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(12) **United States Patent**
Chen

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(54) **SLIDING PUZZLE TOY**

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(72) Inventor: **Weihong Chen**, Shantou (CN)

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Oct. 10, 2023 (CN) 202322716462.0

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A63F 9/08 (2006.01)

(52) **U.S. Cl.**
CPC ***A63F 9/0857*** (2013.01)

(58) **Field of Classification Search**
CPC A63F 9/083; A63F 9/0857; A63F 9/0865; A63F 2009/0892
See application file for complete search history.

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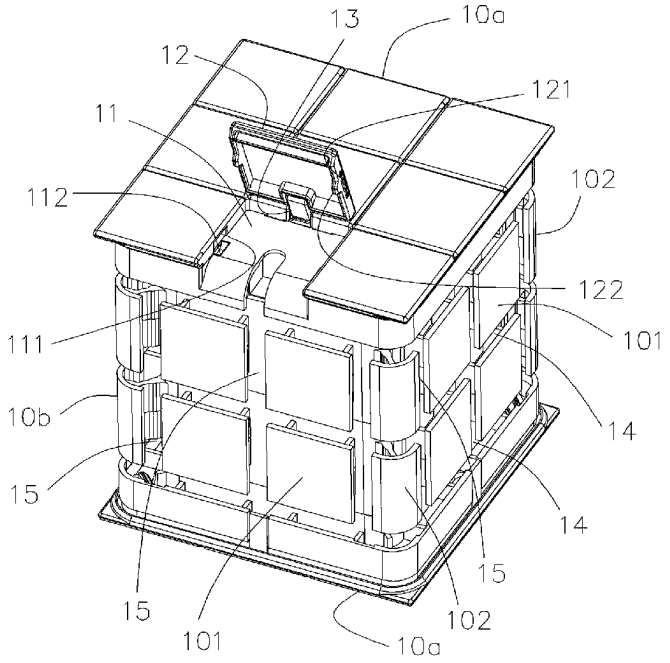
Primary Examiner — Steven B Wong

(57) **ABSTRACT**

A sliding puzzle toy is provided, including a main body and sliders slidably connected to the main body. The main body includes two bottom walls and a side wall, wherein at least one of the two bottom walls is provided with a recessed slot and a separable block, one side of the recessed slot is connected to the side wall, an arc transition is provided at a connection between the recessed slot and the side wall, and the separable block is movably or detachably connected to the recessed slot. The outer surface of the side wall is provided with sliding grooves that intersects with each other along circumferential and longitudinal directions, the sliding grooves are movably connected to the sliders, and one of the longitudinal sliding grooves passes through a connection between the recessed slot and the side wall and extends towards a bottom wall of the recessed slot.

