0027] This embodiment describes an integrated, passive refill device designed for use with automated cat litter box systems.

Structure Overview:

- The system includes a base (1), and a rotatable main body of the cat litter box (2) mounted on it.
- The main body (2) is typically a hollow spherical or hemispherical structure with an internal cavity, including a recessed area (21) for storing clean litter—where cats defecate.

Device Components:

- *Litter Storage Chamber (52):* A container made of durable plastic such as ABS or PP via injection molding. It has a removable lid or door for easy refilling.
- *Refill Channel (54):* Formed either integrally with the storage chamber (e.g., through one-piece molding) or installed separately using ultrasonic welding, adhesive bonding, or screw fixation.
 - The channel includes an inlet port (542), outlet port (543), and a central *metering cavity (541)* shaped as a U-, V-, or arcuate-shaped depression—creating the lowest point along the path.

Key Design Principle:

- The refill channel is designed with “*high at both ends, low in the middle*” geometry.
 - Both inlet and outlet are positioned higher than the lowest point of the metering cavity (541).
 - This creates a gravitational potential trap that temporarily holds litter within the metering cavity without spilling.

Reference Plane Concept:

- A reference plane (e.g., horizontal plane) is defined.
- The projected distance between the outlet port (543) and the lowest point of the metering cavity on this plane is predetermined.
- This geometric parameter determines the effective volume of the metering cavity, enabling precise control over refill quantity.

Flow Optimization:

- Smooth transitions at junctions prevent bridging or blockage by different types of litter (e.g., bentonite, tofu-based, mineral).
- The channel may adopt various shapes:
 - U-shaped: smooth flow and good retention.
 - V-shaped: simple manufacturing.
 - Arcuate: continuous curvature for optimal performance.

Multi-Lowest Section Design (Optional):

- Multiple lowest sections can be arranged sequentially along the path (e.g., W-shape or wave-like).
- This allows delayed refill—only after a larger rotation angle is achieved, enabling advanced control logic such as “refill every second cycle.”

Connection Mechanism:

- A releasable connection system enables easy installation and removal.
 - Protruding structures (51) on the storage chamber engage with recesses or slots on the main body (2).
 - Installation involves simple snapping; disassembly requires pressing a release tab.

Method of Operation – Two-Stage “Standby → Execute” Process

[0038]

Step 1: First Position (Standby & Filling)

- Device is placed in its normal horizontal standby position. - Gravity causes litter to flow from the storage chamber (52) into the metering cavity (541). - The outlet port (543) remains elevated above the natural angle of repose, preventing overflow. - Metering cavity remains fully filled and ready—automatically replenished if partially emptied.

Step 2: Second Position (Discharge)

- During cleaning cycle, the main body rotates to a specific inclined position. - The outlet port (543) now becomes lower than the metering cavity's lowest point. - Gravity triggers discharge of pre-measured litter into the litter storage area (21). - After cleaning ends and rotation returns to original position, the system resets automatically.

 **Advantage:** No electronic control needed; reliable, maintenance-free operation.

Embodiment 2 – Modular & Adjustable Refill Device

[0045] This embodiment introduces a *modular design* that allows users to adjust refill volume based on individual needs (e.g., number of cats, seasonal changes).

Core Innovation:

- Use of multiple *replaceable flow control blocks (53)* inside a fixed chamber (55).
- Each block acts as an independent refill unit.
- Refill amount is adjustable by changing the number of active blocks.

Structure Details:

- Fixed chamber (55) contains cavity (551), with inlet opening (552) connected to the storage chamber (52), and outlet opening (553) facing toward litter area (21).
- Multiple flow control blocks (53) can be inserted side-by-side into the cavity.

Block Operation:

Each block has two installation orientations: - *Open Position*: Inlet port aligns with storage chamber → allows litter to enter and fill metering cavity. - *Closed Position*: Block rotated 180°; solid wall blocks inlet → no flow possible.

 *User Adjustment Example*: - Suppose each active block delivers ~20g of litter per cycle. - Standard mode: Install two open, one closed → total refill = 40g. - High-demand mode (e.g., two cats): Rotate the closed block to open position → now three blocks active → total refill = 60g. - Low-demand mode: Revert one block back to closed → reduce amount.

Design Features:

- Blocks are rectangular, slightly smaller than cavity for smooth insertion/removal.
- Friction or small elastic protrusions ensure secure fit without loosening during rotation.
- Easy access via side opening—no tools required.

 *Advantage*: One device fits multiple usage scenarios; no need to replace entire unit.

