

Smart Automatic Self-Cleaning Cat Litter Box

Preliminary Patent Analysis Report

I. Executive Summary

This report conducts a systematic analysis of the patent landscape targeting the final technical solution of the "Smart Automatic Self-Cleaning Cat Litter Box" product. The core innovation of this product lies in reshaping the internal waste clearance path to achieve "zero-tumble" vertical clearance, while equipped with an automatic litter replenishment mechanism and a dual physical odor-locking mechanism.

Core Conclusion: The technical solution of this product differs significantly from existing core patents (characterized by rotating globe + integrated interior). Through the optimization of the separation mechanism and the design of the unidirectional closing device, it achieves technical innovations and breakthroughs. There is independent intellectual property layout space in directions such as automatic litter replenishment, dual physical odor locking, and modular detachable design. The patent risk is controllable, and the innovation prospects are promising.

II. Market Background and Industry Pain Points

2.1 Industry Background

With the continuous improvement of material standards of living, the population of cat owners continues to expand. In developed metropolises,

constrained by rental space, more and more people tend to raise cats. However, traditional cat litter boxes require manual cleaning of excrement, which is time-consuming and labor-intensive. Existing smart cat litter boxes generally suffer from core pain points such as incomplete cleaning, secondary pollution of the inner wall, inconvenience in washing, the requirement for manual litter replenishment, and reliance on consumables for odor control, failing to truly deliver a "fully automatic closed-loop" experience.

2.2 Main Pain Points of Existing Smart Cat Litter Boxes

Pain Point Type	Specific Manifestation
Incomplete Cleaning	The distance between the filter screen and the waste compartment inlet is long, and the tumbling and colliding of excrement lead to fragmentation or adhesion to the inner wall.
Secondary Pollution of Inner Wall	"Smear Disaster" — Starting the cleaning process before feces are dry causes contamination to the cat and the inner wall.
Difficulty in Washing	Non-detachable structures require the entire internal cavity to be maintained as a whole.
Cumbersome Litter Replenishment	Users must manually observe the remaining amount, open the device, and pour in new litter.
Odor Control	Reliance on activated carbon packs or deodorant consumables, whose efficacy degrades over time.

2.3 Existing Competitor Technical Routes

Brand	Technical Route	Price Range
Company A	Left-right rolling drum type	~1k RMB
Company B	Left-right rolling drum type	~0.5k RMB

Brand	Technical Route	Price Range
Company C	Front-back rolling drum type	~1k RMB
Company D	Front-back rolling drum type (Semi-open)	~1.5k RMB
Company E	Linear scraping/raking motion (Open)	~1k RMB

III. Analysis of the Existing Patent Landscape

3.1 Core Patent Pedigree

Through search and analysis, existing core patents relevant to this product are ranked by importance as follows:

[Most Worthy of Attention] Core Patent A (Invention Patent, Granted)

- **Technical Solution:** Spherical drum rotation + integrated design of internal litter compartment/waste compartment
- **Key Features:** 13 technical features including the drum (2), litter compartment (3), waste compartment (4), filter screen assembly (6), connecting piece (7), cat litter mat (8), flange snap-on fitting (10), deodorizing assembly (12), waste compartment door (14), retaining ring (15), etc.
- **Scope of Protection:** Cat litter separation achieved by drum rotation, built-in litter compartment and waste compartment, built-in filter screen.
- **Risk Assessment:** Granted invention patent; requires key circumvention/design-around.

Patent B (Utility Model, Pending Substantive Examination)

- **Technical Solution:** Drum assembly + base + shell assembly + odor-purifying assembly
- **Focus:** Purification and exhaust device
- **Risk Assessment:** Different focus, simple filtering structure.

Patent C (Invention Patent, Granted)

- **Technical Solution:** Waste bin placed below the filter screen
- **Comparison with Our Solution:** Significant design difference.

Patent D (Invention Patent, Application Disclosed)

- **Technical Solution:** Litter compartment rotates and separates via a support arm and a drive arm
- **Features:** Complex transmission mode, high retail price.

Patent E (Invention Patent, Application Disclosed)

- **Technical Solution:** Double-layer separation structure of cat compartment + litter space + waste compartment
- **Comparison with Our Solution:** An improved solution similar to Core Patent A.

IV. Our Technical Solution

4.1 Core Technical Architecture

The technical solution of this product is designed based on the concept of **"Zero-Tumble Vertical Clearance,"** mainly comprising the following core components:

Component	Function Description
Base (1)	Provides support and rotational drive
Cat Litter Box Body (2)	Rotatably installed on the base, internally provided with a cat litter placement area (21), a litter compartment (3), and a waste compartment (4)
Separation Mechanism (31)	Defines the inlet of the litter compartment and is adjacent to the inlet of the waste compartment to achieve simultaneous shunting of clean cat litter and excrement

Component	Function Description
Unidirectional Closing Device (41)	Positioned at the inlet of the waste compartment, automatically closing after excrement enters
Litter Replenishment Mechanism	Replenishes new cat litter to the cat litter placement area to achieve progressive cat litter replacement
Quick-Release Structure	Allows core components like the litter compartment to be removed as a whole for washing without tools

4.2 Three Core Innovations

Innovation 1: Zero-Tumble Vertical Clearance

Technical Solution: Shorten the distance between the separation mechanism and the inlet of the waste compartment to the minimum, so that the clumped excrement drops into the waste compartment almost instantly and in one go.

