Claims

[Claim 1] A set of printing-fluid cartridges each configured to be inserted into a prescribed insertion space of a cartridge-attachment section in an insertion direction crossing a gravitational direction to be attached to the cartridge-attachment section in an attached posture, the set of printing-fluid cartridges comprising a first printing-fluid cartridge, a second printing-fluid cartridge and a third printing-fluid cartridge,

wherein:

the first printing-fluid cartridge stores printing fluid of a first type and the second printing-fluid cartridge stores printing fluid of a second type different from the first type, the third printing-fluid cartridge storing printing fluid of a third type different from the first type and the second type;

each of the first printing-fluid cartridge, the second printing-fluid cartridge and the third printing-fluid cartridge comprising:

a housing defining a width in a widthwise direction perpendicular to the insertion direction and the gravitational direction in the attached posture, the housing comprising:

a storage chamber configured to store printing fluid therein;

a front surface facing frontward in the insertion direction in the attached posture;

a rear surface away from the front surface in a removal direction opposite to the insertion direction in the attached posture, the rear surface facing rearward in the attached posture, the storage chamber being positioned between the front surface and the rear surface in the insertion direction in the attached posture; and

an upper surface positioned between the front surface and the rear surface in the insertion direction, the upper surface being positioned upward relative to the storage chamber and facing upward in the attached posture;

a supply portion provided at the front surface and having a supply hole, the printing fluid being configured to flow out of the storage chamber through the supply hole in the insertion direction in the attached posture;

an electrical interface disposed at the upper surface and facing upward in the attached posture; and

an interfering surface positioned upward relative to the storage chamber in the attached posture, the interfering surface extending in the widthwise direction in the attached posture, the interfering surface being positioned downward and frontward in the insertion direction relative to the electrical interface in the attached posture, the interfering surface being configured to abut against a projection provided at another insertion space different from the prescribed insertion space of the cartridge-attachment section during an insertion of the printing-fluid cartridge into the another insertion space,

the upper surface of each of the printing-fluid cartridges has a first outer edge and a second outer edge opposite to each other in the widthwise direction; and

the interfering surface of the first printing-fluid cartridge is positioned closer to the first outer edge in the widthwise direction than the interfering surface of the second printing-fluid cartridge is to the first outer edge in the widthwise direction,

each of the printing-fluid cartridges defines an imaginary plane passing through a center of the electrical interface in the widthwise direction and extending parallel to the insertion direction and the gravitational direction;

the first printing-fluid cartridge and the third printing-fluid cartridge are configured to be inserted respectively into a first insertion space and a third insertion space positioned opposite to each other with respect to a second insertion space in the widthwise direction, the second printing-fluid cartridge being configured to be inserted into the second insertion space;

the interfering surface of the second printing-fluid cartridge is positioned on the imaginary plane in the widthwise direction;

the interfering surface of the first printing-fluid cartridge is positioned offset from the imaginary plane toward the first outer edge in the widthwise direction; and

the interfering surface of the third printing-fluid cartridge is positioned offset from the imaginary plane toward the second outer edge in the widthwise direction.

[Claim 2] The set of printing-fluid cartridges as claimed in claim 1, wherein each of the housings further comprises an inner surface that defines a front edge of the storage chamber in the insertion direction in the attached posture, each of the interfering surfaces being positioned rearward relative to the inner surface in the insertion direction in the attached posture.

[Claim 3] The set of printing-fluid cartridges as claimed in claim 1, each of the printing-fluid cartridges further comprising a light-blocking wall disposed at the housing, the light-blocking wall being positioned rearward relative to the interfering surface in the insertion direction in the attached posture, the light-blocking wall including a light-blocking surface extending in the insertion direction and the gravitational direction in the attached posture.

[Claim 4] The set of printing-fluid cartridges as claimed in claim 3, wherein the interfering surface and the light-blocking wall are aligned with each other in the insertion direction.

[Claim 5] The set of printing-fluid cartridges as claimed in claim 3, wherein each of the interfering surfaces has a first width in the widthwise direction,

wherein each of the upper surface has a first outer edge and a second outer edge opposite to each other in the widthwise direction, and

wherein each of the light-blocking walls has outer edges opposite to each other in the widthwise direction, the second outer edge of the upper surface being positioned closer to one of the outer edges of the light-blocking wall than the first outer edge is to the one of the outer edges of the light-blocking wall in the widthwise direction, the second outer edge of the upper surface and the one of the outer edges of the light-blocking wall defining a second width therebetween that is greater than the first width in the widthwise direction.

[Claim 6] The set of printing-fluid cartridges as claimed in claim 3, wherein each of the light-blocking walls includes a light-transmission portion configured to transmit light, the light-transmission portion extending in the widthwise direction.

[Claim 7] The set of printing-fluid cartridges as claimed in claim 3, wherein each of the light-blocking walls is configured to block light traveling in the widthwise direction.

