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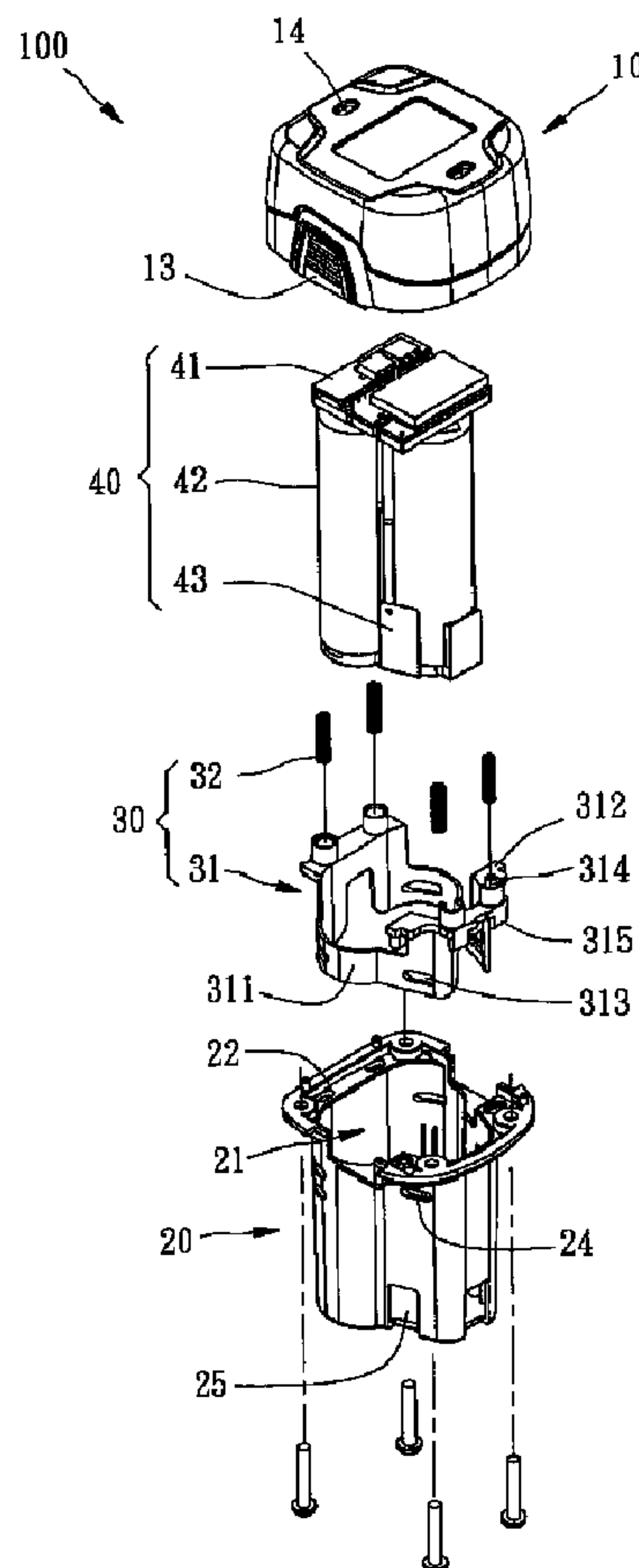
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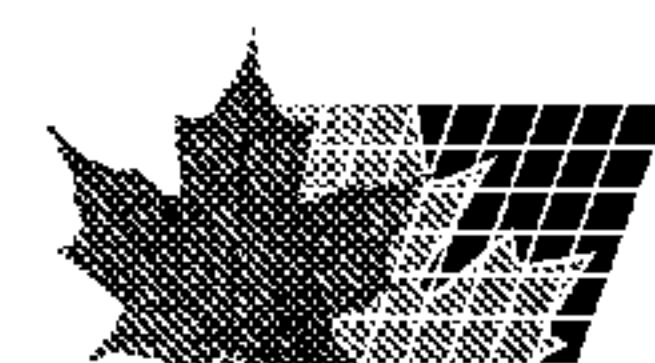
(54) Titre : MODULE DE BATTERIE POUR OUTIL A MAIN ELECTRIQUE

