

Claims

1. A printing material cartridge attachable to a cartridge attachment unit of a printing apparatus having a plurality of apparatus-side terminals, comprising:

a memory device;

a plurality of first terminals through which a power source voltage and signals for operating the memory device are supplied from the printing apparatus; and

a plurality of second terminals to be used for detecting attachment status of the printing material cartridge in the cartridge attachment unit,

wherein the plurality of first terminals have a plurality of first contact portions for contacting corresponding apparatus-side terminals when the printing material container is properly attached to the cartridge attachment unit,

the plurality of second terminals have a plurality of second contact portions for contacting corresponding apparatus-side terminals when the printing material container is properly attached to the cartridge attachment unit,

the plurality of first and second contact portions are arranged so as to form a first row and a second row, ~~and~~

four contact portions of the plurality of second contact portions are disposed respectively at the ends of the first and second rows, and

wherein among the four contact portions of the plurality of second contact portions,

two contact portions disposed at the ends of the first row are connected with each other and neither of them is directly connected to a fixed voltage,
and

two contact portions disposed at the ends of the second row have connected therebetween an electric device installed in the printing material cartridge.

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2. The printing material cartridge according to Claim 1, wherein

the plurality of first contact portions are disposed within a first area,

the four contact portions among the plurality of second contact portions are disposed outside the first area and are arranged at positions corresponding to four corners of a quadrangular second area that encompasses the first area, and

the second area has a trapezoid shape having a short first base corresponding to the first row and a long second base corresponding to the second row.

~~3. The printing material cartridge according to Claim 1 or 2, wherein~~

~~among the four contact portions of the plurality of second contact portions,~~

~~two contact portions disposed at the ends of the first row are connected with each other and neither of them is connected to a fixed voltage, and~~

~~two contact portions disposed at the ends of the second row are connected therebetween an electric device installed in the printing material cartridge.~~

43. The printing material cartridge according to Claim 1 or Claim 23,

wherein

a contact portion of a ground terminal for the memory device is disposed at the center of the second row.

54. The printing material cartridge according to any one of Claims 1-34, wherein during detection of attachment status of the printing material cartridge in the cartridge attachment unit:

the two contact portions at the ends of the first row are applied with a voltage that is equal to or less than a first power supply voltage supplied to a power terminal for the memory device, and

the two contact portions at the ends of the second row are applied with a voltage that is higher than the first power supply voltage and that is equal to or less than a second power supply voltage for driving a print head of the printing apparatus.

65. The printing material cartridge according to Claim 45, wherein during detection of attachment status of the printing material cartridge in the cartridge attachment unit:

a first attachment inspection signal is inputted, as a first pulse signal, to one of the two contact portions at the ends of the first row, and a first attachment response signal is outputted in accordance with the first attachment inspection signal from the other of the two contact portions, and

a first voltage that is less than or equal to the second power supply voltage and that is higher than the first power supply voltage is applied to one of the two contact portions at the ends of the second row, and a voltage that is lower than the first voltage and that is higher than the first power supply voltage is outputted from the other of the two contact portions.

76. The printing material cartridge according to Claim 56, wherein

the two contact portions at the ends of the first row are used for detecting when an overvoltage was applied to the two contact portions, and

a high level of the first attachment inspection signal is set to a voltage that is lower than the overvoltage.

87. The printing material cartridge according to any one of Claims 1-67,

wherein

two contact portions disposed at the ends of the second row have connected therebetween an electric device installed in the printing material cartridge, and

the electric device is a resistance element.

98. The printing material cartridge according to Claim 45, wherein during

detection of attachment status of the printing material cartridge in the cartridge attachment unit:

a first attachment inspection signal is inputted as a first pulse signal to one of the two contact portions at the ends of the first row, and a first attachment response signal is outputted in accordance with the first attachment inspection signal from the other of the two contact portions, and

a second attachment inspection signal is inputted as a second pulse signal to one of the two contact portions at the ends of the second row, and a second attachment response signal is outputted in accordance with the second attachment inspection signal from the other of the two contact portions.

~~109~~. The printing material cartridge according to Claim 89, wherein

the second attachment inspection signal has a rising edge from a low level to a high level that is at a timing that is different from timing of the rising edge from a low level to a high level of the first attachment inspection signal.

~~1110~~. The printing material cartridge according to Claim 98 or ~~109~~, wherein

the two contact portions at the ends of the first row are used for detecting when an overvoltage was applied to the two contact portions, and

a high level of the first attachment inspection signal is set to a voltage that is lower than the overvoltage.

~~1211~~. The printing material cartridge according to any one of Claims ~~1-54~~ and ~~9-118-10~~, wherein

two contact portions disposed at the ends of the second row are connected therebetween an electric device installed in the printing material cartridge, and

the electric device is a sensor for detecting a remaining amount of printing material within the printing material cartridge.

123. The printing material cartridge according to any one of Claims ~~1-1211~~, wherein

the plurality of first terminals include a ground terminal for supplying a ground voltage from the printing apparatus to the memory device, a power supply terminal for supplying power at a different voltage than the ground voltage from the printing apparatus to the memory device, a clock terminal for supplying clock signals

from the printing apparatus to the memory device, a reset terminal for supplying reset signals from the printing apparatus to the memory device, and a data terminal for supplying data signals from the printing apparatus to the memory device, and

two of the first contact portions are disposed in the first row, and three of the first contact portions are disposed in the second row.

1413. The printing material cartridge according to any one of Claims 1-~~13~~12, wherein a distance between the two contact portions at the ends of the first and second contact portions existing in the first row is longer than a distance between the two contact portions at the ends of the first contact portions existing in the second row.

1514. The printing material cartridge according to any one of Claims 1-~~14~~13, wherein

the printing material cartridge is for attaching to a cartridge attachment unit of the printing apparatus that comprises a print head and the cartridge attachment unit.