

CLAIMS

1. ~~(Amended)~~ An information storage device installed in a removable device configured to be removably installed in an image forming apparatus body, comprising:

5 an information storage unit that stores information communicated between the image forming apparatus body and the removable device;

10 a terminal that comes in contact with a body side terminal installed in the image forming apparatus body ~~and communicates the information with the image forming apparatus body~~; and

15 a substrate that holds the information storage unit and the terminal and includes a ~~hole~~-opening configured to be engaged with a protruding section installed in the image forming apparatus body,

20 wherein the terminal includes a plurality of terminals each including one of a plurality of metallic plates arranged in a transverse direction thereof with a clearance therebetween, and said plurality of terminals include a terminal for communicating the information with the image forming apparatus body,

25 an earth terminal, which comes in contact with a body side earth terminal formed in the protruding section of the image forming apparatus body, is formed in the ~~hole~~-opening in the substrate, and

 the ~~hole~~-opening in the substrate is disposed at a position sandwiched between two metallic plates among the plurality of metallic plates.

30 2. ~~(Amended)~~ The information storage device according to claim 1,

 wherein the earth terminal is formed at least on an inner surface of the ~~hole~~-opening.

3. ~~(Amended)~~ The information storage device according to claim 1 or 2,

wherein the substrate includes one ~~hole~~opening as the holeopening, and

the holeopening is formed at a position above a gravity center of the substrate.

4. ~~(Amended)~~ The information storage device according to any one of claims 1 to 3,

wherein the earth terminal includes a protruding section formed to extend in a predetermined direction on a front surface of the substrate on which the terminal is formed.

5. ~~(New)~~ The information storage device according to claim 4,

wherein the protruding section is arranged in a wedge-shaped area formed between an outer edge of a annular section of the earth terminal and the metallic plate having a rectangular shape.

6. ~~(New)~~ The information storage device according to any one of claims 1 to 5,

wherein the body side terminal includes a plurality of metallic member terminals, and

the plurality of metallic plates comprise:

an input terminal for a clock signal to which a serial clock is input when that input terminal is connected to a first metallic member terminal of the body side terminal among the metallic member terminals,

an input terminal for a serial data to which the serial data is input/output when that input terminal is

connected to a second metallic member terminal of the body side terminal among the metallic member terminals, and

an input terminal for a power source to which a voltage is input when that input terminal is connected to a
5 third metallic terminal of the body side terminal among the metallic member terminals.

7. ~~(Amended)~~ A removable device that is installed removably in an image forming apparatus body and is any one of a
10 toner cartridge inside which toner is contained, a process cartridge inside which toner is contained, and an ink cartridge inside which ink is contained, comprising:

the information storage device according to any one of claims 1 to 6.

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8. The removable device according to claim 7,
further comprising a holder that holds the information storage device such that the information storage device is movable on a virtual plane that intersects with a moving
20 direction in which the earth terminal approaches and comes in contact with the body side earth terminal.

9. ~~(New)~~ A removable device that is installed removably in an image forming apparatus body and is any one of a toner
25 cartridge inside which toner is contained, a process cartridge inside which toner is contained, and an ink cartridge inside which ink is contained, comprising:

an information storage device installed in the removable device, comprising:

30 an information storage unit that stores information communicated between the image forming apparatus body and the removable device;

a terminal that comes in contact with a body side

terminal installed in the image forming apparatus body and communicates the information with the image forming apparatus body; and

a substrate that holds the information storage unit and the terminal and includes at least one of a holeopening and a notch configured to be engaged with a protruding section installed in the image forming apparatus body,

wherein an earth terminal, which comes in contact with a body side earth terminal formed in the protruding section of the image forming apparatus body, is formed in the holeopening or the notch formed in the substrate, and

the removable device further comprises a holder that holds the information storage device such that the information storage device is movable on a virtual plane that intersects with a moving direction in which the earth terminal approaches and comes in contact with the body side earth terminal.

10. ~~(Amended)~~ An image forming apparatus, comprising:

the removable device according to any one of claims 7 to 9 that is mounted in the image forming apparatus body,

wherein the body side terminal includes a plurality of body side terminals each including one of a plurality of plate-like or linear metallic members each of which is fixed to and supported on the image forming apparatus body to have one end formed as a fixed end and the other end formed as a free end and has a curved section that curves toward the removable device on a side of the other end,

the protruding section is a positioning pin that has a leading end formed in a tapered shape and is engaged with the holeopening,

the body side earth terminal includes a plate-like or

linear metallic member in which a part thereof is contained inside the positioning pin, and a section thereof to be in contact with the earth terminal is exposed outside the positioning pin, and

5 a section of the body side earth terminal to be in contact with the earth terminal is arranged closer to the facing information storage device than the curved section of the body side terminal.