(54) Title: BATTERY MODULE FOR POWER HAND TOOL



(57) Abrégé/Abstract:

A battery module includes a top cover and a bottom cover affixed together to accommodate a battery set, which has conducting terminals positioned in respective bottom side holes of the bottom cover for the contact of respective metal contacts of a battery



(57) **Abrégé(suite)/Abstract(continued):**

charger or power hand tool. A movable member is sleeved onto the battery set inside the bottom cover and held in a first position by spring members to block side holes of the bottom cover and movable from the first position to a second position to open the side holes of the bottom cover for ventilation to dissipate heat upon insertion of the battery module in a battery charger for charging.

ABSTRACT OF THE DISCLOSURE

A battery module includes a top cover and a bottom cover affixed together to accommodate a battery set, which has conducting terminals positioned in respective
5 bottom side holes of the bottom cover for the contact of respective metal contacts of a battery charger or power hand tool. A movable member is sleeved onto the battery set inside the bottom cover and held in a first position by spring members to block side holes of the bottom cover and movable from the first position to a second position to open the side holes of the bottom cover for ventilation to dissipate heat upon insertion
10 of the battery module in a battery charger for charging.

BATTERY MODULE FOR POWER HAND TOOL

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates generally to accessories for power hand tool, and more particularly to a battery module for a power hand tool.

2. Description of the Related Art

 The battery of a regular power hand tool needs to have a high electricity storage capacity to supply long life power to the power hand tool. Therefore, Li-ion
10 battery is the main choice for power hand tools.

 A Li-ion battery has a high electricity storage capacity, however it generates much heat energy during charging, thereby increasing the temperature. There are battery chargers that have heat dissipation means to dissipate heat when charging a battery. However, the heat dissipation means simply dissipates heat from the battery
15 charger, having no significant effect in lowering the temperature of the battery, and the battery under charging may burn out due to excessively high temperature.

SUMMARY OF THE INVENTION

 The present invention has been accomplished under the circumstances in view. It is therefore one objective of the present invention to provide a battery module,
20 which obtains a better heat dissipation effect.

 To achieve this objective of the present invention, the battery module comprises a top cover and a bottom cover affixed together to accommodate a battery set, which has conducting terminals positioned in respective bottom side holes of the bottom cover for the contact of respective metal contacts of a battery charger or power
25 hand tool. A movable member is sleeved onto the battery set inside the bottom cover

and held in a first position by spring members to block side holes of the bottom cover and movable from the first position to a second position to open the side holes of the bottom cover for ventilation to dissipate heat upon insertion of the battery module in a battery charger for charging.

5 In a preferred embodiment, the top cover includes a chamber and a plurality of recessed holes. The bottom cover includes a chamber disposed in communication with the chamber of the top cover to form an enclosed receiving space. The bottom cover has a plurality of top through holes spaced around the chamber of the bottom cover, a plurality of bottom through holes in communication between the chamber of
10 the bottom cover and the space outside the bottom cover, a plurality of first side holes in communication between the chamber of the bottom cover and the space outside the bottom cover near a top side of the bottom cover, and a plurality of second side holes in communication between the chamber of the bottom cover and the space outside the bottom cover near a bottom side of the bottom cover. A shutter is mounted in the
15 enclosed receiving space around the battery set. The shutter has a movable member and a plurality of spring members. The movable member has a plurality of bottom pins respectively inserted through the top through holes of the bottom cover for stopping against an external object to move the movable member relative to the bottom cover, a plurality of recessed holes at a top side thereof corresponding to the recessed holes of
20 the top cover, and a plurality of through holes corresponding to the first side holes of the bottom cover. The spring members are respectively connected between the recessed holes of the top cover and the recessed holes of the movable member. When the bottom pins receive no external pressure, the spring members support the movable member in the enclosed receiving space in a first position where the through holes of the movable
25 member are not in communication with the first side holes of the bottom cover and the

periphery of the movable member blocks the first side holes of the bottom cover; when the bottom pins are stopped against an external object to move the movable member relative to the bottom cover, the spring members are compressed and the through holes of the movable member are forced into communication with the first side holes of the
5 bottom cover for ventilation.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various
10 changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by
15 way of illustration only, and thus are not limitative of the present invention, and wherein:

FIG. 1 is an exploded view of a battery module in accordance with a preferred embodiment of the present invention;

FIG. 2 is a sectional side view of the present invention, showing the status of
20 the battery module before charging; and

FIG. 3 corresponds to FIG. 2, showing the charging status of the battery module.

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIGS. 1-3, a battery module **100** in accordance with a preferred
25 embodiment of the present invention comprises a top cover **10**, a bottom cover **20**, a

shutter **30**, a battery set **40**.

The top cover **10** defines therein a chamber **11** and a plurality of recessed holes **12**. Further, the top cover **10** has two elastic retaining members **13** symmetrically disposed at two opposite lateral sides for securing to a battery charger or power hand
 5 tool (not shown), and a plurality of top through holes **14** in communication with the chamber **11** and the outside space.

The bottom cover **20** defines therein a chamber **21**, a plurality of top through holes **22** spaced around the chamber **21**, a plurality of bottom through holes **23** in communication between the chamber **21** and the outside space, a plurality of first side
 10 holes **24** in communication between the chamber **21** and the outside space near the top side of the chamber **21**, and a plurality of second side holes **25** in communication between the chamber **21** and the outside space near the bottom side of the chamber **21**.

The shutter **30** includes a movable member **31** and a plurality of spring members **32**. The movable member **31** has a body **311** and an extension **312**. The body
 15 **311** of the movable member **31** is an annular member of a predetermined configuration, having a plurality of through holes **313** in communication between the inside of the body **311** and the outside of the body **311** corresponding to the first side holes **24** of the bottom cover **20**. The extension **312** extends outwards from the top side of the body **311**, having a plurality of recessed holes **314** at the top side corresponding to the
 20 recessed holes **12** of the top cover **10** and a plurality of pins **315** at the bottom side corresponding to the top through holes **22** of the bottom cover **20**. The spring members **32** are compression springs.

The battery set **40** comprises a control circuit board **41**, a plurality of energy storage capacitors **42**, and a plurality of conducting terminals **43**. The control circuit
 25 board **41** is provided at the top side of the energy storage capacitors **42** and electrically

connected to the energy storage capacitors 42. The conducting terminals 43 are provided at the bottom side of the energy storage capacitors 42 at locations corresponding to the second side holes 25 of the bottom cover 20, and electrically connected to the energy storage capacitors 42 and the control circuit board 41.

5 After introduction of the component parts of the battery module 100, the assembly procedure and features of the battery module 100 are outlined hereinafter.

 At first, the spring members 32 are respectively inserted with the respective first ends into the recessed holes 12 of the top cover 10, and then the movable member 31 is inserted into the chamber 11 of the top cover 10 to have the respective second
10 ends of the spring members 32 be respectively engaged into the recessed holes 314 of the extension 312 of the movable member 31, and then the battery set 40 is inserted into the movable member 31, and then the bottom side of the top cover 10 is fixedly fastened to the top side of the bottom cover 20 to have the chamber 11 of the top cover 10 and the chamber 21 of the bottom cover 20 form an enclosed receiving space, the
15 pins 315 of the movable member 31 be respectively engaged into the top through holes 22 of the bottom cover 20, and the conducting terminals 43 of the battery set 40 be respectively positioned in the second side holes 25 of the bottom cover 20 for the contact of the respective metal contacts of a battery charger or power hand tool so that electricity can be inputted from the battery charger through the conducting terminals
20 43 into the energy storage capacitors 42 or outputted from the energy storage capacitors 42 through the conducting terminals 43 into the power hand tool. When the battery module 100 is assembled, the through holes 313 of the body 311 of the movable member 31 are spaced from the first side holes 24 of the bottom cover 20 and not in communication with the first side holes 24 of the bottom cover 20 (see FIG. 2).