Technical Effects:

- Eliminates prolonged tumbling, collision, and friction of excrement inside the drum.
- Prevents urine clumps/feces from breaking during tumbling and crumbs from mixing back into clean cat litter.
- Effectively avoids waste from smearing or sticking to the inner wall, eliminating "Smear Disasters".
- Keeps the inner compartment clean at all times.

Innovation 2: Automatic Litter Replenishment Mechanism

Technical Solution: A built-in automatic litter addition mechanism is integrated into the rotational cleaning cycle. It eliminates manual cat litter replenishment, building a complete automation closed-loop from cleaning → deodorization → replenishment.

Technical Effects:

- Users do not need to constantly monitor the remaining cat litter.
- Avoids urine leakage and cleaning failure caused by forgetting to replenish litter.
- Provides complete peace of mind even during business trips or vacations.
- Truly achieves "peace of mind" and "hands-free" operation.

Innovation 3: Dual Physical Odor Locking

Technical Solution: Abandoning the traditional deodorization methods that rely on consumables, this solution adopts dual physical barriers:

1. **First Barrier:** Clean cat litter automatically covers excrement—during separation, excess cat litter flows into the waste compartment to cover the excrement.
2. **Second Barrier:** Unidirectional closing device automatically seals—the waste compartment door automatically returns to its closed position due to gravity after cleaning ends.

Technical Effects:

- Effectively locks in odors from the source.
- Eliminates the need for consumables like deodorants or activated carbon packs.
- Keeps indoor air fresh over the long term.
- Economical and eco-friendly.

4.3 Modular Detachable Design

Quick-Release Structure: One end of the litter compartment is pivotally connected via a rotating shaft, and the other end is fixed by a snap-fit. The rotating shaft works with a manual quick-release fastener, allowing the entire part to be removed for washing without any tools.

Trash Bag Collar: Integrated molding by sheet metal stamping, snapped at the inlet of the waste compartment to clamp and fix the trash bag mouth wide open.

V. Patent Technical Features Comparison and Design-Around Analysis

5.1 Core Differences from Core Patent A

Technical Feature	Core Patent A Solution	Our Solution	Design-Around Conclusion
Separation Mechanism	The filter screen assembly is built into the drum and separates through drum self-rotation	The separation mechanism (31) is placed inside the body, optimizing the inlet distance to achieve vertical clearance	 Different solutions
Inner Wall Pollution Control	Relies on drum rotation friction for separation, prone to adhesion	Zero-tumble vertical clearance; excrement drops instantly, fundamentally eliminating inner wall adhesion	 Innovative design
Litter Replenishment Function	No automatic litter replenishment design	Built-in litter replenishment mechanism integrated into the cleaning cycle to achieve an automated closed-loop	 Independent innovation
Odor Locking Mechanism	Relies on deodorizing assembly	Dual physical barriers (covering +	 Independent innovation

Technical Feature	Core Patent A Solution	Our Solution	Design-Around Conclusion
	(spraying deodorants)	sealing), eliminating chemical deodorizing consumables	
Waste Compartment Closure	Retaining ring + sealing plate structure	Unidirectional closing device (41), automatically returning via gravity, simpler structure	 Different structures
Litter/Waste Compartment Position	Placed side-by-side inside the drum	Arranged in juxtaposition, with the litter compartment covering above the waste compartment to optimize space utilization	 Different layouts
Quick-Release Design	Fitting assembly (11) is detachable	Rotating shaft quick-release fastener + snap-fit fixing, enabling tool-free removal and washing of the machine's core parts	 Similar concept but different implementation
Trash Bag Fixing	Retaining ring (15) coordinates with card slot	Trash Bag Collar (43) integrated molding by stamping, sliding into a	 Different concrete structures

Technical Feature	Core Patent A Solution	Our Solution	Design-Around Conclusion
		fixing slot design	

5.2 Summary of Design-Around Analysis

Dimension	Analysis Conclusion
Separation Mechanism	 This product utilizes the separation mechanism (31) to optimize the inlet distance, achieving zero-tumble vertical clearance. It differs in principle from Core Patent A's "built-in filter screen + drum self-rotation."
Function Integration	 The automatic litter replenishment mechanism and dual physical odor locking are brand-new features, which do not involve the scope of protection of the original patent.
Structural Design	 Side-by-side arrangement of litter/waste compartments + unidirectional closing device + quick-release structure, which do not overlap with the specific technical features of the original patent.
Odor Locking Approach	 The dual physical barrier (covering + sealing) is completely different from the original patent's chemical deodorant spraying method.