Benefits of the Invention

[0015] Compared with prior art, the present invention offers significant advantages:

1. *Fully Automatic and Quantitative Refilling*:
 - Uses only gravity and mechanical geometry—no motors or sensors required.

- Integrates seamlessly into existing cleaning cycles of automated litter boxes.
 - 2. *Simple Structure & Low Cost:*
 - No expensive electronic components; easy to manufacture via injection molding.
 - Suitable for mass production at low cost.
 - 3. *Adjustable Refill Volume (Modular Version):*
 - Users can customize the refill amount by changing block configuration.
 - Adaptable to different cat numbers, litter types, and usage habits.
 - 4. *Easy Installation & Maintenance:*
 - Releasable connection allows quick removal for refilling or cleaning.
 - No tools needed—user-friendly design enhances usability.
 - 5. *High Reliability & Durability:*
 - Passive mechanism avoids failure due to power loss or sensor malfunction.
 - Long-term performance without degradation.
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Drawings Description

[0019]

- Figure 1: Schematic view of the refill device installed in a cat litter box system.
- Figure 2: Structural diagram of the refill device.
- Figure 3: Cross-sectional view showing internal channel and metering cavity.
- Figure 4: Structure of modular embodiment with multiple control blocks.
- Figure 5: Separated view of flow control block and fixed chamber.
- Figure 6: Cross-section of the modular design.

Reference Numerals:

- 1 – Base;
 - 2 – Main body of cat litter box;
 - 21 – Litter storage area;
 - 51 – Protruding structure (e.g., latch);
 - 52 – Litter storage chamber;
 - 53 – Flow control block;
 - 54 – Refill channel;
 - 541 – Metering cavity;
 - 542 – Inlet port;
 - 543 – Outlet port;
 - 55 – Fixed chamber;
 - 551 – Internal cavity;
 - 552 – Cavity inlet;
 - 553 – Cavity outlet.
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Conclusion

[0067] The present invention provides a robust, low-cost, and intelligent solution for automatic cat litter replenishment. By combining mechanical design with gravity-based flow control, it achieves reliable, precise, and user-adjustable refilling—without relying on electronics or complex mechanisms.

While the preferred embodiments have been described in detail, various modifications, substitutions, and improvements may be made within the spirit and scope of the invention as defined by the appended claims. All such variations are intended to fall within the protection range of this patent application.

✓ Final Notes:

- This document is suitable for submission to international patent offices (e.g., WIPO, USPTO, EPO) with minor formatting adjustments.
- For formal filing, consider adding a *Claims Summary*, *Abstract*, and *Priority Statement* if applicable.
- The language used here follows standard *patent drafting conventions*—clear, precise, and legally robust.