25 When wishing to charge the battery module 100 with a battery charger 50,

insert the bottom cover **20** of the battery module **100** into the insertion hole of the battery charger **50** to force the conducting terminals **43** into contact with the respective metal contacts (not shown) in the insertion hole of the battery charger **50** for enabling electricity be inputted through the conducting terminals **43** into the energy storage capacitors **42** to charge the energy storage capacitors **42**.

When inserting the battery module **100** into the insertion hole of the battery charger **50**, the pins **315** of the movable member **31** are respectively stopped against a respective protruding block **51** in insertion hole of the battery charger **50** to compress the spring members **32**, and therefore the movable member **31** is moved relative to the bottom cover **20** from a first position where the through holes **313** of the body **311** of the movable member **31** are not in communication with the first side holes **24** of the bottom cover **20** (see FIG. 2) to a second position where the through holes **313** of the body **311** of the movable member **31** are in communication with the first side holes **24** of the bottom cover **20** respectively (see FIG. 3). After the movable member **31** reached the second position, the through holes **313** of the body **311** of the movable member **31** are in communication with the first side holes **24** of the bottom cover **20** for ventilation so that thermal energy can be carried out of the battery set **40** to the outside of the bottom cover **20** to lower the temperature of the battery set **40** when charging the energy storage capacitors **42**.

After charging, the battery module **100** is removed from the battery charger **50**. After removal of the battery module **100** from the battery charger **50**, the pins **315** of the movable member **31** receive no pressure, and the spring members **32** return the movable member **31** from the second position to the first position. At this time, the through holes **313** of the body **311** of the movable member **31** are not in communication with the first side holes **24** of the bottom cover **20**, and the peripheral

wall of the movable member **31** blocks the first side holes **24** of the bottom cover **20** against outside dust or external bodies.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the
5 spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

WHAT IS CLAIMED IS:

1. A battery module comprising:

a top cover having a chamber and a plurality of recessed holes;

a bottom cover fixedly fastened to a bottom side of said top cover, said

5 bottom cover having a chamber disposed in communication with the chamber of said top cover to form an enclosed receiving space, a plurality of top through holes spaced around the chamber of said bottom cover, a plurality of bottom through holes in communication between the chamber of said bottom cover and the space outside said bottom cover, a plurality of first side holes in communication between the chamber of
10 said bottom cover and the space outside said bottom cover near a top side of said bottom cover, and a plurality of second side holes in communication between the chamber of said bottom cover and the space outside said bottom cover near a bottom side of said bottom cover;

a battery set mounted in said enclosed receiving space, said battery set
15 having a plurality of conducting terminals respectively positioned in the second side holes of said bottom cover for the contact of respective metal contacts of an external electronic device; and

a shutter mounted in said enclosed receiving space, said shutter having a movable member and a plurality of spring members, said movable member having a
20 plurality of bottom pins respectively inserted through the top through holes of said bottom cover for stopping against an external object to move said movable member relative to said bottom cover, a plurality of recessed holes at a top side thereof corresponding to the recessed holes of said top cover, and a plurality of through holes corresponding to the first side holes of said bottom cover, said spring members being
25 respectively connected between the recessed holes of said top cover and the recessed

holes of said movable member;

wherein when said bottom pins receive no external pressure, said spring members support said movable member in said enclosed receiving space in a first position where the through holes of said movable member are not in communication with the first side holes of said bottom cover and the periphery of said movable member blocks the first side holes of said bottom cover; when said bottom pins are stopped against an external object to move said movable member relative to said bottom cover, said spring members are compressed and the through holes of said movable member are forced into communication with the first side holes of said bottom cover for ventilation; and

wherein said movable member comprises a body sleeved onto said battery set, and an extension extended from said body; the through holes of said movable member are formed in the periphery of said body; the recessed holes of said movable member are formed in a top side of said extension; the bottom pins of said movable member are respectively extending from a bottom side of said extension.