3 Claims, 19 Drawing Sheets



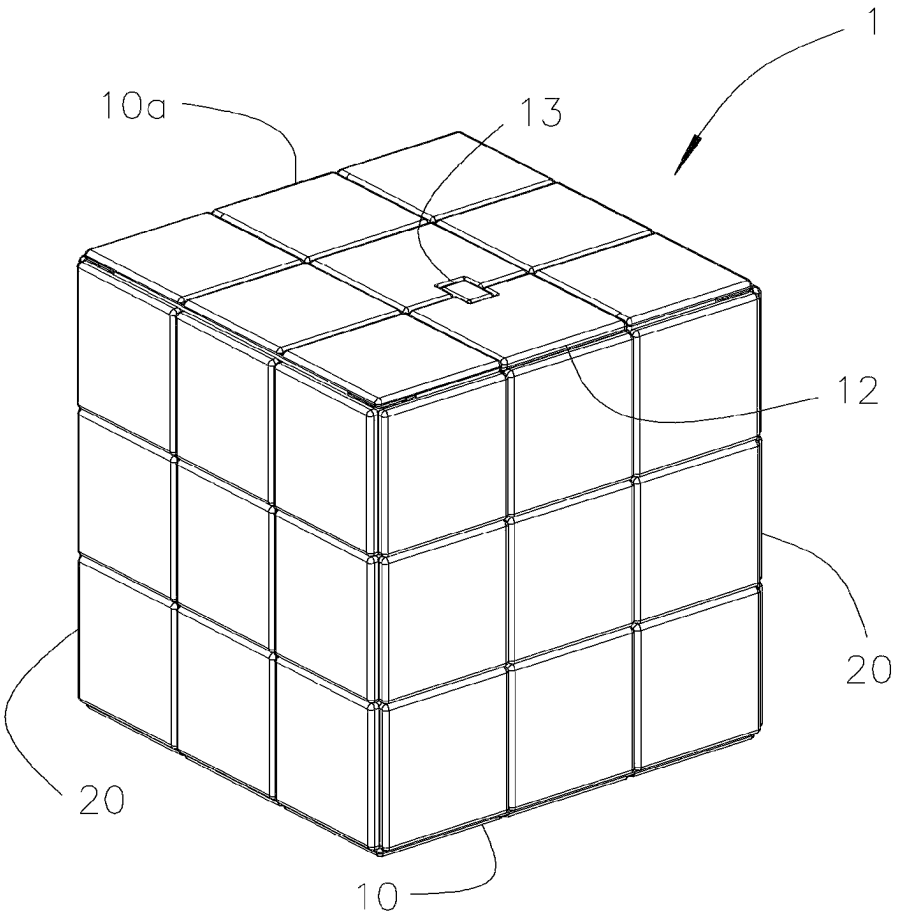


FIG. 1

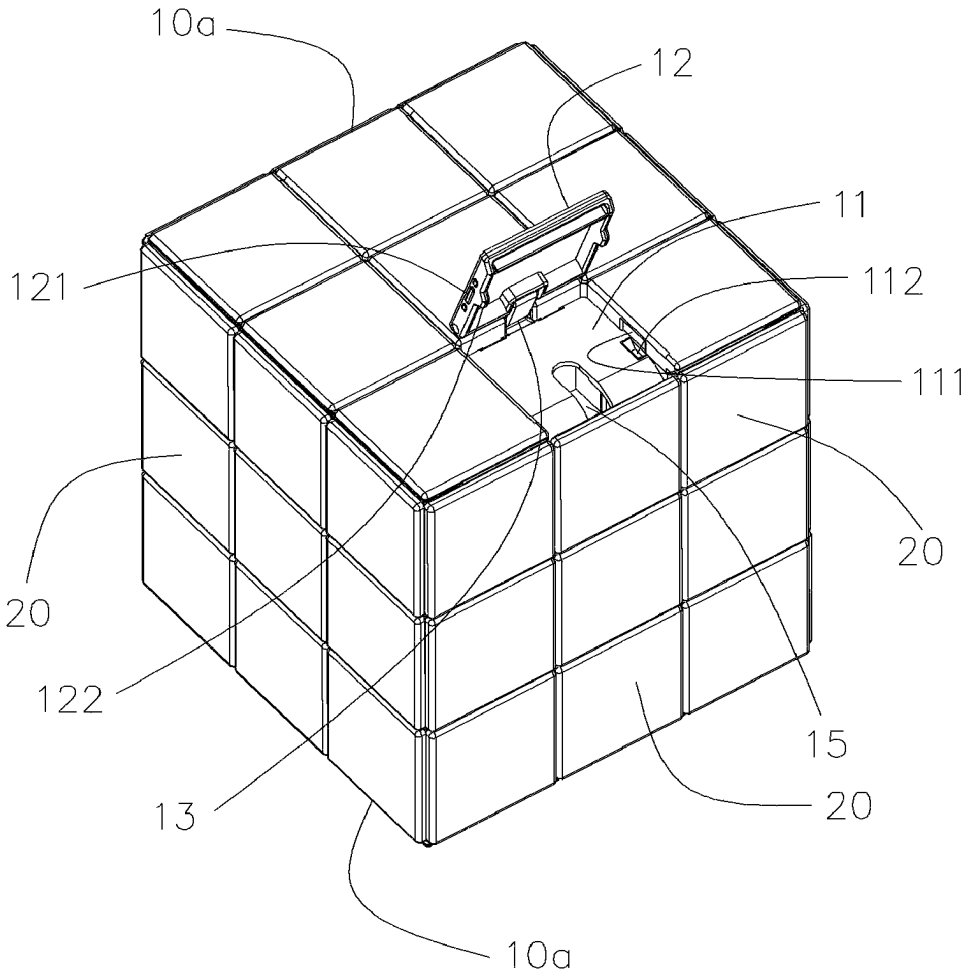


FIG. 2

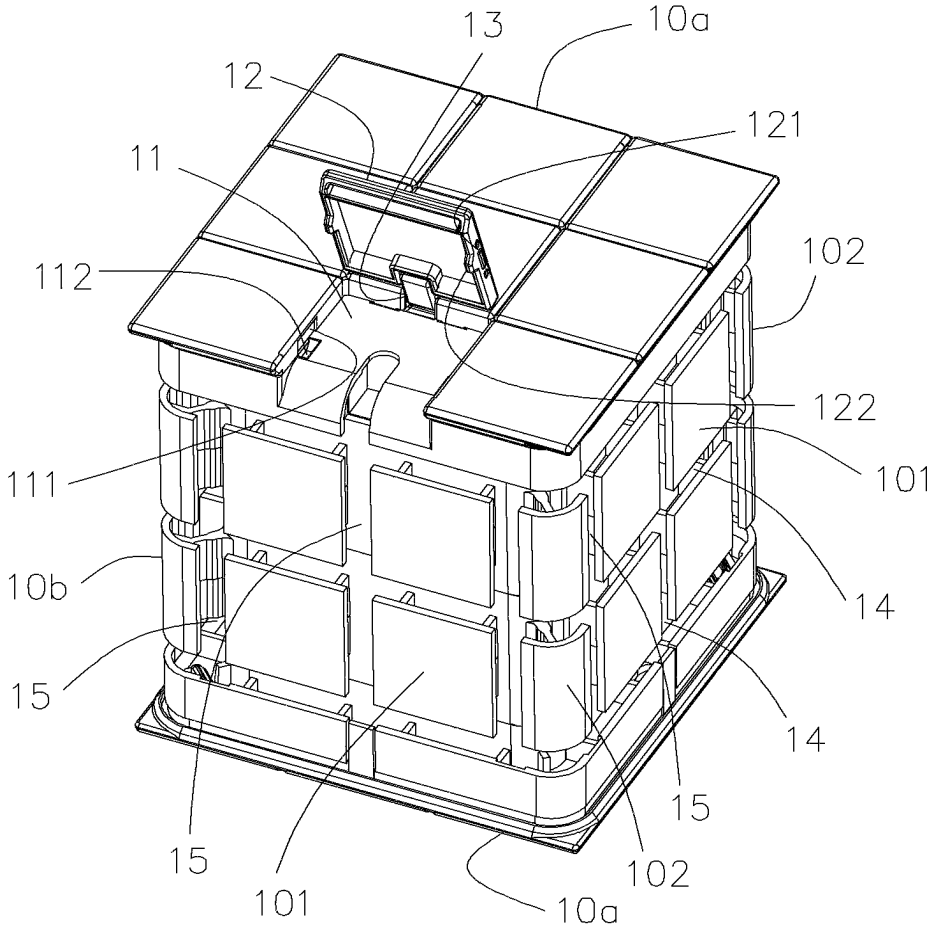


FIG. 3

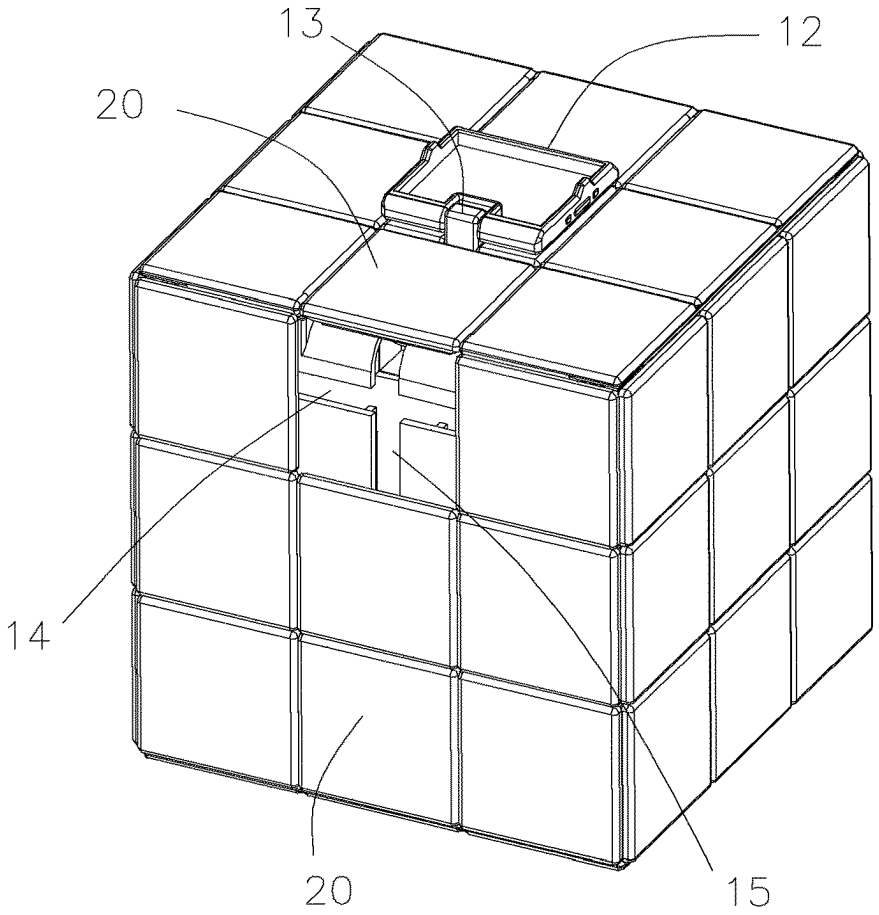


FIG. 4

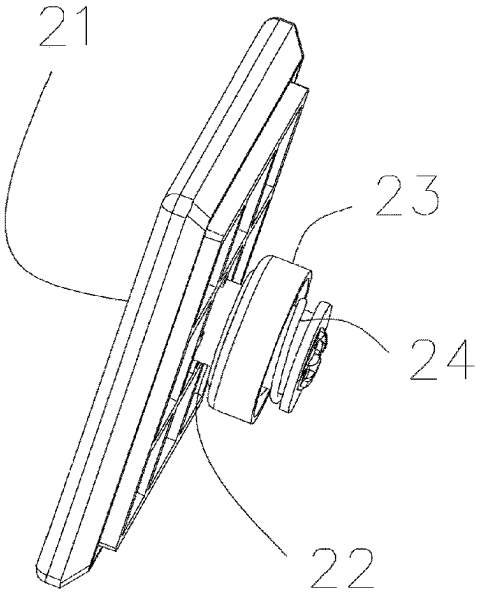


FIG. 5