10 | 11. ~~(Amended)~~ An image forming apparatus, comprising:

the removable device according to claim 8 that is mounted in the image forming apparatus body,

wherein the body side terminal includes a plurality of terminals each including one of a plurality of plate-like
15 or linear metallic members each of which is fixed to and supported on the image forming apparatus body to have one end formed as a fixed end and the other end formed as a free end and has a curved section that curves toward the removable device on a side of the other end,

20 the protruding section is a positioning pin that has a leading end formed in a tapered shape and is engaged with the holeopening,

the body side earth terminal includes a plate-like or linear metallic member in which a part thereof is contained
25 inside the positioning pin, and a section thereof to be in contact with the earth terminal is exposed outside the positioning pin,

a section of the body side earth terminal to be in contact with the earth terminal is arranged closer to the
30 facing information storage device than the curved section of the body side terminal, and

a pair of restricting members each of which is arranged to face one of both side end surfaces of the

substrate at a position below the center of the ~~hole~~opening.

12. ~~(Amended)~~ A developer container that is installed
removably in an image forming apparatus body in a state in
5 which a longitudinal direction the developer container is
horizontal, and that stores a developer thereinside,
comprising:

a cylindrical container body that includes an opening
formed at one end in the longitudinal direction and is
10 configured such that the developer stored thereinside is
conveyed toward the opening;

a cap in which the opening of the container body is
inserted and that includes a discharge opening used to
discharge the developer, which has been discharged from the
15 opening of the container body, outside the developer
container; and

a shutter that is held in the cap and moves to
open/close the toner discharge opening in conjunction
movement of the developer container when the developer
20 container is attached to/detached from the image forming
apparatus body,

wherein the cap includes an information storage device
installed in an end section in the longitudinal direction
and a positioning ~~hole~~opening engaged with a positioning
25 pin installed in the image forming apparatus body, and
the information storage device is the information
storage device according to any one of claims 1 to 6.

13. ~~(Amended)~~ The developer container according to claim 12,
30 further comprising a holder that holds the information
storage device such that the information storage device is
movable on a virtual plane that intersects with a moving
direction in which the earth terminal approaches and comes

in contact with the body side earth terminal.

14. ~~(New)~~ A developer container that is installed removably in an image forming apparatus body and is any one of a
5 toner cartridge inside which toner is contained, a process cartridge inside which toner is contained, and an ink cartridge inside which ink is contained, comprising:
an information storage device installed in the removable device, comprising:
10 an information storage unit that stores information communicated between the image forming apparatus body and the removable device;
a terminal that comes in contact with a body side terminal installed in the image forming apparatus body and
15 communicates the information with the image forming apparatus body; and
a substrate that holds the information storage unit and the terminal and includes at least one of a
~~hole~~opening and a notch configured to be engaged with a
20 protruding section installed in the image forming apparatus body,
wherein an earth terminal, which comes in contact with a body side earth terminal formed in the protruding section of the image forming apparatus body, is formed in the
25 ~~hole~~opening or the notch formed in the substrate, and
the developer container further comprises a holder that holds the information storage device such that the information storage device is movable on a virtual plane that intersects with a moving direction in which the earth
30 terminal approaches and comes in contact with the body side earth terminal.

15. ~~(Amended)~~ An image forming apparatus, comprising:

the developer container according to claim 12 or 14 that is mounted in the image forming apparatus body,

wherein the body side terminal includes a plurality of body side terminals each including one of a plurality of
5 plate-like or linear metallic members each of which is fixed to and supported on the image forming apparatus body to have one end formed as a fixed end and the other end formed as a free end and has a curved section that curves toward the developer container side on a side of the other
10 end,

the protruding section is a positioning pin that has a leading end formed in a tapered shape and is engaged with
| the ~~hole~~opening,

the body side earth terminal includes a plate-like or
15 linear metallic member in which a part thereof is contained inside the positioning pin, and a section thereof to be in contact with the earth terminal is exposed outside the positioning pin, and

a section of the body side earth terminal to be in
20 contact with the earth terminal is arranged closer to the facing information storage device than the curved section of the body side terminal.

| 16. ~~(Amended)~~ An image forming apparatus, comprising:

25 the developer container according to claim 13 that is mounted in the image forming apparatus body,

wherein the body side terminal includes a plurality of body side terminals each including one of a plurality of plate-like or linear metallic members each of which is
30 fixed to and supported on the image forming apparatus body to have one end formed as a fixed end and the other end formed as a free end and has a curved section that curves toward the removable device side on a side of the other end,

the protruding section is a positioning pin that has a leading end formed in a tapered shape and is engaged with the holeopening,

the body side earth terminal includes a plate-like or linear metallic member in which a part thereof is contained inside the positioning pin, and a section thereof to be in contact with the earth terminal is exposed outside the positioning pin,

a section of the body side earth terminal to be in contact with the earth terminal is arranged closer to the facing information storage device than the curved section of the body side terminal, and

a pair of restricting members each of which is arranged to face one of both side end surfaces of the substrate at a position below the center of the holeopening.

17. (Amended) A removable device that is configured to be removably installed in an image forming apparatus body and holds an information storage device, comprising:

- the information storage device including
- an information storage unit that stores information communicated between the image forming apparatus body and the removable device,
- a terminal that comes in contact with a body side terminal installed in the image forming apparatus body and communicates the information with the image forming apparatus body,
- a substrate that holds the information storage unit and the terminal and includes at least one of a hole and a notch that allows a protruding section installed in the image forming apparatus body to be inserted into, and
- a holder that holds the information storage device such that the information storage device is movable on a

~~virtual plane that intersects with a moving direction in which the terminal approaches and comes in contact with the body side terminal.~~

5 ~~18. (Amended) The removable device according to claim 17,~~
~~— wherein the holder includes:~~

~~— a first facing section that faces a first plane of the substrate on which the terminal is installed and is formed such that a part of the first plane is slidable on the~~
10 ~~first facing section;~~

~~— a second facing section that faces a second plane of the substrate that is opposite to the first plane and on which the information storage unit is installed, the second facing section being formed such that a part of the second~~
15 ~~plane is slidable on the second facing section; and~~

~~— an opening formed to expose the terminal and the hole or the notch at a side facing the body side terminal.~~

~~19. (Amended) The removable device according to claim 17 or~~
20 ~~18,~~

~~— wherein the terminal includes a plurality of terminals each including one of a plurality of metallic plates that are arranged in a transverse direction thereof with a clearance therebetween,~~

25 ~~— the body side terminal includes a plurality of body side terminals each including one of a plurality of plate-like or linear metallic members each of which is fixed to and supported on the image forming apparatus body to have one end formed as a fixed end and the other end formed as a~~
30 ~~free end and has a curved section that curves toward the removable device side on a side of the other end,~~

~~— a first virtual straight line that passes through the center of the hole or the notch and is parallel to a~~

~~direction in which the plurality of metallic plates are arranged is configured to be positioned not to overlap a second virtual straight line that connects the centers of the plurality of metallic plates in a longitudinal direction thereof, and~~

~~— when the plurality of metallic plates approach and come in contact with the plurality of body side terminals, the plurality of body side terminals are deformed so that the curved section that becomes a contact point between the plurality of body side terminals and the plurality of metallic plates get close to the first virtual straight line while being pressed by the plurality of metallic plates and elastically deformed.~~

20. ~~(Amended) The removable device according to claim 19, — wherein the plurality of metallic plates are arranged so that the direction in which the plurality of metallic plates are arranged is vertical in a state in which the removable device is mounted on the image forming apparatus body.~~

21. ~~(Amended) The removable device according to claim 19 or 20,~~

~~— wherein the hole or the notch includes two holes or notches that are formed on both ends in the direction in which the plurality of metallic plates are arranged so that the plurality of metallic plates are sandwiched between the two holes or notches.~~

22. ~~(Amended) The removable device according to any one of claims 19 to 21,~~

~~— further comprising positioning holes that are engaged with positioning pins installed in the image forming~~

~~apparatus body and are formed at positions away from each other in a vertical direction so that the information storage device is sandwiched between the positioning holes in a state in which the removable device is mounted on the image forming apparatus body,~~

~~— wherein a third virtual straight line that connects the centers of the two positioning holes is configured to be parallel to the first virtual straight line.~~

~~23. (Amended) The removable device according to any one of claims 17 to 22,~~

~~— wherein the holder is configured to be removably installed in the removable device and includes an insertion opening through which the information storage device is inserted.~~

~~24. (Amended) The removable device according to any one of claims 17 to 23,~~

~~— wherein the removable device is any one of a developer container inside which toner is contained, a process cartridge inside which toner is contained, and an ink cartridge inside which ink is contained.~~

~~25. (Amended) A developer container that is installed removably on an image forming apparatus body in a state in which a longitudinal direction of the developer container is horizontal, comprising:~~