2. The battery module as claimed in claim 1, wherein said top cover comprises two elastic retaining members symmetrically disposed at two opposite lateral sides for securing to the external electronic device.

3. The battery module as claimed in claim 1, wherein said top cover comprises a plurality of through holes in communication between the chamber of said top cover and the space outside said top cover.

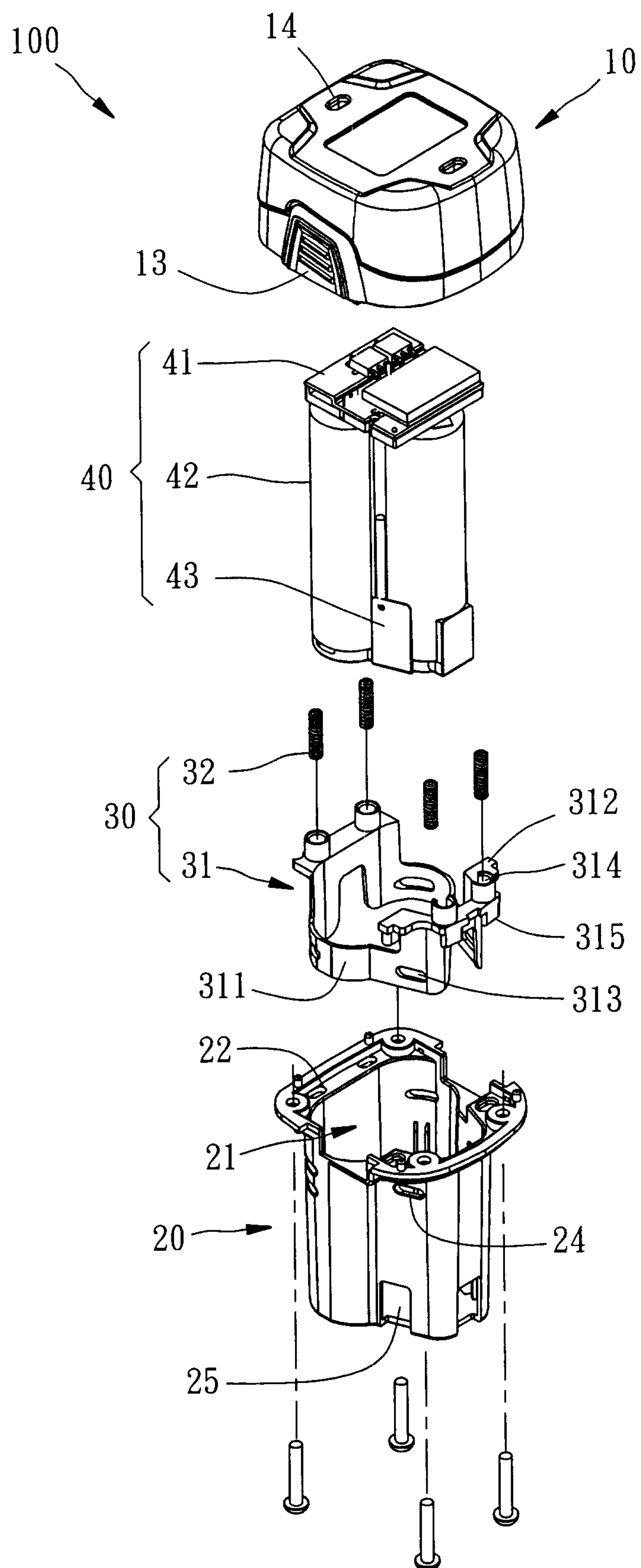


FIG. 1

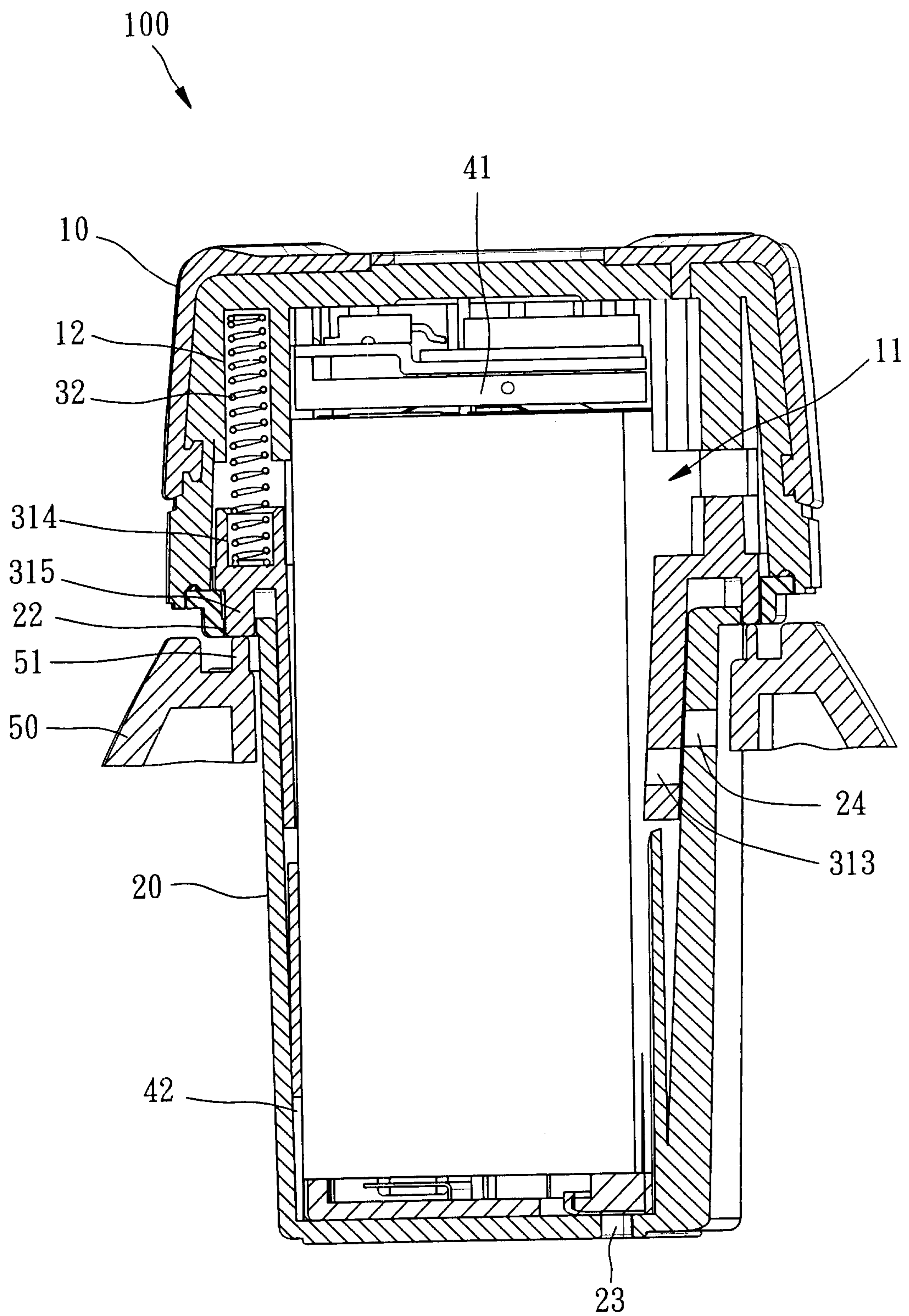


FIG. 2

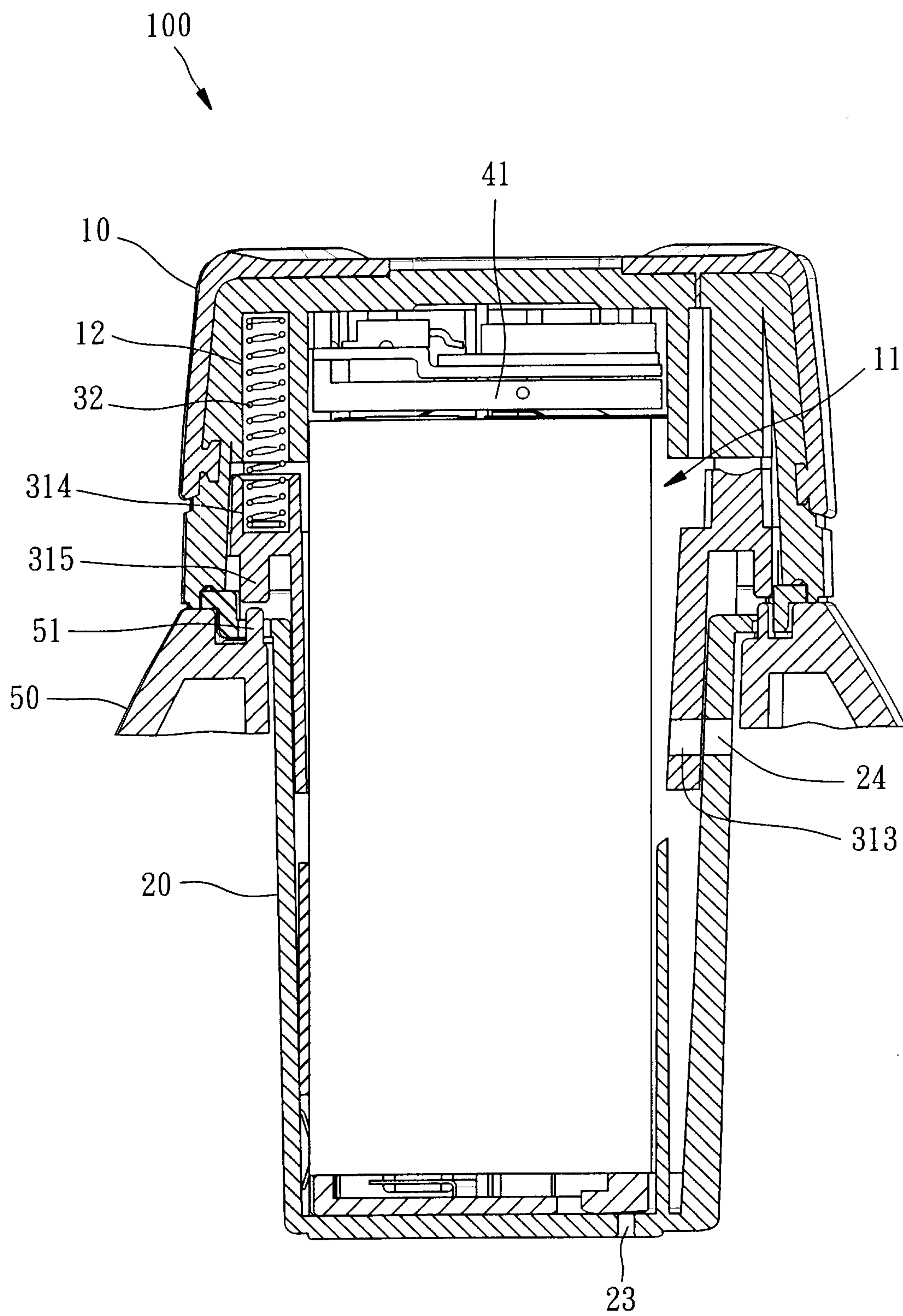


FIG. 3