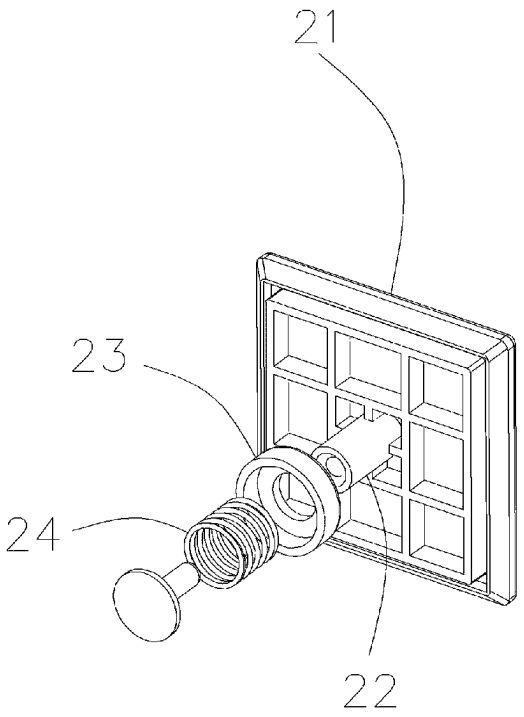


FIG. 6

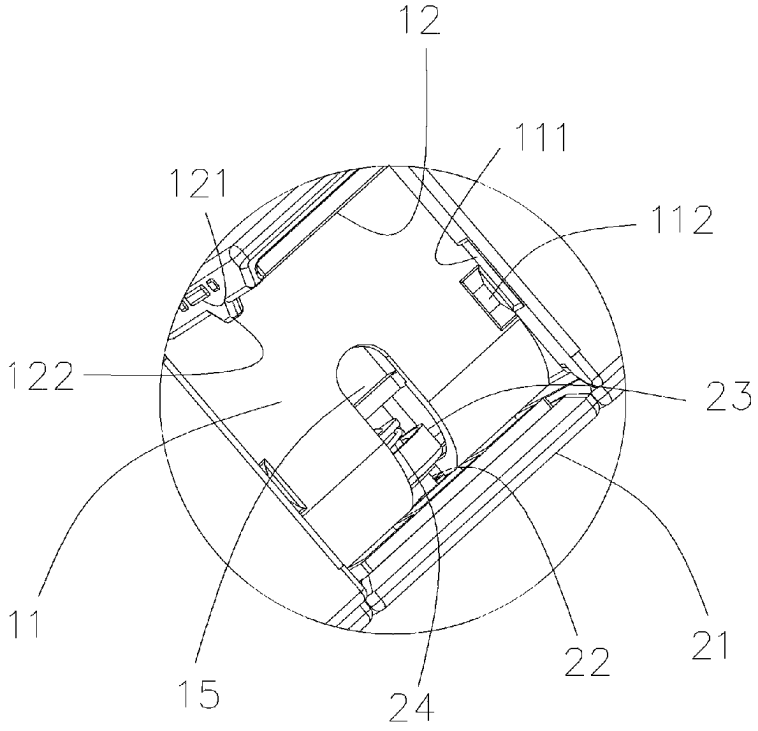


FIG. 7

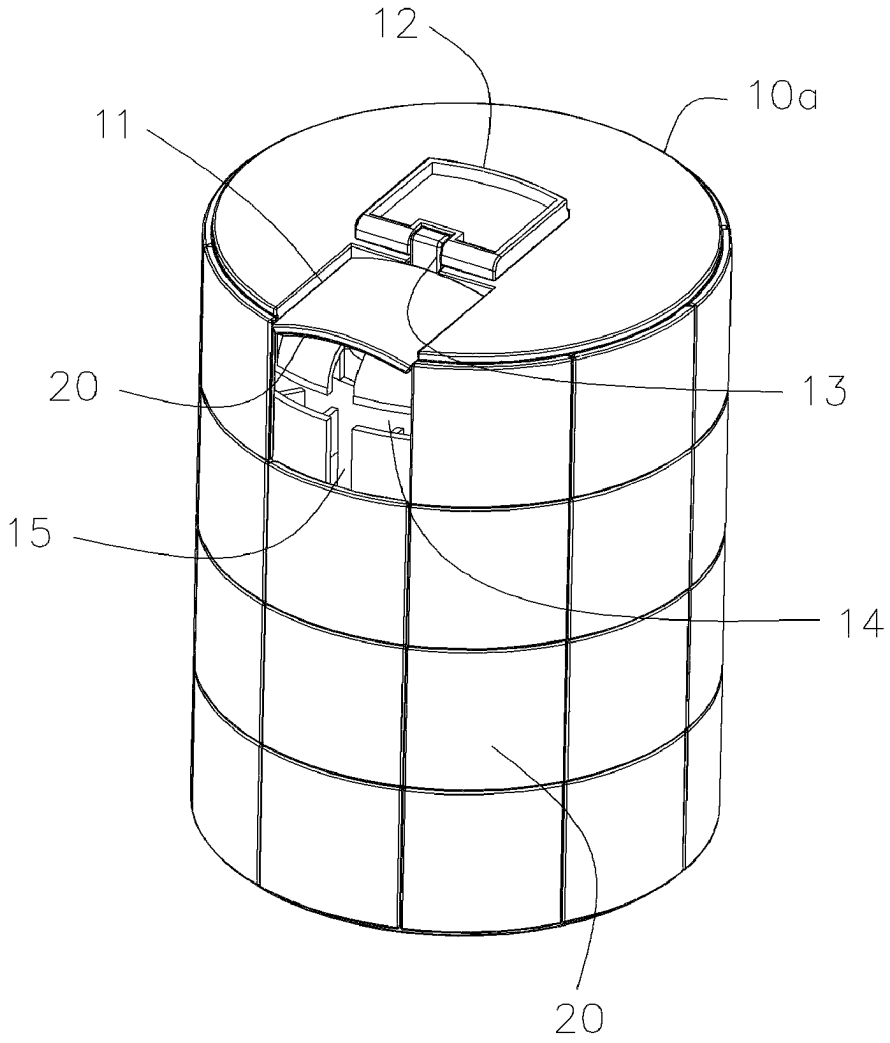


FIG. 8

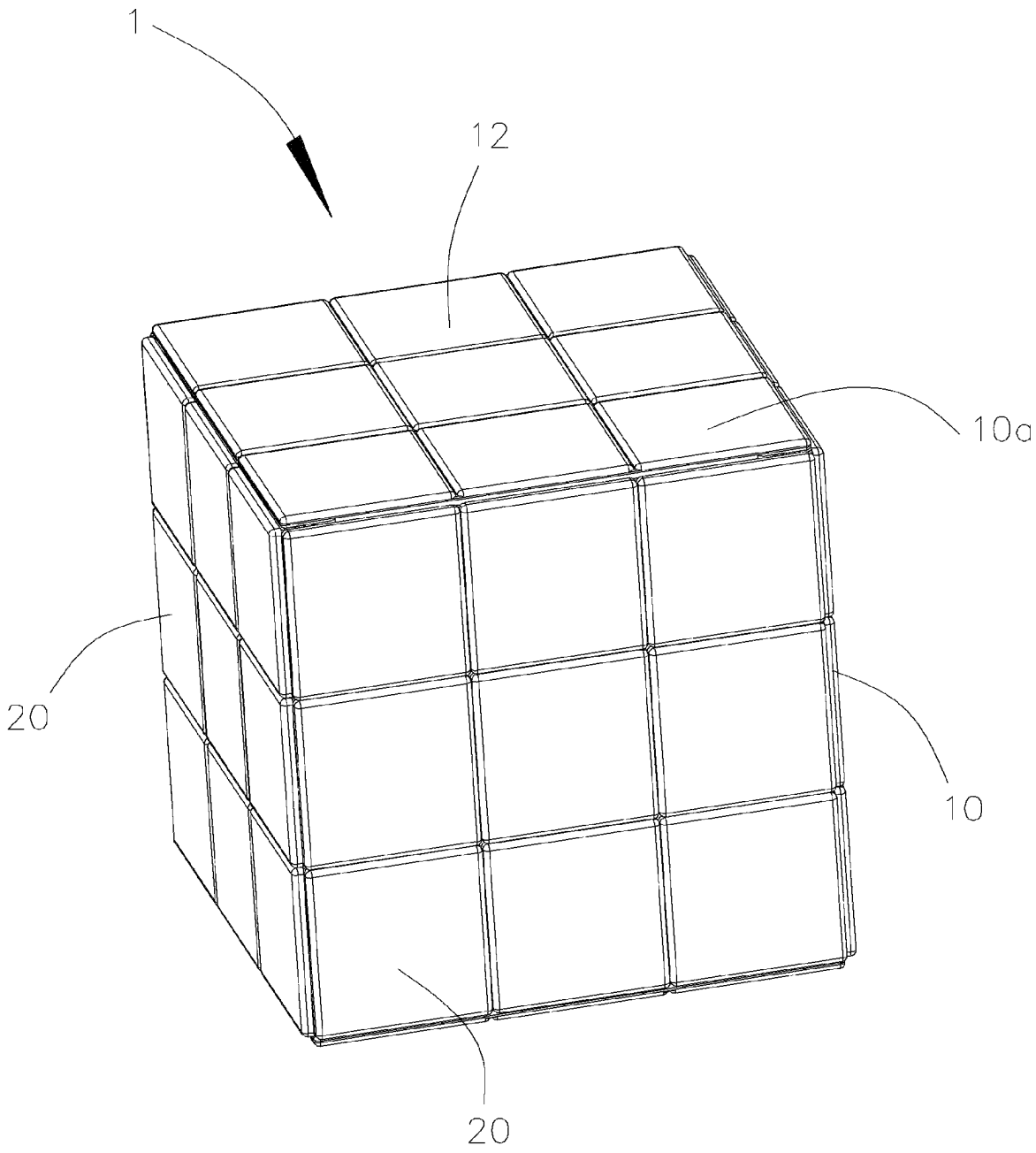


FIG. 9

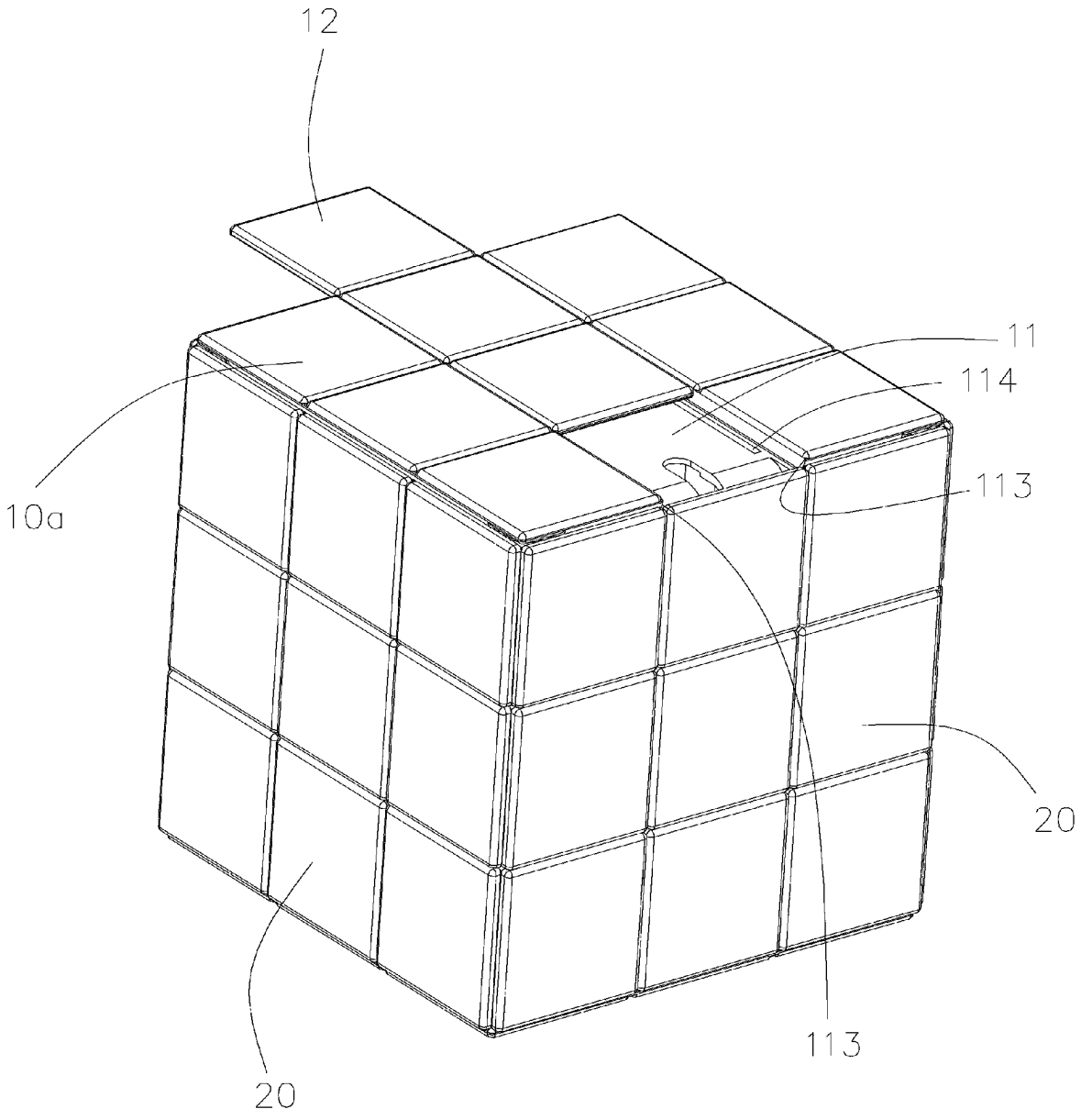


FIG. 10

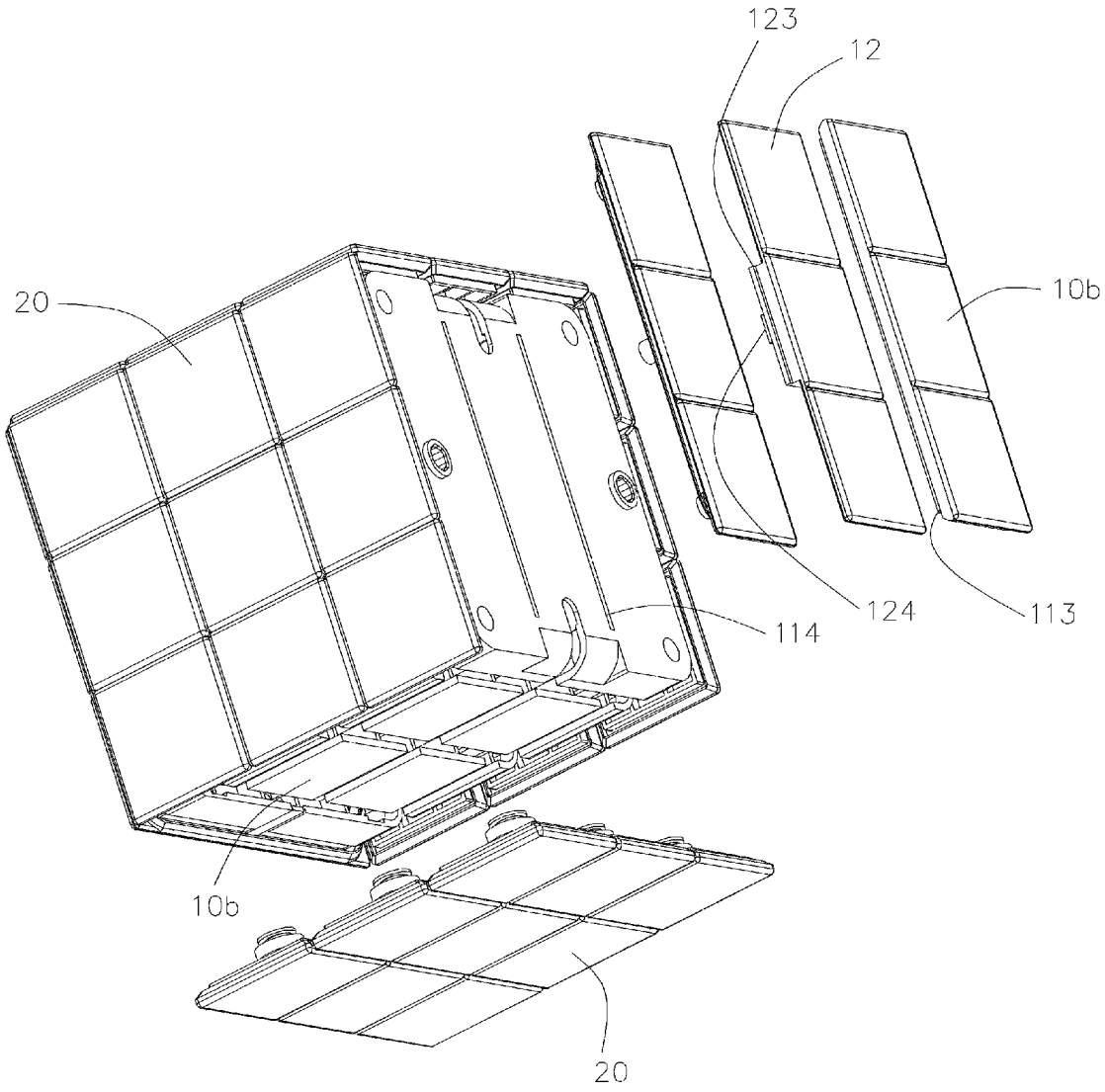