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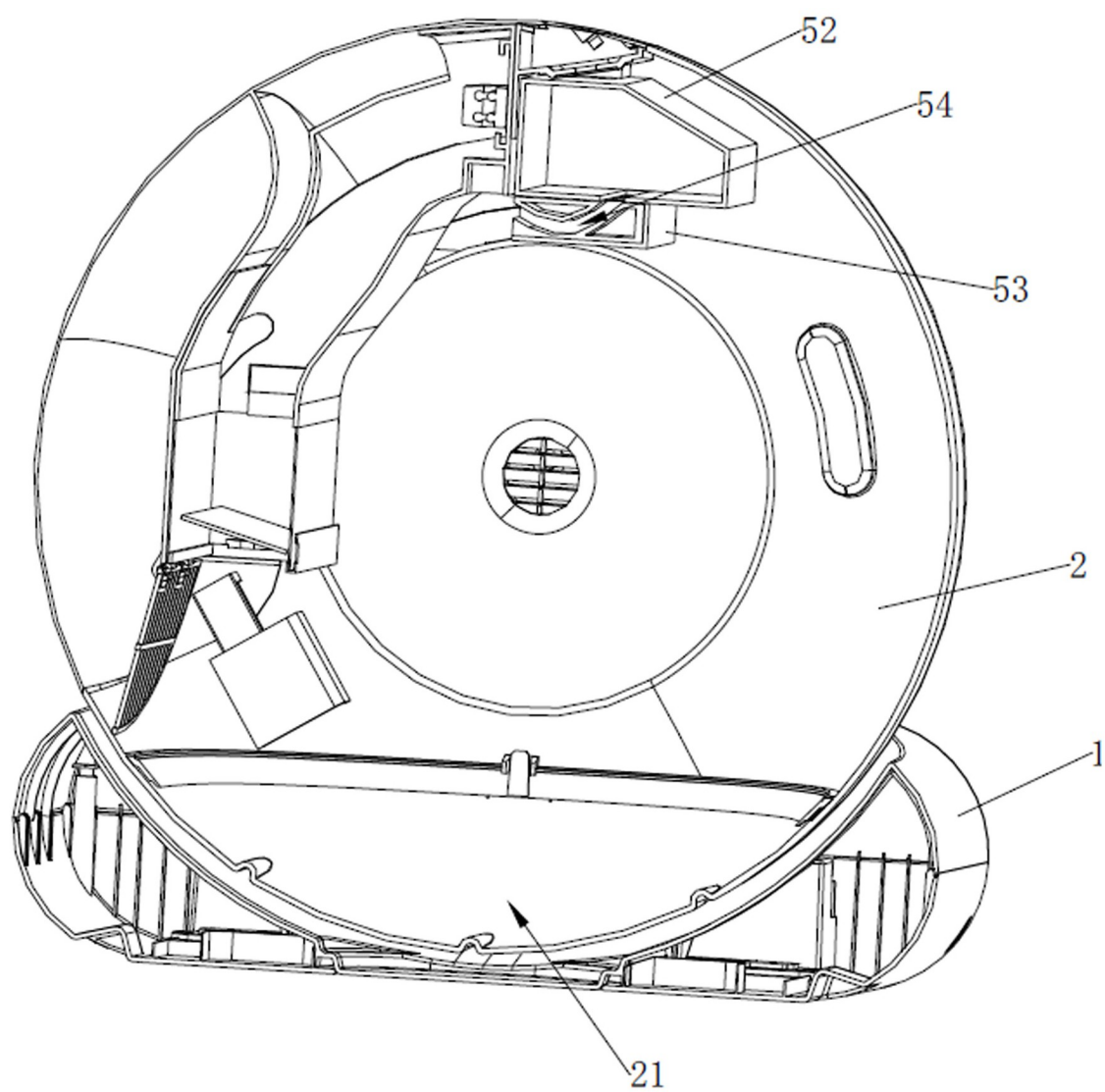