~~— a cylindrical container body that includes an opening formed at an end in the longitudinal direction and is configured such that a developer stored thereinside is conveyed toward the opening;~~

~~— a cap in which the opening of the container body is inserted and that includes a discharge opening, which is~~

disposed at a bottom section, used to discharge the developer, which has been discharged from the opening of the container body, outside the developer container; and
—— a shutter that is held in the bottom section of the cap and moves along an outer surface of the cap to open/close the toner discharge opening,
—— wherein the cap includes: a holder that is installed at an end in the longitudinal direction and holds an information storage device; and a positioning hole engaged with a positioning pin installed in the image forming apparatus body;

—— the information storage device includes:

—— an information storage unit that stores information communicated between the image forming apparatus body and the removable device;

—— a terminal that comes in contact with a body side terminal installed in the image forming apparatus body and communicates the information with the image forming apparatus body; and

—— a substrate that holds the information storage unit and the terminal and includes at least one of a hole and a notch that allows a protruding section installed in the image forming apparatus body to be inserted into, and

—— the holder that holds the information storage device such that the information storage device is movable on a virtual plane that intersects with a moving direction in which the terminal approaches and comes in contact with the body side terminal.

26. (Amended) The developer container according to claim 25,

—— wherein the holder includes:

—— a first facing section that faces a first plane of the substrate on which the terminal is installed and is formed

~~such that a part of the first plane is slidable on the first facing section;~~

~~—— a second facing section that faces a second plane of the substrate that is opposite to the first plane and on which the information storage unit is installed, the second facing section being formed such that a part of the second plane is slidable on the second facing section; and~~

~~—— an opening formed to expose the terminal and the hole or the notch at a side facing the body side terminal.~~

~~27. (Amended) The developer container according to claim 25 or 26,~~

~~—— wherein the terminal includes a plurality of terminals each including one of a plurality of metallic plates that are arranged in a transverse direction thereof with a clearance therebetween,~~

~~—— the body side terminal includes a plurality of body side terminals each including one of a plurality of plate-like or linear metallic members each of which is fixed to and supported on the image forming apparatus body and has a curved section that curves toward the removable device side on a side of the other end,~~

~~—— the hole or the notch consist of two holes or two notches each of which is formed on one of both ends in a direction in which the plurality of metallic plates are arranged such that the plurality of metallic plates are sandwiched between the two holes or the two notches,~~

~~—— a first virtual straight line that connects the two holes or the two notches is configured to be positioned not to overlap a second virtual straight line that connects the centers of the plurality of metallic plates in a longitudinal direction thereof, and~~

~~—— when the plurality of metallic plates approach and~~

come in contact with the plurality of body side terminals, the plurality of body side terminals are deformed so that the curved section that becomes a contact point between the plurality of body side terminals and the plurality of metallic plates get close to the first virtual straight line while being pressed by the plurality of metallic plates and elastically deformed.

28. (Amended) The developer container according to claim 27, — wherein the plurality of metallic plates are arranged so that a direction in which the plurality of metallic plates are arranged is vertical in a state in which the developer container is mounted on the image forming apparatus body.

29. (Amended) The developer container according to claim 27 or 28, — wherein the first virtual straight line is configured to be parallel to the second virtual straight line.

30. (Amended) The developer container according to any one of claims 27 to 29, — wherein the positioning hole of the cap consist of two positioning holes each of which is formed on one of both ends in a vertical direction so that the information storage device is sandwiched between the two positioning holes in a state in which the developer container is mounted on the image forming apparatus body, and — a third virtual straight line that connects the centers of the two positioning holes is configured to be parallel to the first virtual straight line.

31. (Amended) The developer container according to any one

~~of claims 25 to 30,~~

~~— wherein the holder is configured to be removably installed in the cap and includes an insertion opening through which the information storage device is inserted,~~

~~and~~

~~— the cap includes a standing member that blocks the insertion opening in a state in which the holder is installed in the cap.~~

~~32. (Amended) The developer container according to any one of claims 25 to 31,~~

~~— wherein the developer is toner.~~

~~33. (Amended) The developer container according to any one of claims 25 to 31,~~

~~— wherein the developer is a two component developer in which toner and a carrier are mixed.~~

~~34. (Amended) An image forming apparatus, comprising:~~

~~— the removable device according to any one of claims 17 to 24 that is installed in the image forming apparatus body.~~

~~35. (Amended) An image forming apparatus, comprising:~~

~~— the developer container according to any one of claims 25 to 33 that is installed in the image forming apparatus body.~~