FIG. 11

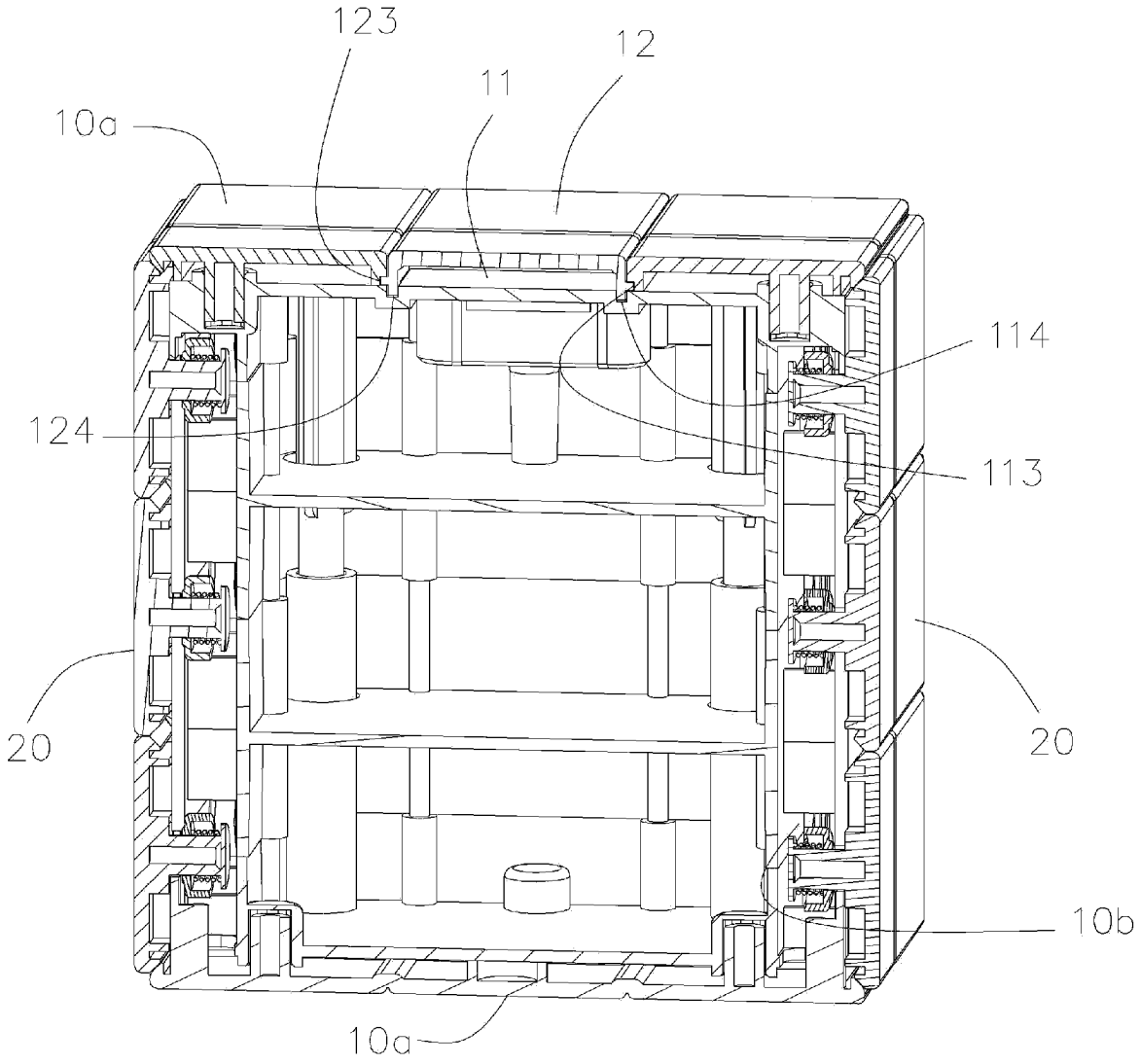


FIG. 12

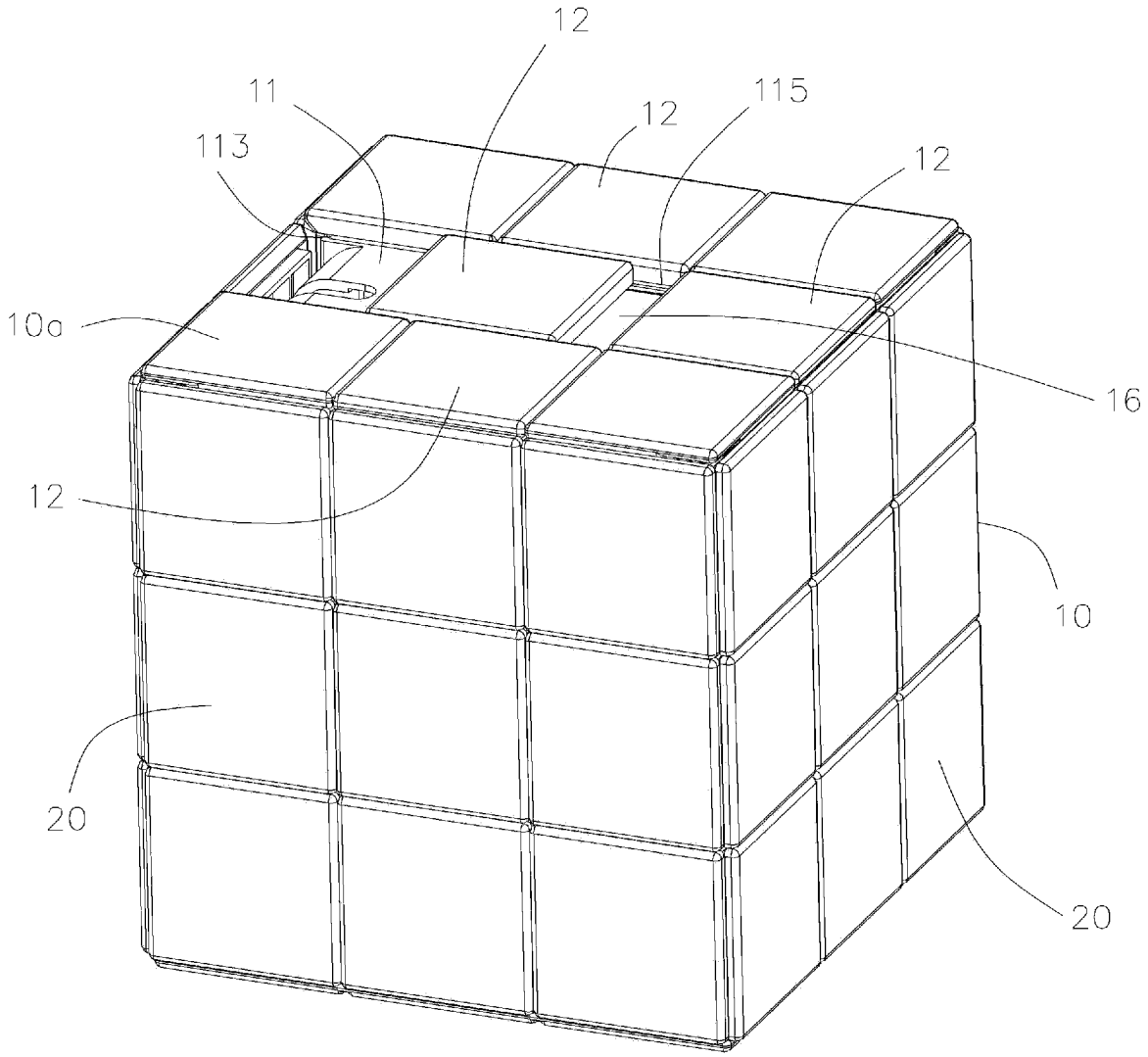


FIG. 13

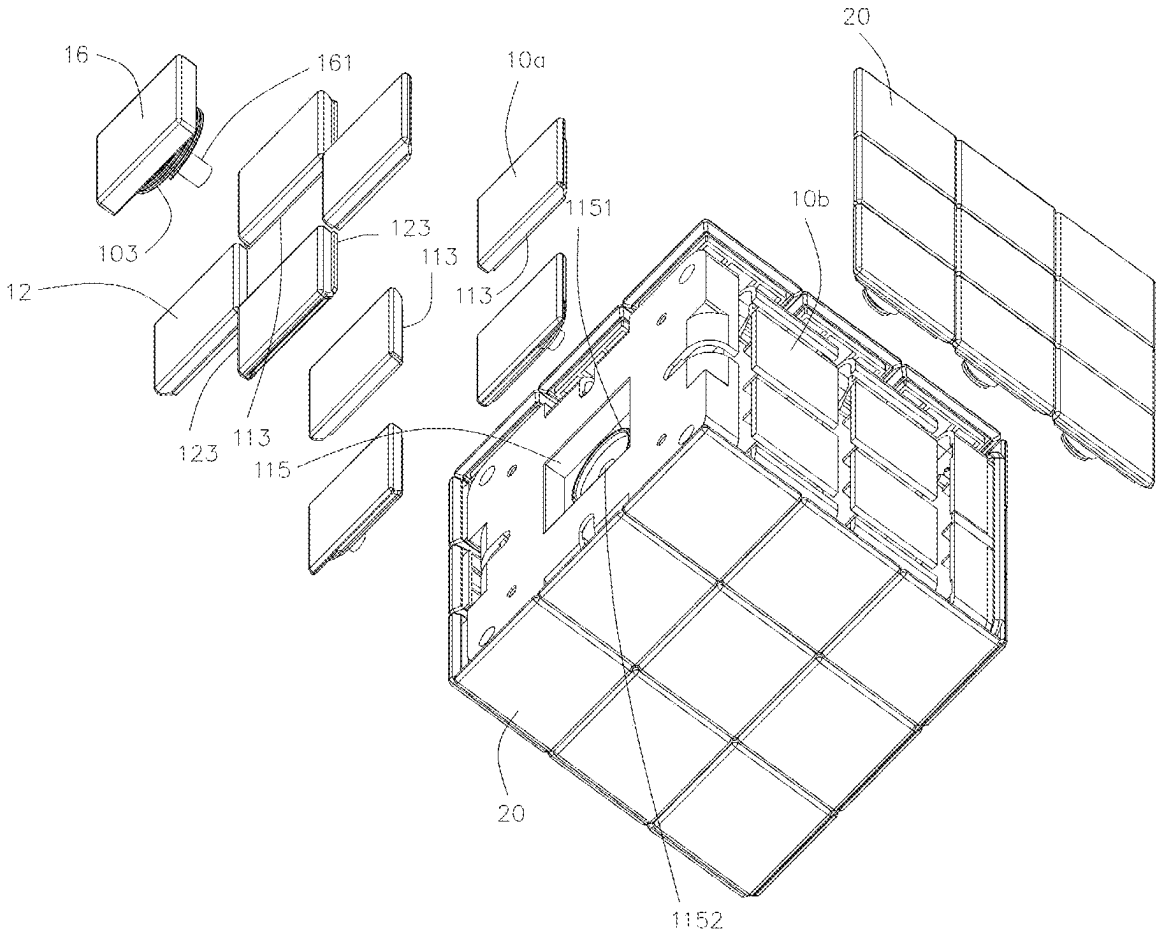


FIG. 14

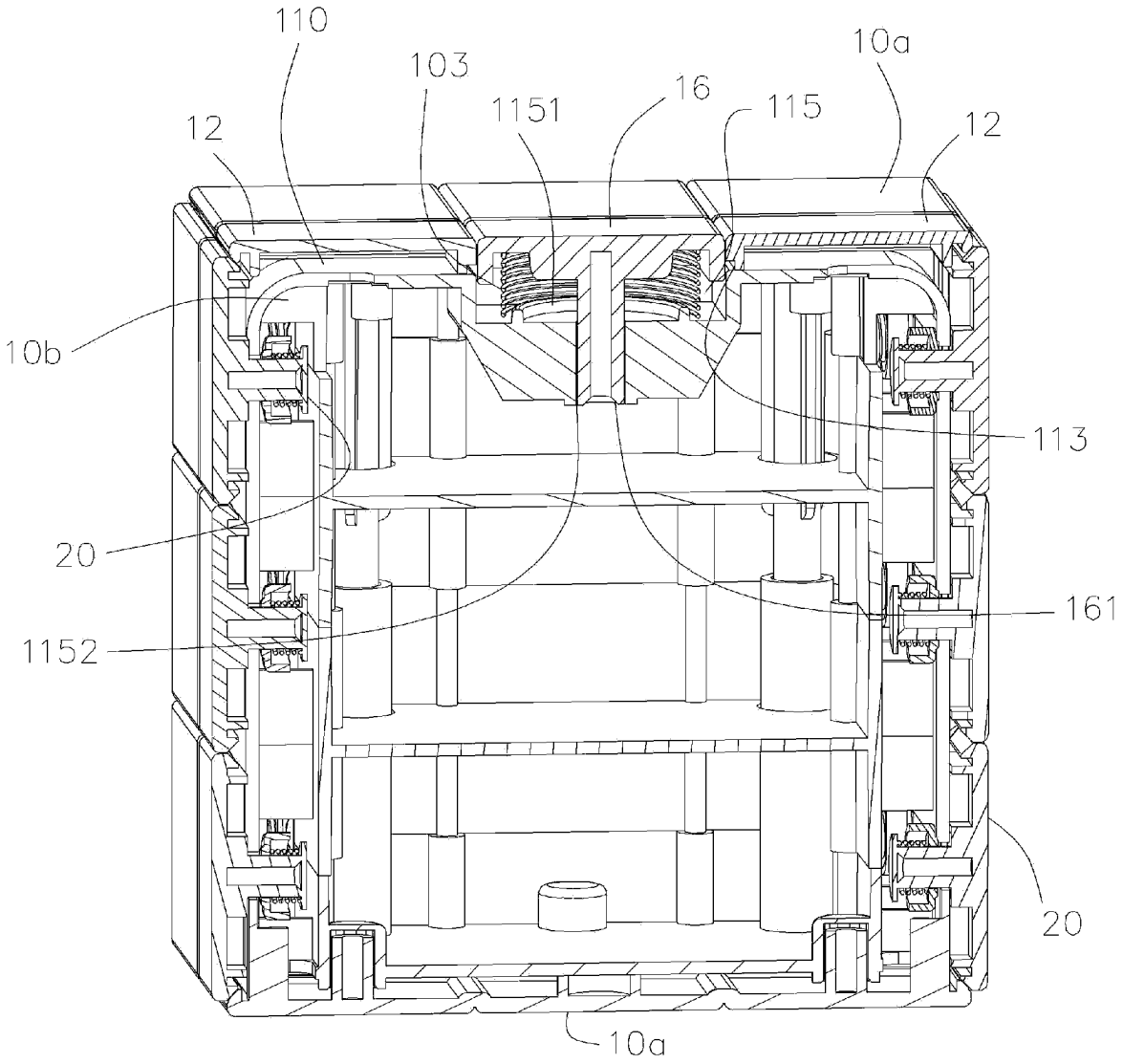


FIG. 15

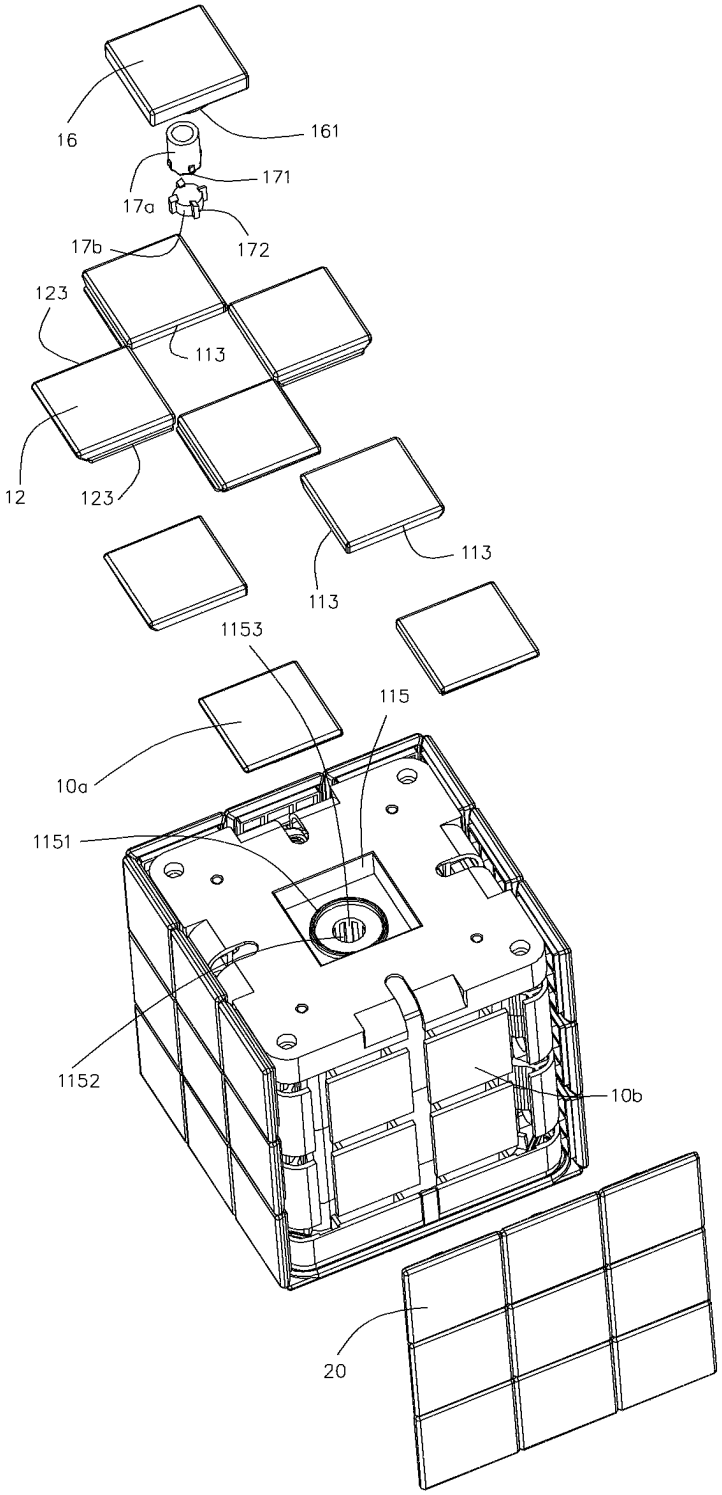