图1

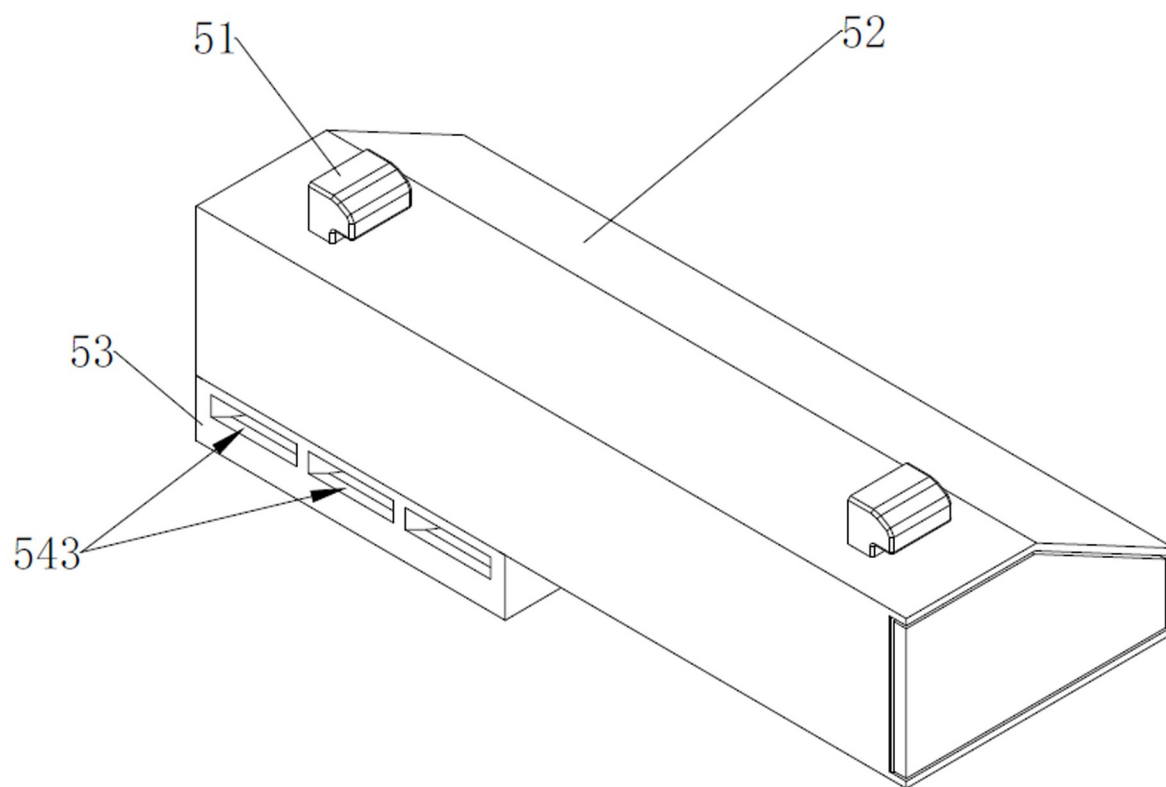


图2

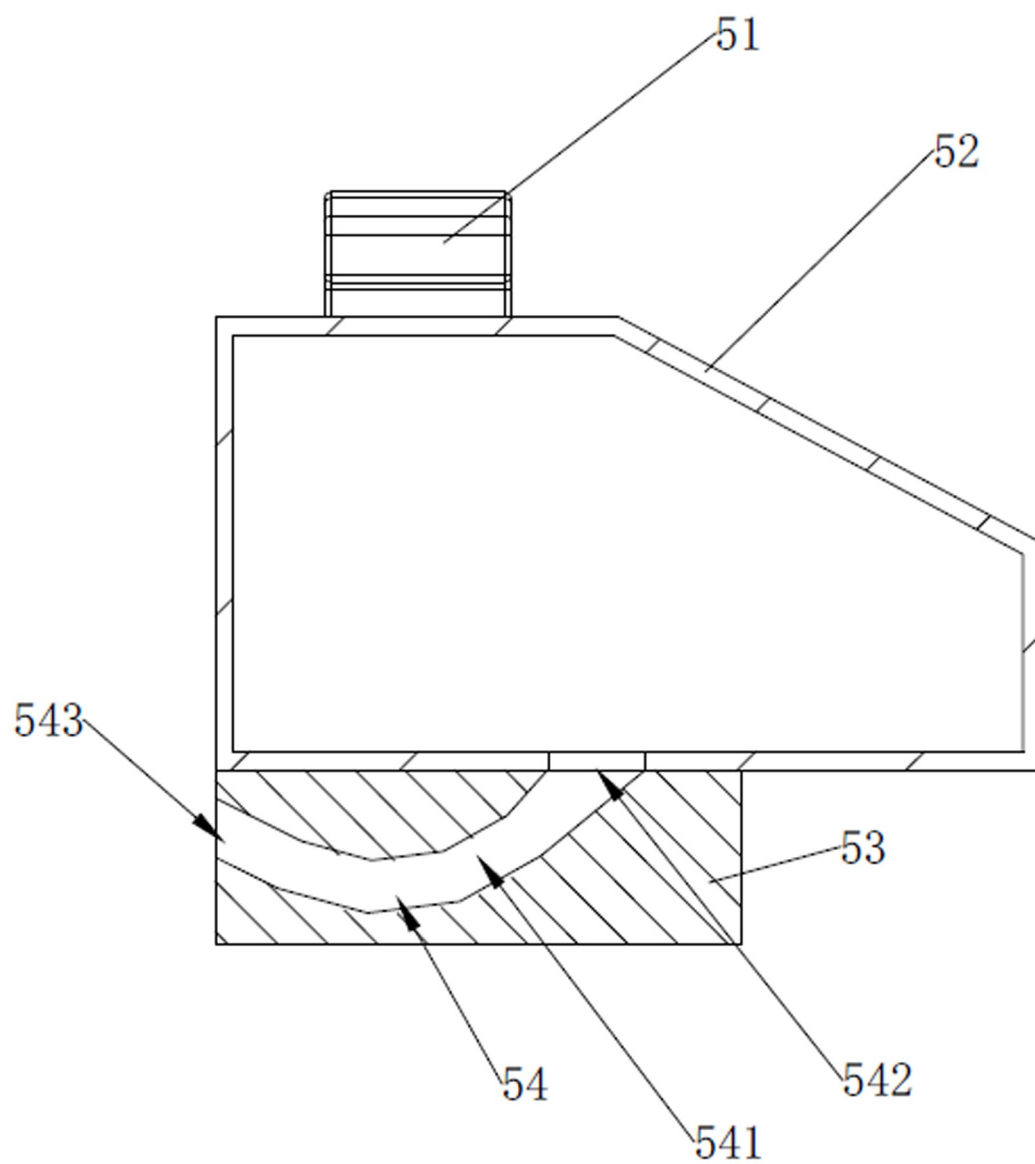