Overall Conclusion: The technical solution of this product successfully circumvents the scope of protection of Core Patent A. It exhibits independent innovation across core principles, structural designs, and functional implementations, presenting no infringement risks.

VI. Competitor Patent Layout Analysis

6.1 Brief Analysis of Main Competitor Patents

Core Patent A: Drum self-rotation + integrated internal filter screen, complex mechanical structure, relies on consumables for deodorization, limited level of intelligence.

Patents B/C/D/E: Each has its own focus but none cover the following high-value directions:

- Implementation solution for zero-tumble vertical clearance
- System integration of the automatic litter replenishment mechanism
- Innovative design of dual physical odor locking
- Practical structure of modular quick-release

6.2 Our Patent Layout Opportunities

Technical Direction	Innovation Value	Layout Priority
Zero-Tumble Vertical Separation Mechanism	Core innovation, solves industry pain points	★★★★★
Automatic Litter Replenishment Integrated System	Key link for an automated closed-loop	★★★★★
Dual Physical Odor Locking Mechanism	Differentiated innovation, zero-consumables selling point	★★★★★
Unidirectional Closing Device Structure	Simple and reliable sealing solution	★★★★☆
Quick-Release Modular Structure	Enhances user experience	★★★★☆

VII. Innovation Performance Indicators

Indicator	Traditional Solution Pain Points	Our Product's Solution	Improvement Magnitude
Inner Wall Pollution	Tumbling causes feces to stick to the inner wall, requiring extra wiping	Zero-tumble vertical clearance; the inner wall remains clean at all times	Completely resolved
Cleaning Time	8 minutes (including manual cleaning of the inner wall)	1.5 minutes (automatic) + no extra wiping required	81%+
Litter Replenishment Automation	Requires manual observation and replenishment by users	Automatic litter replenishment without manual intervention	Fully automated closed-loop
Odor Locking Approach	Relies on activated carbon packs/deodorant consumables	Dual physical barriers, no consumables required	Zero consumables
Cleaning Convenience	Non-detachable, difficult overall maintenance	Quick-release structure, removal and washing without tools	Substantially enhanced

VIII. Risk and Opportunity Assessment

8.1 Main Risks

Risk Item	Level	Mitigation Strategy
Base structure of Core Patent A	Medium	Already circumvented through the zero-tumble vertical clearance solution; no infringement
Potential local similarities in specific component structures	Low	Core principles and functional implementations are independent; can be further differentiated through design details
Overseas patent risks	Medium	Advise conducting FTO searches for target markets prior to going overseas

8.2 Core Opportunities

Opportunity Direction	Value Assessment
Zero-Tumble Vertical Separation Mechanism	Industry pain point solution, high-value patent layout point
Automatic Litter Replenishment Closed-Loop System	Builds a complete automated experience, core differentiated competitiveness
Dual Physical Odor Locking Mechanism	Zero-consumables selling point, aligns with user health and environmental demands
Modular Quick-Release Design	Elevates user maintenance experience, boosts product word-of-mouth

IX. Conclusions and Recommendations

9.1 Comprehensive Conclusion

Through three core innovations—**"Zero-Tumble Vertical Clearance + Automatic Litter Replenishment Mechanism + Dual Physical Odor Locking"**—the final technical solution of this product systematically solves the core pain points of existing smart cat litter boxes. The technical solution has successfully circumvented the scope of protection of Core Patent A, showing independent innovation in mechanical structures, odor-locking mechanisms, and automated functions.

9.2 Patent Layout Recommendations

Priority	Technical Direction	Recommended Type	Time Node
P0	Zero-Tumble Vertical Separation Mechanism	Invention + Utility Model Portfolio	As soon as possible
P0	Automatic Litter Replenishment Closed-Loop System	Invention Patent	As soon as possible
P1	Dual Physical Odor Locking Mechanism	Invention + Utility Model Portfolio	As soon as possible
P1	Unidirectional Closing Device Structure	Utility Model	As soon as possible
P2	Quick-Release Modular Structure	Utility Model	Secondary

9.3 Next Action Steps

1. **Submit patent applications as soon as possible** to seize the priority rights for core innovations such as the zero-tumble separation mechanism and the automatic litter replenishment system.
2. **Conduct an in-depth FTO search** as product details are finalized to ensure there are no other potential infringement risks.
3. **Construct a patent portfolio protection net**, pairing each core function with a dual protection of Invention + Utility Model.

4. **Consider PCT international applications** to reserve patent pathways for going overseas.

**This report is a preliminary schematic version, compiled in combination with the final technical solution (CN 121369247 A). Specific patent strategic recommendations should be further refined in conjunction with legal opinions.*