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FIG. 16

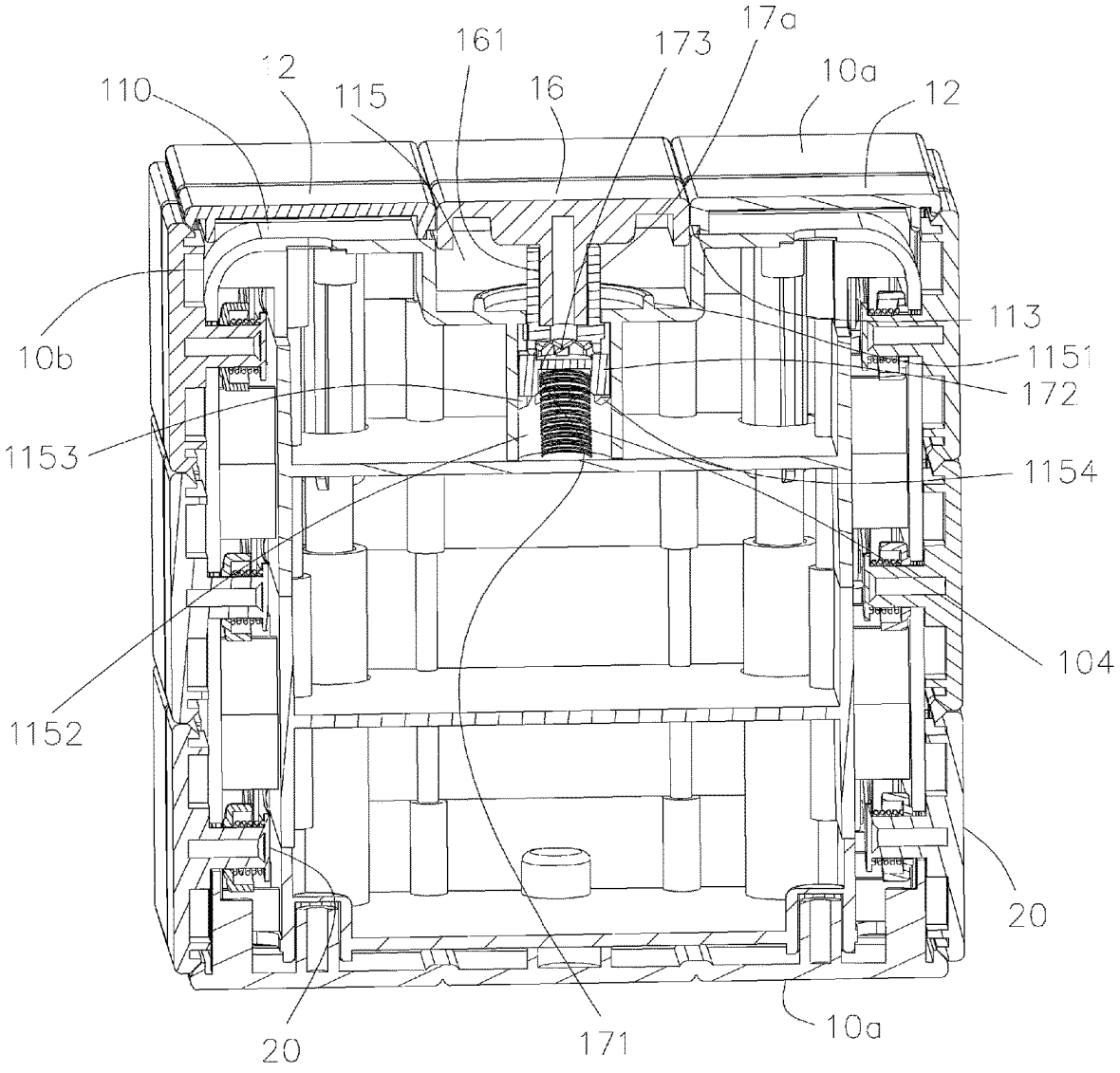
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FIG. 17

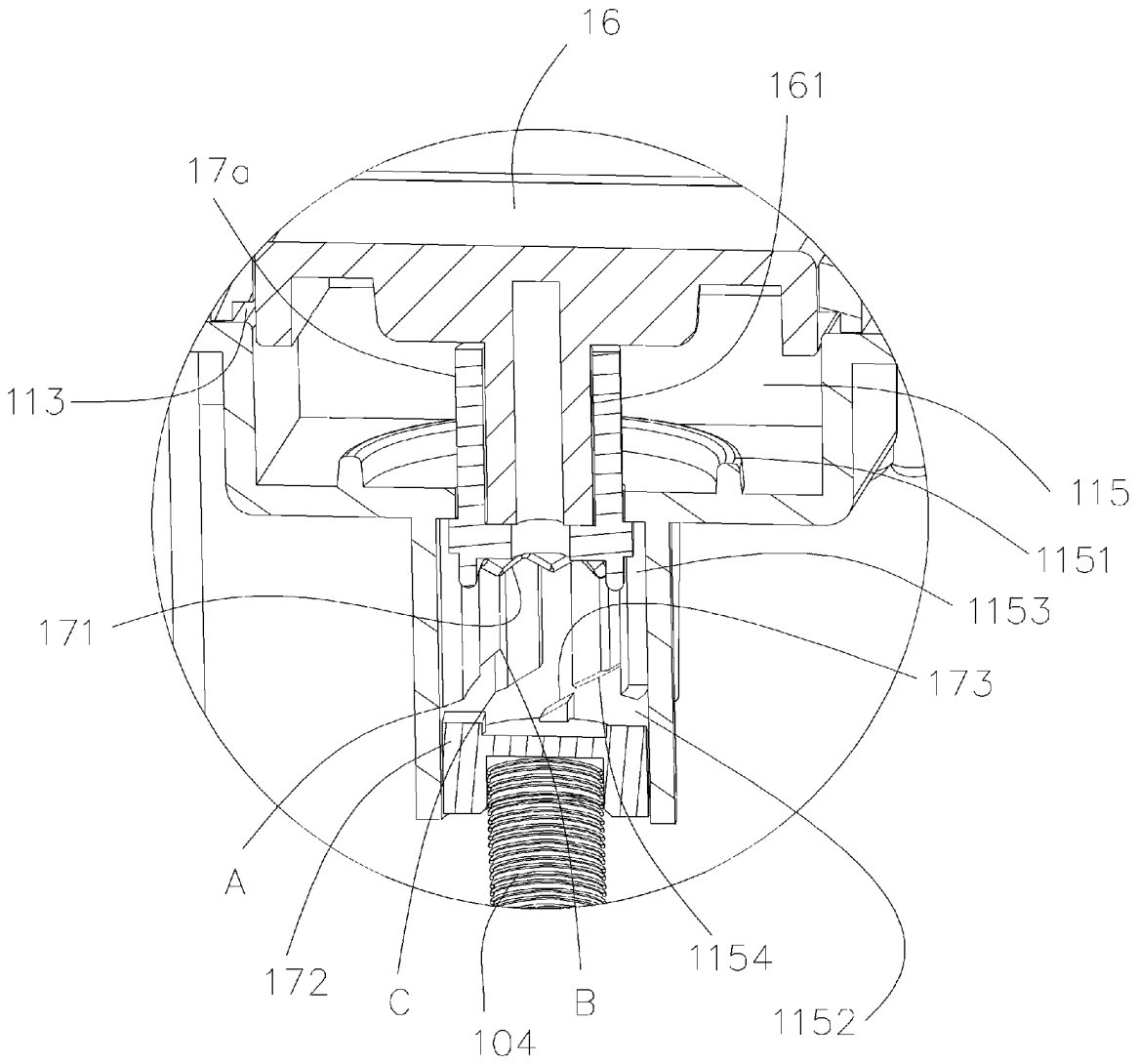

FIG. 18

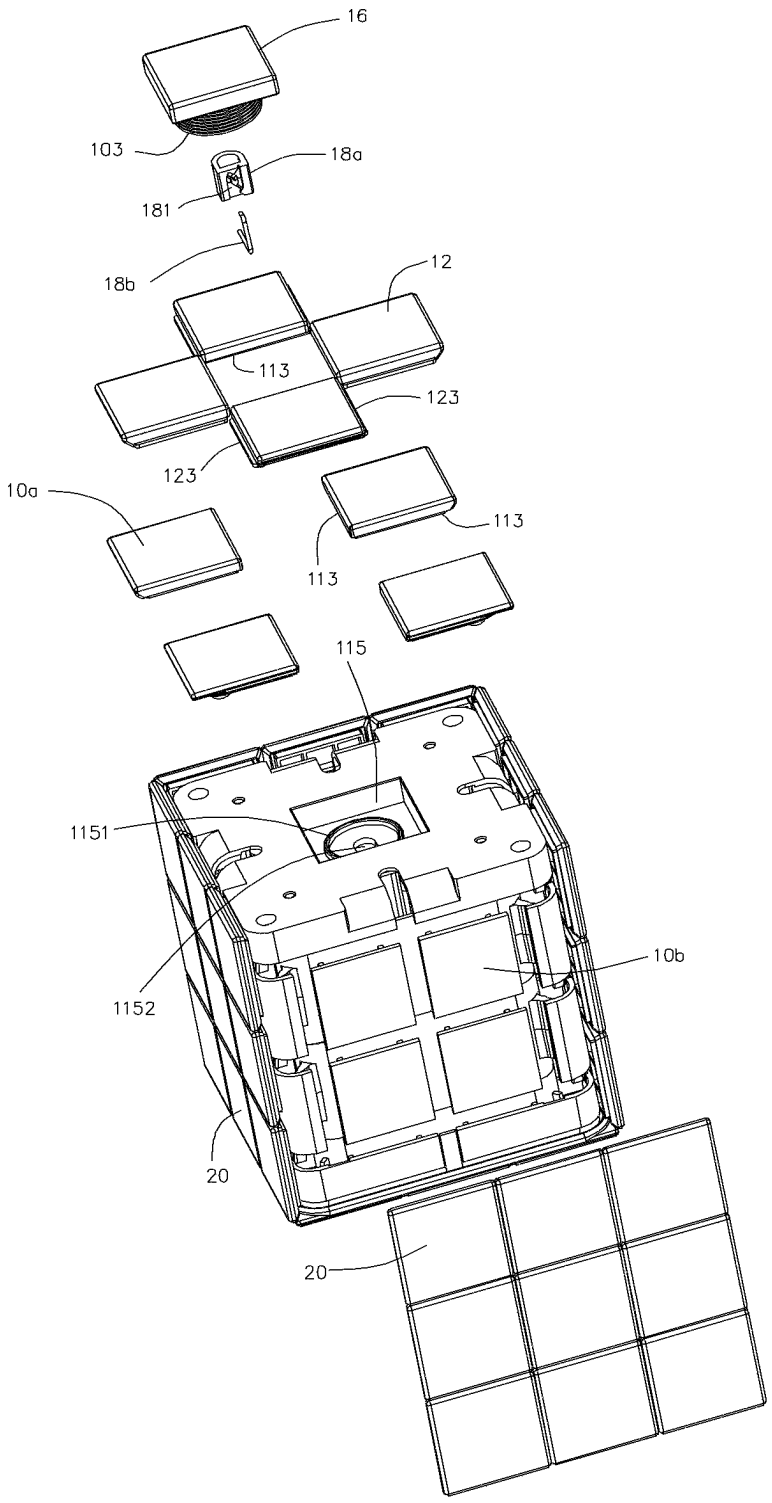
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FIG. 19