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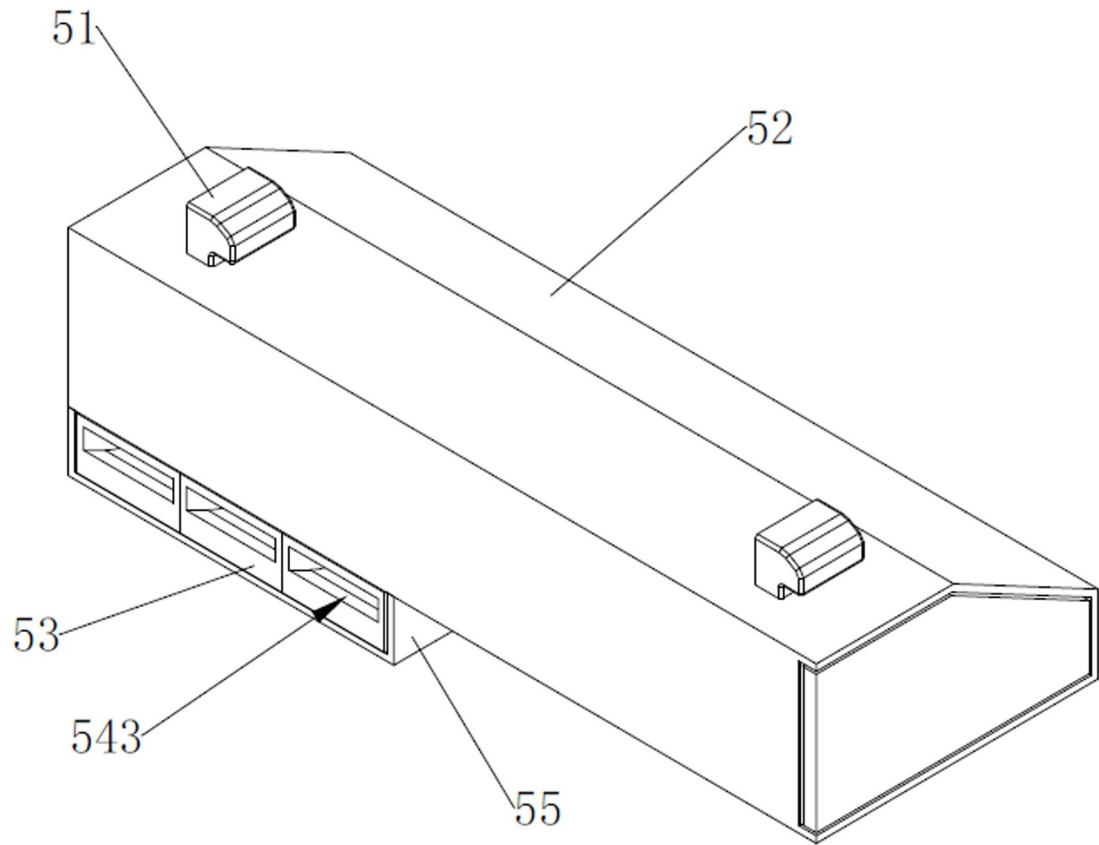