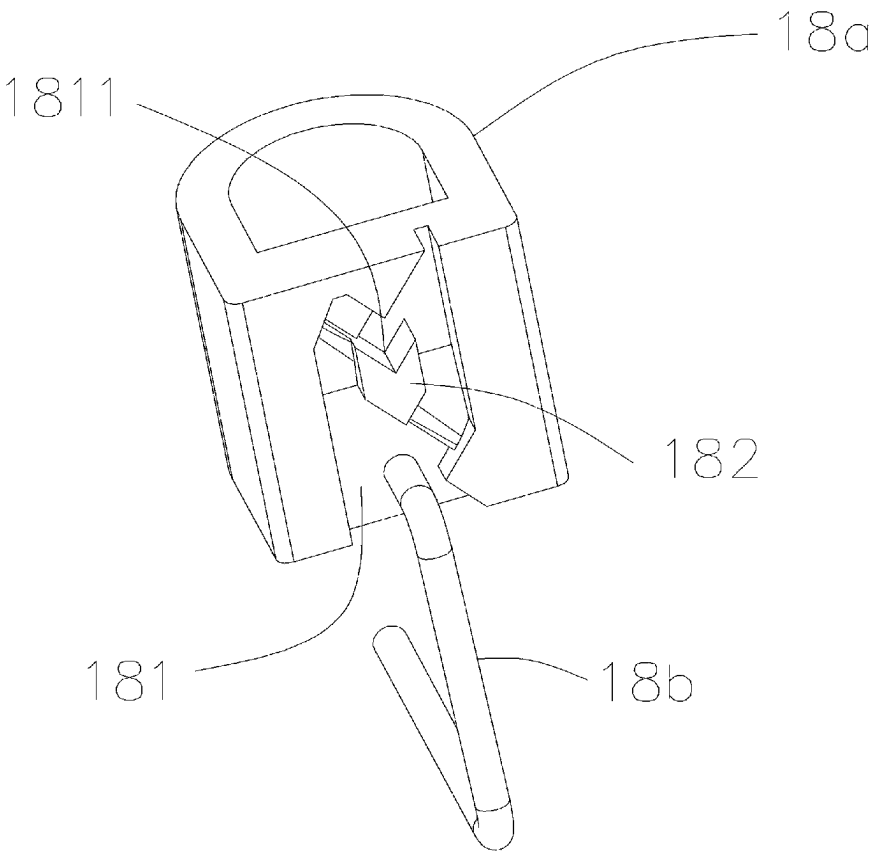

FIG. 20

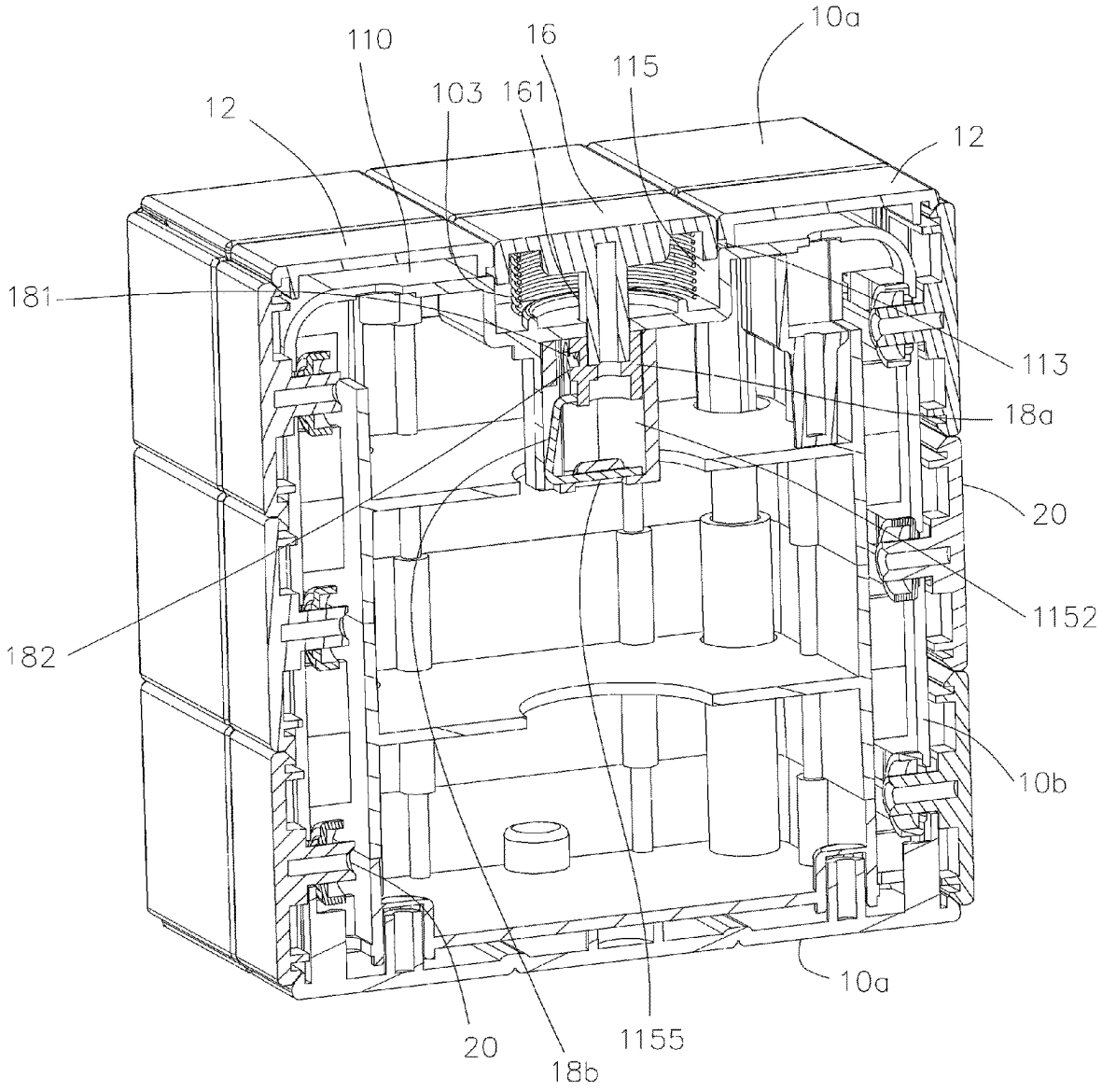
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FIG. 21

SLIDING PUZZLE TOY

CROSS-REFERENCE

This application claims to the benefit of priority from Chinese Application No. 202320056772.1 with a filing date of Jan. 9, 2023, and further claims to the benefit of priority from Chinese Application No. 2023227164620 with a filing date of Oct. 10, 2023. The content of the aforementioned applications, including any intervening amendments thereto, are incorporated herein by reference.

TECHNICAL FIELD

The present disclosure relates to the technical field of toys, particularly to a sliding puzzle toy.

BACKGROUND

At present, sliding puzzle toys include two types: flat puzzle toys and sliding puzzle toys. In related arts, sliding puzzle toys generally include a main body and a plurality of sliders. The plurality of sliders slide on the surface of the main body to create corresponding patterns. Because the slider gap on the surface of the main body is only one grid, in order to achieve the goal of creating a complete pattern, the slider must be cleverly moved. Therefore, this type of toy is both interesting and can exercise intelligence of user, especially for inspiring children's intelligence. However, due to the presence of a slider gap, not only dust and other impurities can easily enter the main body, but also affect the overall aesthetics of the sliding puzzle toy. In related art, separable puzzle unit blocks are provided on the main body to open or close the slider gap, such as a puzzle toy disclosed in patent document CN203469438U. However, in the structure of the puzzle toy disclosed in the above patent document, the separable puzzle unit blocks are connected to the cylinder (i.e. the main body) through an open structure, which is complex and not conducive to simplifying assembly materials, reducing manufacturing costs, and also not conducive to improving the assembly efficiency of the puzzle toy.

SUMMARY

The present disclosure aims to solve at least one of the technical problems existing in the existing technology. Therefore, this present disclosure provides a sliding puzzle toy, aiming to solve the problem of complex connection structure between separable puzzle unit blocks and the main body in existing puzzle toys, which is not conducive to reducing costs and improving work efficiency.

To achieve the above objective, a sliding puzzle toy is provided by the present disclosure, including a main body and a plurality of sliders slidably connected to the main body, wherein the main body includes two end walls and a side wall connected between the two end walls, at least one of the two end walls is provided with a recessed slot and a separable block, one side of the recessed slot is connected to the side wall, an arc transition is provided at a connection between the recessed slot and the side wall, and the separable block is movably or detachably connected to the recessed slot; an outer surface of the side wall is provided with a plurality of sliding grooves that intersects with each other along circumferential and longitudinal directions, the sliding grooves are movably connected to the sliders, and one of the longitudinal sliding grooves passes through a connection between the recessed slot and the side wall and extends towards a bottom wall of the recessed slot.

As the preferred solution, the separable block matches with the recessed slot, one side of the separable block is detachably connected to an open side of the recessed slot, and an other side of the separable block is pivoted to a side wall of the recessed slot.

As the preferred solution, two side walls opposite each other in the recessed slot are respectively provided with a connection slot, two side walls opposite each other of the separable block are respectively provided with snap bulges, and the snap bulges are arranged corresponding to the connection slot and is detachably connected in the connection slot.

As the preferred solution, a bottom wall of the recessed slot is provided with a positioning slot adjacent to the connection slot, the two side walls opposite each other of the separable block protrude towards a position of the positioning slot to form snap blocks, and the snap blocks match with the positioning slot and detachably connected to the positioning slot.

As the preferred solution, the separable block is connected to the end wall through a connection strip, the connection strip is accommodated and connected between the separable block and the end wall, and the two ends of the connection strip are respectively pivoted to the separable block and the end wall.

As the preferred solution, the separable block is slidably connected within the recessed slot, and a length of the separable block is equal to or less than a length of the recessed slot;

- when the length of the separable block is equal to the length of the recessed slot, an other side of the recessed slot is connected to an outside;
- when the length of the separable block is less than the length of the recessed slot, some part of the recessed slot is recessed to form a receiving cavity, a moving block is movably connected within the receiving cavity, and the moving block has a first state adjacent to the separable block and a second state overlapping with the separable block.

As the preferred solution, the side wall of the recessed slot is provided with a guide slot along a direction of movement of the separable block, the separable block is provided with a first sliding plate on the side wall opposite to the guide slot, and the first sliding plate and the guide slot are in a concave-convex sliding fit.

As the preferred solution, the side wall of the recessed slot is provided with a limit slot along a direction of movement of the separable block, the separable block is provided with a second sliding plate on the side wall opposite to the limit slot, and the second sliding plate and the limit slot are in a concave-convex sliding fit.

As the preferred solution, the recessed slots include at least two sub slots that intersect with each other, an intersection position of any two sub slots is recessed to form the receiving cavity, and each sub slot is provided with at least one separable block in a sliding manner.

As the preferred solution, any separable block is provided with the guide slot on the side wall adjacent to the moving block.

As the preferred solution, a bottom wall of the receiving cavity is further provided with a moving cavity, and the moving block is provided with a connection post on the side wall corresponding to the moving cavity, and the connection post is movably connected within the moving cavity.

As the preferred solution, the bottom wall of the receiving cavity is connected to the moving block and/or a bottom wall of the moving cavity is connected to the connection post through at least one elastic member.

As the preferred solution, a side wall of the moving cavity are circumferentially provided with a plurality of guiding ribs at intervals, and each end of the guiding ribs is provided with a first inclined surface, the first inclined surface is arranged in an inclined Z-shaped shape, and the connection post is movably connected to the moving cavity through a pushing block and a limit block;

the pushing block is fixed to the connection post and is slidably connected between the plurality of guiding ribs, and an end of the pushing block in the moving cavity is provided with serrated claws in a circumferential direction; and the limit block is connected to a bottom wall of the moving cavity through an elastic member, and an outer wall of the limit block is provided with a plurality of positioning ribs; each positioning rib is slidably connected between any two guiding ribs, each positioning rib is provided with a second inclined surface at an end opposite to the serrated claws, the second inclined surface contacts with the serrated claws, and an inclination direction and an inclination angle of each second inclined surface are the same as those of the first inclined surface.

As the preferred solution, the bottom wall of the moving cavity is provided with a mounting hole, and the connection post is movably connected to the moving cavity through a restriction block and a restriction rod;

the restriction block is fixed to the connection post and is slidably connected in the moving cavity, one side of the restriction block is provided with a channel, the channel is provided with a recessed point recessed downwards; and

one end of the restriction rod is fixed in the mounting hole, and an other end of the restriction rod is movably connected in the channel and connected or separated from the recessed point.

As the preferred solution, the side wall is a closed curved surface, or the side wall includes at least three closed connected planes, and each two adjacent planes are connected by an arc-shaped transition surface.

As the preferred solution, each slider includes a plate and a base pillar arranged along a vertical direction, the plate is exposed to the side wall, the base pillar is movably connected in the sliding groove, a positioning piece is slidably sleeved on the base pillar, the positioning piece is movably connected to the sliding groove and contacts with an inner wall of the sliding groove, and an elastic member is connected between the positioning piece and an end of the base pillar.

Therefore, based on the technical means of the present disclosure, a brief explanation of the advantages that the present disclosure can achieve is as follows: In the sliding puzzle toy provided by the present disclosure, by setting the recessed slot on the bottom wall, the recessed slot and the side wall are connected to serve as a slider gap; and at the same time, by setting the separable block on the bottom wall that is movably or detachably connected with the recessed slot, such that the separable block can be flipped or moved within the recessed slot, or can be separated and disassembled from the recessed slot. When in use, through flipping, moving or disassembling the separable block to open or close the slider gap. Compared with existing structures, by setting the recessed slots and separable blocks which movably or detachably connected with each other on the bottom wall, it can effectively simplify the connection structure between the separable block and the main body, which is beneficial for reducing costs and improving assembly efficiency. Moreover, by setting the recessed slots and separable blocks which movably or detachably connected with each other on the bottom wall, it can make the opening or closing of the separable block simpler and faster, making it easier for game operations. It can also separate the separable block from the slider, compared with the existing structure, the pattern formed by the splicing of several sliders on the side wall is not limited by the separable block (pattern), and the relative position of the splicing pattern on the side wall can be changed at any time, making the sliding puzzle toy more playable and lasting appeal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic diagram of a sliding puzzle toy in the first embodiment of this present disclosure.

FIG. **2** is a schematic diagram of the separable block in opened state of the sliding puzzle toy in FIG. **1**.

FIG. **3** is a schematic diagram of the main body in FIG. **2**.

FIG. **4** is a schematic diagram when the sliding puzzle toy in FIG. **2** is used.

FIG. **5** is a schematic diagram of the slider in FIG. **1**.

FIG. **6** is an exploded view of the slider in FIG. **5**.

FIG. **7** is a schematic diagram of the slider in FIG. **2** connected to the main body.

FIG. **8** is a schematic diagram when a sliding puzzle toy in the second embodiment of this present disclosure is used.

FIG. **9** is a schematic diagram of a sliding puzzle toy in the third embodiment of this present disclosure.

FIG. **10** is a schematic diagram of the separable block in opened state of the sliding puzzle toy in FIG. **9**.