图4

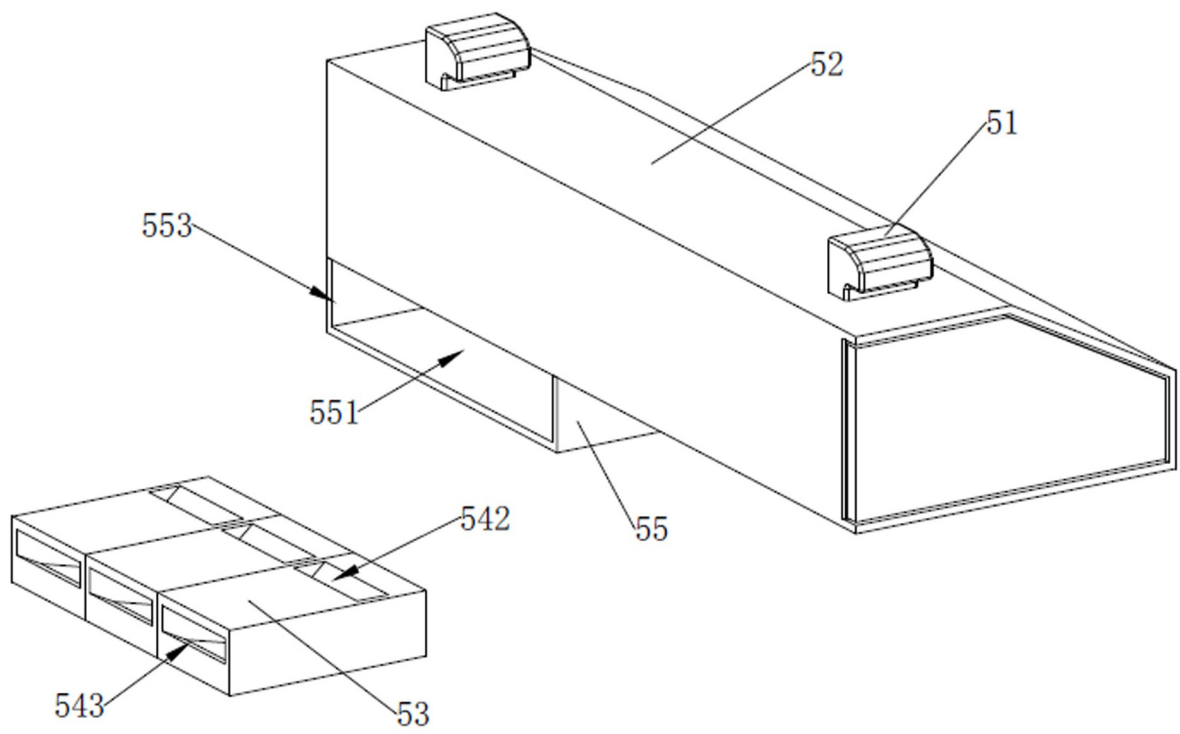


图5

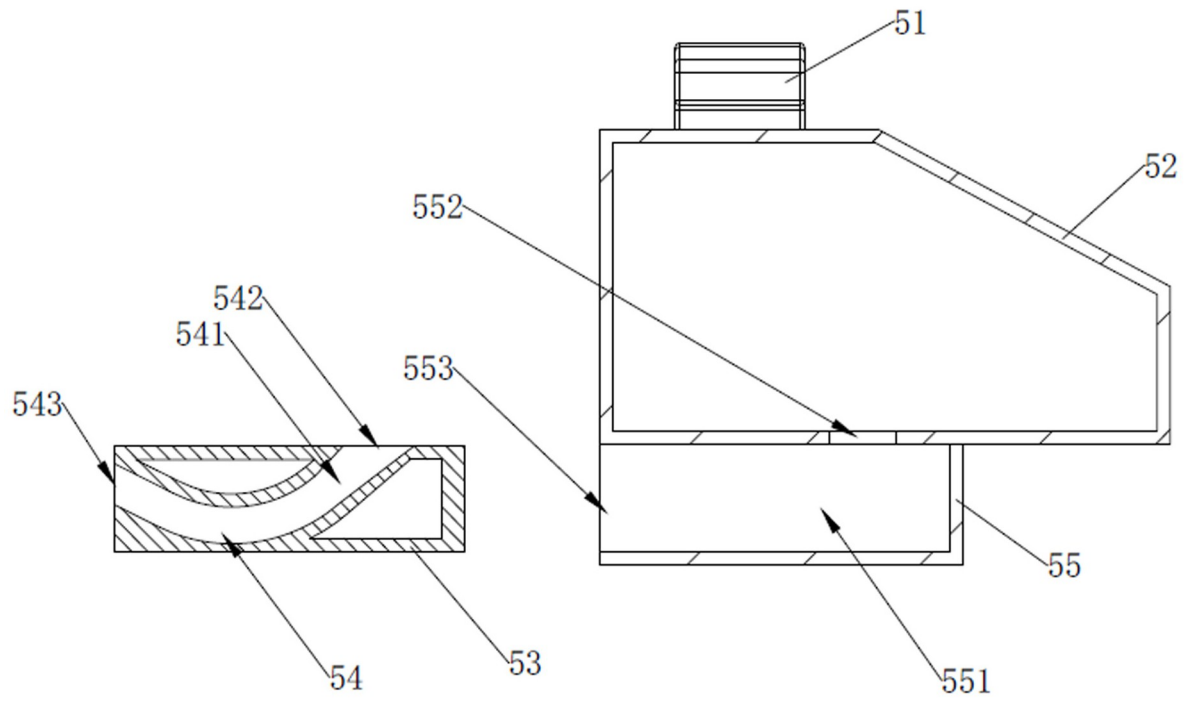


图6