FIG. **11** is a partial exploded view of the sliding puzzle toy in FIG. **9**.

FIG. **12** is a cross-sectional schematic diagram of the sliding puzzle toy in FIG. **9**.

FIG. **13** is a schematic diagram of the separable block in opened state of the sliding puzzle toy in the fourth embodiment of the present disclosure.

FIG. **14** is a partial exploded view of the sliding puzzle toy in FIG. **13**.

FIG. **15** is a cross-sectional schematic diagram of the sliding puzzle toy in FIG. **13**.

FIG. **16** is a partial exploded view of a sliding puzzle toy in the fifth embodiment of the present disclosure.

FIG. **17** is a cross-sectional schematic diagram of the sliding puzzle toy in FIG. **16**.

FIG. **18** is a partially cross-sectional schematic diagram of the moving block in FIG. **16**, which is movably connected in the receiving cavity by a pushing block and a limit block.

FIG. **19** is a partial exploded view of a sliding puzzle toy according to the sixth embodiment of the present disclosure.

FIG. **20** is a schematic diagram of the connection between the restriction block and the restriction rod in FIG. **19**.

FIG. **21** is a cross-sectional schematic diagram of the sliding puzzle toy in FIG. **19**.

In the picture: **1**—sliding puzzle toy; **10**—main body; **10***a*—end wall; **11**—recessed slot; **111**—connection slot; **112**—positioning slot; **110**—sub slot; **113**—guide slot; **114**—limit slot; **115**—receiving cavity; **1151**—retaining ring; **1152**—moving cavity; **1153**—guiding rib; **1154**—first inclined surface; **1155**—mounting hole; **12**—separable block; **121**—snap bulge; **122**—snap block; **123**—first sliding plate; **124**—second sliding plate; **13**—connection strip;

10*b*—side wall; **14**—circumferential sliding groove; **15**—longitudinal sliding groove; **101**—plane; **102**—arc-shaped transition surface; **16**—moving block; **161**—connection post; **17***a*—pushing block; **171**—serrated claw; **17***b*—limit block; **172**—positioning rib; **173**—second inclined surface; **18***a*—restriction block; **181**—channel; **1811**—recessed point; **182**—raised rib; **18***b*—restriction rod; **103**—first spring; **104**—second spring; **20**—slider; **21**—plate; **22**—base pillar; **23**—positioning piece; **24**—elastic member.

DETAILED DESCRIPTION OF THE EMBODIMENTS

The following will provide a clear and complete description of the technical solution in the embodiments of this present disclosure in conjunction with the attached drawings. Obviously, the described embodiments are only a part of the embodiments of this present disclosure, not all of them. Based on the embodiments in this present disclosure, all other embodiments obtained by ordinary skilled person in the art without creative labor fall within the scope of this present disclosure. It can be understood that the attached drawings are only for reference and illustration purposes and are not intended to limit the present disclosure. The connections shown in the attached drawings are only for the purpose of clear description and do not limit the connection method.

It should be understood that the terms "up", "down", "front", "back", "left", "right", "top", "bottom", "inside", "outside", etc. are based on the attached drawings to describe the direction or position relationship shown in the present disclosure. They are only for the convenience of describing the present disclosure and simplifying the description, rather than indicating that the device or component referred to must have a special direction or position relationship, thus, it cannot be understood as a limitation on the present present disclosure. Further, it should be noted that when a component is considered to be "connected" to another component, it may be directly or indirectly connected to another component. Unless otherwise defined, all technical and scientific terms used in this article have the same meanings as those commonly understood by the skilled person in the art of this present disclosure. The terms used in the specification of this present disclosure are only for the purpose of describing specific embodiments and are not intended to limit this present disclosure.

Please refer to FIG. **1** to FIG. **7**, the first embodiment provides a sliding puzzle toy **1**, which includes a main body **10** and a plurality of sliders **20** that can be slidably connected to the main body **10**. In this embodiment, the main body **10** is roughly arranged in a square shape, including two end walls **10***a* and a side wall **10***b* connected between the two end walls **10***a*. It can be understood that since the main body **10** is roughly arranged in a square shape, the two end walls **10***a* are correspondingly arranged as squares, and the side walls **10***b* include four closed connected planes **101**, wherein each two adjacent planes **101** are connected with an arc-shaped transition surface **102** to enable the sliders **20** to move more smoothly on the side walls **10***b*. It should be noted that the side length of end wall **10***a* is equal to the sum of the side length of side wall **10***b* and the thickness of two sliders **20**. so as to make the outer surface of the sliding puzzle toy **1** smooth and tidy when the slider **20** is connected to the main body **10**, making it easy to play.

In other embodiments of present disclosure, the main body **10** can also be arranged in other cylindrical structures, such as a cylinder (a sliding puzzle toy provided by the second embodiment as shown in FIG. **8**), a triangular prism, or other multi prism structures. When the main body **10** is arranged in a cylinder, the end wall **10***a* is circular, and the side wall **10***b* is a closed curved surface; When the main body **10** is arranged in a triangular prism or other multi prism structure, the end wall **10***a* is a triangle or other polygon, and the side wall **10***b* includes three or a corresponding number of planes **101**. Similarly, there is an arc-shaped transition surface **102** connected between every two adjacent planes **101**. When the main body **10** is arranged in other columnar structures, the length or diameter of the end wall **10***a* and the side wall **10***b* should be adjusted adaptively based on the principle of making the outer surface of the sliding puzzle toy **1** smooth and tidy.

In the first embodiment, one of the bottom walls **10***a* is provided with a recessed slot **11** and a separable block **12**. One side of the recessed slot **11** is connected to the side wall **10***b* to enable the recessed slot **11** to serve as a slider gap, and the connection between the recessed slot **11** and the side wall **10***b* has an arc-shaped transition to enable sliders **20** to move more smoothly between the recessed slot **11** and the side wall **10***b*. In other embodiments of present disclosure, it is not limited to setting recessed slots **11** and separable blocks **12** on only one end wall **10***a*, but can also set recessed slots **11** and separable blocks **12** on both bottom walls **10***a* simultaneously. The number of recessed slots **11** and separable blocks **12** on each end wall **10***a* can also be two, three, or more.

In the first embodiment, two connection slots **111** and two positioning slots **112** are also recessed inside the recessed slot **11**. The two connection slots **111** are located on opposite sides of the walls inside the recessed slot **11**, which are connected to the part of the separable block **12**. The two positioning slots **112** are located on the bottom wall of recessed slot **11** and are adjacent to one connection slot **111**, respectively, which are detachably connected to another part of the separable block **12**. In other embodiments of present disclosure, the recessed slot **11** may not be equipped with a connection slot **111** and/or a positioning slot **112**.

In the first embodiment, the separable block **12** is matched with the recessed slot **11**, and one side of the separable block **12** is detachably connected to the open side of the recessed slot **11**. The other side of the separable block **12** is pivoted to the side wall of the recessed slot **11** through the connection strip **13**. Wherein the connection strip **13** is accommodated and connected between the separable block **12** and the end wall **10***a*, and the two ends of the connection strip **13** are respectively pivoted with the separable block **12** and the end wall **10***a*. The setting of the connection strip **13** allows the separable block **12** to have a high degree of rotational freedom relative to the end wall **10***a*. It can be understood that the separable block **12** and the recessed slot **11**, which are pivoted and matched on the end wall **10***a*, can open or close the slider gap during the relative rotation of the separable block **12**, allowing the slider **20** to move on the main body **10** to ensure the game can proceed, and can close the slider gap when idle to prevent dust and maintain the overall aesthetics of the sliding puzzle toy **1**. In other embodiments of present disclosure, the separable block **12** can also be directly pivoted with the side wall of the recessed slot **11**. Obviously, in other embodiments, the separable block **12** matches with the recessed slot **11** can also be directly and detachably connected to the recessed slot **11**. When in use, the slider gap can be opened or closed by

placing the separable block **12** in the recessed slot **11** or disassembling and separating the separable block **12** from the recessed slot **11**.

In the first embodiment, the two side walls opposite each other of the separable block **12** are respectively provided with one snap bulge **121** and one snap block **122**, wherein the snap bulge is arranged corresponding to the connection slot **111** and is detachably connected to the connection slot **111**, which is used to enable the separable block **12** to be stably connected to the recessed slot **11** when the sliding puzzle toy **1** is idle, preventing the separable block **12** from detaching from the recessed slot **11** under gravity. The snap block **122** is located on the side facing the positioning slot **112** on the side wall of the separable block **12**. The snap block **122** is matched with the positioning slot **112** and is detachably connected to the positioning slot **112**, playing a role in positioning and fixing the separable block **12** and the recessed slot **11** in collaboration with the snap bulge **121** and the connection slot **111**. In other embodiments of present disclosure, when there is no connection slot **111** and/or positioning slot **112** in the recessed slot **11**, the separable block **12** is also not provided with a snap bulge **121** and/or a snap block **122**.

It should be noted that the structural design of setting the recessed slot **11** and separable block **12** on the end wall **10***a* has the advantage of a more streamlined and compact connection structure between the separable block **12** and the end wall **10***a* compared to the structure of setting the separable puzzle unit blocks on the side wall in existing technology, which is beneficial for reducing production costs and improving assembly efficiency. Moreover, setting the recessed slot **11** and the separable block **12** on the end wall **10***a* not only facilitates the operation of flipping the separable block **12**, but also enables the slider **20** to move on the side wall **10***b* without being limited by the pattern of the separable block **12**.

The outer surface of the side wall **10***b* is provided with a plurality of the sliding grooves which are intersected with each other along the circumferential and longitudinal directions, and the sliding groove is movably connected with a part structure of slider **20**. In the first embodiment, the sliding groove includes three circumferential sliding grooves **14** and twelve longitudinal sliding grooves **15**, wherein one longitudinal sliding groove **15** passes through the connection between the recessed slot **11** and the side wall **10***b* and extends towards the bottom wall of the recessed slot **11** to enable the slider **20** to enter and exit the recessed slot **11** under the guidance of the longitudinal sliding groove **15**. In other embodiments of present disclosure, the number of circumferential sliding grooves **14** and longitudinal sliding grooves **15** can be adaptively adjusted according to the number and arrangement of sliders **20**.

Each slider **20** includes a plate **21** and a base pillar **22** arranged in a vertical direction, wherein the plate **21** is exposed on the side wall **10***b* and matched with the side wall **10***b*, that is, when the side wall **10***b* is a closed curved surface, the plate **21** is an arc-shaped plate; when the side wall **10***b* is connected by multiple closed planes, the plate **21** is a flat plate. A pattern can be set on the plate **21** through spraying, adhesive connection, snap-fit connection, buckle connection, threaded connection, bolt connection, or magnetic connection. The patterns of several plates **21** can be spliced to form a complete large pattern, and the game can be played by restoring the disrupted patterns of several plates **21**.

The base pillar **22** passes through the sliding groove to movably connect the slider **20** within the sliding groove. In the first embodiment, a positioning piece **23** is slidably sleeved on the base pillar **22**, and the positioning piece **23** is movably connected in the sliding groove along with the base pillar **22** and contacts with the inner wall of the sliding groove. There is an elastic member **24** (such as a spring, etc.) connected between the positioning piece **23** and the end of the base pillar **22**, which is used for providing an extra space for slider **20** to move smoothly on the main body **10** when the slider **20** crosses the connection between the recessed slot **11** and the side wall **10***b* and when the slider **20** crosses any arc-shaped transition surface **102**, ensuring that the sliding puzzle toy **1** has a good gaming feel. In the other embodiments, the slider **20** can also adopt other structures to achieve the purpose of being movable and connected within the sliding groove, for example, a magnet may be provided fixed at the end of the base pillar **22** in each slider **20**, and the magnet is movably connected in the sliding groove along with the base pillar **22**. At this time, a magnetic film is set on the outer side on the side wall **10***b* opposite to the magnet, and the magnetic film is magnetically connected to the magnet to slidably connect the slider **20** to the main body **10**.

During the game, the separable block **12** is rotated to open the recessed slot **11**. By manually pushing the plate **21**, the base pillar **22** is driven to move between the circumferential sliding grooves **14** and the longitudinal sliding grooves **15** which are intersected with each other, in order to change the relative position of any slider **20** on the side wall **10***b*, until the disrupted large pattern is restored to end the game.

Please refer to FIG. **9** to FIG. **12**, a sliding puzzle toy **1** of the third embodiment of the present disclosure is provided, which differs from the first embodiment in that the separable block **12** can be slidably connected within the recessed slot **11**. In the third embodiment, the length of the separable block **12** is equal to the length of the recessed slot **11**. At this time, the other side of the recessed slot **11** is connected to the outside, making the recessed slot **11** a straight structure with both ends intercommunicated. By pushing the separable block **12** forward or backward, the recessed slot **11** can be opened or closed. Moreover, the other side of the recessed slot **11** can also be intercommunicated to the side wall **10***b* at the same time. By pushing the separable block **12** forward or backward, the recessed slot **11** can be can opened to increase the utilization convenience of the sliding puzzle toy. In other embodiments of the present disclosure, the other side of the recessed slot **11** can also be set only to be connected to the outside.

In order to ensure that the separable block **12** is securely slidably connected within the recessed slot **11**, a guide slot **113** is provided on the side wall of the recessed slot **11** along the movement direction of the separable block **12**. The separable block **12** is provided with a first sliding plate **123** on the side wall opposite to the guide slot **113**, and the first sliding plate **123** and the guide slot **113** are in a concave-convex sliding fit. In the third embodiment, in order to make it difficult for the separable block **12** to detach from the recessed slot **11**, the bottom wall of the recessed slot **11** is further provided with a limit slot **114** along the movement direction of the separable block **12**. The separable block **12** is provided with a second sliding plate **124** on the side wall opposite to the limit slot **114**, and the second sliding plate **124** and the limit slot **114** are in a concave-convex sliding fit. Obviously, in other embodiments, the bottom wall of the recessed slot **11** may not be equipped with a limited slot **114**, and at this time, the separable block **12** may not be correspondingly equipped with a second sliding plate **124**.

Please refer to FIG. **13** to FIG. **15**, a sliding puzzle toy **1** of the fourth embodiment of the present disclosure is pro-

vided, which differs from the third embodiment is that in the fourth embodiment, the length of the separable block **12** is smaller than the length of the recessed slot **11**. At this time, the part of the recessed slot **11** far away from the side wall **10***b* is recessed to form a receiving cavity **115**, and the receiving cavity **115** is connected to a moving block **16** through an elastic member (such as the first spring **103**). As the moving block **16** moves within the receiving cavity **115**, the moving block **16** has a first state adjacent to the separating block **12** and a second state overlapped with the separating block **12**. Therefore, when the moving block **16** moves downwards towards the receiving cavity **115**, it can still move the separating block **12** within the recessed slot **11** to the second state overlapped with the moving block **16**, achieving the opening of the recessed slot **11**.

In other embodiments of the present disclosure, the receiving cavity **115** in the recessed slot **11** can also be set adjacent to the side wall **10***b* according to different shapes and structures of the puzzle toy. The moving block **16** can also be movably connected to the receiving cavity **115** through other means, such as a structure with concave-convex moving fit, a structure with meshing moving fit, etc.

In the fourth embodiment, the recessed slot **11** includes two sub slots **110** that intersect with each other in a cross shape. The intersection position of the two sub slots **110** is recessed to form a receiving cavity **115**, and each sub slot **110** is sliding with two separable blocks **12**. By pushing any separable block **12** to move and overlap with the moving block **16**, the recessed slot **11** can be opened, so as to increase the utilization convenience of the sliding puzzle toy. It can be understood that since recessed slot **11** is composed of two cross intersecting sub slots **110**, four separable blocks **12** are respectively moved and set at the midpoint positions of the four sides of the end wall **10***a* on one end wall **10***a* of the main body **10**. At this time, guide slots **113** are set on either of the two vertical edges of the recessed slot **11** in end wall **10***a*, and first sliding plates **123** are set on both sides opposite to the guide slots **113** in any separable block **12**. Meanwhile, any separable block **12** is further provided with guide slots **113** on the side wall adjacent to the moving block **16**, allowing any separable block **12** to move onto the moving block **16**. In other embodiments of the present disclosure, according to the shape and setting requirements of the main body **10**, the recessed slot **11** may also include three or more intersecting sub slots **110**. At this time, the intersection position of any two sub slots **110** is recessed to form a receiving cavity **115**, and at least one separable block **12** is sliding inside each sub slot **110**.

In the fourth embodiment, the bottom wall of the receiving cavity **115** is provided with a retaining ring **1151**. The end of the first spring **103** is detachably clamped and fixed on the retaining ring **1151**, the other end of the first spring **103** is in contact with the moving block **16**, allowing the moving block **16** to move towards the receiving cavity **115** under external force. At the same time, when the external force on the moving block **16** is withdrawn, the moving block **16** can be pushed to reset through the first spring **103**, so that the moving block **16** can transform between the first state and the second state. It can be understood that in order to guide the moving block **16** to move in the correct direction within the receiving cavity **115**, the bottom wall of the receiving cavity **3313** is also provided with a moving cavity **1152**. At this time, the moving block **16** is provided with a connection post **161** on the side wall corresponding to the moving cavity **1152**, and the connection post **161** can be movably connected within the moving cavity **1152**. In other embodiments of the present disclosure, the receiving cavity **115** may not be provided with a moving cavity **1152**, accordingly, the moving block **16** is not provided with a connection post **161**. The bottom wall of the moving cavity **1152** and the connection post **161** can also be connected through an elastic member (such as a spring) to enhance the ability of the moving block **16** to reset automatically.

Please refer to FIG. **16** to FIG. **18**, a sliding puzzle toy **1** of the fifth embodiment of the present disclosure is provided, which differs from the fourth embodiment is that there are a plurality of guiding ribs **1153** arranged at circumferential intervals on the side walls of the moving cavity **1152**, and the end of each guiding rib **1153** is provided with a first inclined surface **1154**. The first inclined surface **1154** is arranged in an inclined Z-shaped shape. At this time, there is no first spring **103** set on the retaining ring **1151**, the connection post **161** can be movably connected in the moving cavity **1152** through the pushing block **17***a* and the limit block **17***b*, so that when the external force on the moving block **16** is withdrawn, it is still possible to fix the moving block **16** in the receiving cavity **115** through the connection between the guiding ribs **1153**, the pushing block **17***a* and the limit block **17***b*.

The pushing block **17***a* is fixedly and slidably connected with the connection post **161** between the plurality of guiding ribs **1153**, so that the pushing block **17***a* needs to move back and forth in the direction limited by the guiding ribs **1153**. The pushing block **17***a* is provided with serrated claws **171** in the circumferential direction at the end of the moving cavity **1152**, which are used to contact with the limit block **17***b* to push the limit block **17***b* to move within the moving cavity **1152**.

The limit block **17***b* is connected to the bottom wall of the moving cavity **1152** through an elastic member (such as the second spring **104**), and the outer wall of the limit block **17***b* is provided with a plurality of positioning ribs **172**. Each positioning rib **172** is slidably connected between any two guiding ribs **1153**, so that the limit block **17***b* needs to move back and forth in the direction restricted by the guiding ribs **1153**. Each positioning rib **172** is provided with a second inclined surface **173** at the end opposite to the serrated claws **171**. The second inclined surface **173** contacts to the serrated claws **171**, so that the limit block **17***b* can slide on the guiding ribs **1153** under the driving force of the pushing block **17***a*. The inclination direction and the inclination angle of each second inclined surface **173** are the same as those of the first inclined surface **1154**, so that the second inclined surface **173** can move along the first inclined surface **1154** when moving to the endpoint position of the first inclined surface **1154**, therefore, each positioning rib **172** can rotate and move between adjacent guiding ribs **1153** to achieve the positioning and resetting of the moving block **16**.

It should be noted that the process of moving block **16** moving within the moving cavity **1152** by the pushing block **17***a* and the limit block **17***b* is roughly as shown in FIG. **17** and FIG. **18**. If the moving block **16** is pressed, the pushing block **17***a* will push the limit block **17***b* to slide within the guiding ribs **1153** through the serrated claws **171**. At this time, the second spring **104** is in a compressed state. When the limit block **17***b* moves to the intersection of point A of the second inclined surface **173** and the first inclined surface **1154**, the limit block **17***b* will be pushed by the elastic force of the second spring **104**, causing the second inclined surface **173** to cross point A and move along the first inclined surface **1154** to point B of the first inclined surface **1154**. At this time, the positioning rib **172** will be clamped on the first inclined surface **1154**, enabling the moving block **16** to be

positioned and fixed in the receiving cavity **115**, further increasing the utilization convenience of the sliding puzzle toy. If the moving block **16** is pressed again, the pushing block **17***a* will push the limit block **17***b* again to slide within the first inclined surface **1154**. At this time, the second spring **104** is in a compressed state. When the limit block **17***b* moves to the intersection of point C on the second inclined surface **173** and the first inclined surface **1154**, when the external force on the moving block **16** is withdrawn, the limit block **17***b* will be pushed by the elastic force of the second spring **104**, enabling the second inclined surface **173** cross point C and move along the first inclined surface **1154** between any two guiding ribs **1153**. Finally, under the force of the second spring **104**, the pushing block **17***a* is pushed to drive the moving block **16** to move and reset (as shown in FIG. **17**).

Please refer to FIG. **19** to FIG. **21**, a sliding puzzle toy **1** of the sixth embodiment of the present disclosure is provided, which differs from the fourth embodiment is that the bottom wall of the moving cavity **1152** is provided with a mounting hole **1155**. At this time, the receiving cavity **115** and the moving block **16** are still connected by the first spring **103**. The connection post **161** can be movably connected in the moving cavity **1152** through the restriction block **18***a* and the restriction rod **18***b* to achieve that when external force on the moving block **16** is withdrawn, it is still possible to fix the moving block **16** in the receiving cavity **115** through the connection between the restriction block **18***a* and the restriction rod **18***b*.

The restriction block **18***a* is fixed and slidably connected to the connection post **161** in the mobile cavity **1152**. One side of the wall of the restriction block **18***a* is provided with a channel **181**. In the sixth embodiment, an arrow-shaped raised rib **182** is arranged in the middle of the channel **181**, to make a M-shaped passage form inside the channel **181**. At this time, the channel **181** is provided with a recessed point **1811** which is recessed downwards. It should be noted that in order to limit the movement path of the restriction rod **18***b* within the channel **181**, the side walls of the channel **181** are equipped with inclined planes that are guided in conjunction with the raised ribs **182**. In other embodiments of the present disclosure, channel **181** may not be limited to the M-shaped passage configuration in this embodiment, and the channel **181** may also be configured in other shapes with a recessed point **1811**.

One end of the restriction rod **18***b* is fixed in the mounting hole **1155**, and the other end of the restriction rod **18***b* corresponds to a raised rib **182** and can be movably connected in the channel **181**, so that the end of the restriction rod **18***b* can move with the movement of the restriction block **18***a*, and move to the recessed point **1811** of the channel **181** to engage or separate, thereby achieving the positioning and resetting of the moving block **16**.

It should be noted that the process of the moving block **16** moving within the moving cavity **1152** through the restriction block **18***a* and the restriction rod **18***b* is roughly as follows: as shown in FIG. **20** and FIG. **21**, if the moving block **16** is pressed, the connection post **161** will drive the restriction block **18***a* to move within the moving cavity **1152**. At this time, the end of the restriction rod **18***b* moves to clamp with the recessed point **1811** of the channel **181** under the guidance of the raised rib **182** and the side wall of the channel **181**, so that the moving block **16** can be positioned and fixed in the receiving cavity **115**, at this point, the first spring **103** is in a compressed state. If the moving block **16** is pressed again, the restriction block **18***a* moves with the connection post **161** in the moving cavity **1152**, so that the end of the restriction rod **18***b* can move to separate from the recessed point **1811** of the channel **181** under the guidance of the raised rib **182** and the side wall of the channel **181**. Therefore, when the external force on the moving block **16** is withdrawn, the end of the restriction rod **18***b* can move again in the channel **181**, finally, under the force of the first spring **103**, the moving block **16** is driven to move and reset (as shown in FIG. **21**).

For clarity, certain features described in the embodiments of this present disclosure can be combined for use in one embodiment. Moreover, the various features of the present disclosure described in a single embodiment can also be used individually or in any suitable form in sub combinations.

What is claimed is:

1. A sliding puzzle toy, comprising a main body and a plurality of sliders slidably connected to the main body, wherein the main body comprises two end walls, and a side wall connected between the two end walls, at least one of the two end walls is provided with a recessed slot and a separable block, one side of the recessed slot is connected to the side wall, an arc transition is provided at a connection between the recessed slot and the side wall, and the separable block is movably or detachably connected to the recessed slot; an outer surface of the side wall is provided with a plurality of sliding grooves that intersects with each other along circumferential and longitudinal directions, the sliding grooves are movably connected to the sliders, and one of the longitudinal sliding grooves passes through a connection between the recessed slot and the side wall and extends towards a bottom wall of the recessed slot;

the separable block matches with the recessed slot, one side of the separable block is detachably connected to an open side of the recessed slot, and an other side of the separable block is pivoted to a side wall of the recessed slot.

2. The sliding puzzle toy according to claim **1**, wherein the separable block is connected to the end wall through a connection strip, the connection strip is accommodated and connected between the separable block and end wall, and the two ends of the connection strip are respectively pivoted to the separable block and the end wall.

3. The sliding puzzle toy according to claim **1**, wherein each slider comprises a plate and a base pillar arranged along a vertical direction, the plate is exposed to the side wall, the base pillar is movably connected in the sliding groove, a positioning piece is slidably sleeved on the base pillar, the positioning piece is movably connected to the sliding groove and contacts with an inner wall of the sliding groove, and an elastic member is connected between the positioning piece and an end of the base pillar.

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