[Claim 8] The set of printing-fluid cartridges as claimed in claim 3, wherein each of the interfering surfaces constitutes a front surface of the light-blocking wall facing frontward in the insertion direction in the attached posture.

[Claim 9] The set of printing-fluid cartridges as claimed in claim 8, wherein each of the light-blocking walls further comprises:

a sloped surface sloping relative to the insertion direction in the attached posture; and

an upper surface facing upward in attached posture, the sloped surface connecting the interfering surface and the upper surface of the light-blocking wall, the sloped surface facing upward and frontward in the insertion direction in the attached posture.

[Claim 10] The set of printing-fluid cartridges as claimed in claim 3, each of the printing-fluid cartridges further comprising a protrusion positioned frontward relative to the light-blocking wall in the insertion direction in the attached posture, the protrusion including the interfering surface.

[Claim 11] The set of printing-fluid cartridges as claimed in claim 10, wherein each of the protrusions is made of a material configured to transmit light.

[Claim 12] The set of printing-fluid cartridges as claimed in claim 3, each of the printing-fluid cartridges further comprising a protrusion disposed at the upper surface and supporting the electrical interface, the electrical interface being positioned upward relative to the upper surface in the attached posture, the light-blocking wall being positioned frontward relative to the protrusion in the insertion direction in the attached posture,

wherein the light-blocking wall is connected to the protrusion.

[Claim 13] The set of printing-fluid cartridges as claimed in claim 3, wherein each of the housings comprises an upper cover defining the upper surface in the attached posture, the upper cover being positioned upward relative to the storage chamber in the attached posture, and

wherein the light-blocking wall is formed integrally with the upper cover.

[Claim 14] The set of printing-fluid cartridges as claimed in claim 3, wherein each of the light-blocking walls is disposed at the upper surface and includes the interfering surface.

[Claim 15] The set of printing-fluid cartridges as claimed in claim 1, wherein each of the housings comprises an upper cover defining the upper surface in the attached posture, the upper cover being positioned upward relative to the storage chamber in the attached posture,

wherein the interfering surface extends upward from the upper cover in the attached posture.

[Claim 16] The set of printing-fluid cartridges as claimed in claim 1, wherein the interfering surface and the electrical interface are arranged at different positions from each other in the widthwise direction.

[Claim 17] The set of printing-fluid cartridges as claimed in claim 1, wherein each of the housings comprises:

an upper cover defining the upper surface in the attached posture, the upper cover being positioned upward relative to the storage chamber in the attached posture; and

a locking surface provided at the upper cover and configured to contact a lock portion provided at the cartridge-attachment section, the locking surface facing rearward in the insertion direction in the attached posture, the locking surface having an upper end in the attached posture, and

wherein the electrical interface is positioned downward and frontward in the insertion direction relative to the upper end of the locking surface in the attached posture.

[Claim 18] The set of printing-fluid cartridges as claimed in claim 1, wherein each of the housings comprises:

a case defining the storage chamber therein; and

an upper cover attached to the case and defining the upper surface in the attached posture, the upper cover being positioned upward relative to the storage chamber in the attached posture, the electrical interface and the interfering surface being disposed at the upper cover.

[Claim 19] The set of printing-fluid cartridges as claimed in claim 1, further comprising a fourth printing-fluid cartridge storing printing fluid of a fourth type different from the first type and the second type and the third type,

wherein:

the housing of the fourth printing-fluid cartridge having a width in the widthwise direction that is greater than the width of the housing of each of the first printing-fluid cartridge, the second printing-fluid cartridge and the third printing-fluid cartridge in the widthwise direction;

the upper surface of the fourth printing-fluid cartridge has a third outer edge and a fourth outer edge opposite to each other in the widthwise direction, the third outer edge of the upper surface of the fourth printing-fluid cartridge corresponding to the first outer edge of the upper surface of each of the first printing-fluid cartridge, the second printing-fluid cartridge and the third printing-fluid cartridge, the fourth outer edge of the upper surface of the fourth printing-fluid cartridge being positioned farther away from the imaginary plane than the second outer edge of the upper surface of each of the first printing-fluid cartridge, the second printing-fluid cartridge and the third printing-fluid cartridge is from the imaginary plane in the widthwise direction; and

the interfering surface of the fourth printing-fluid cartridge is arranged opposite to the imaginary plane with respect to a second imaginary plane in the widthwise direction, the second imaginary plane being parallel to the imaginary plane and defining the second outer edge of the upper surface of each of the first printing-fluid cartridge, the second printing-fluid cartridge and the third printing-fluid cartridge in the widthwise direction.

[Claim 20] A system comprising:

the set of printing-fluid cartridges as claimed in claim 1; and

a printing-fluid consuming apparatus comprising:

the cartridge-attachment section comprising:

a plurality of insertion spaces into each of which each of the plurality of the printing-fluid cartridges is configured to be inserted in the insertion direction, the plurality of insertion spaces including a first insertion space and a second insertion space;

a plurality of tubes each disposed in each of the plurality of insertion spaces;

a plurality of contacts each disposed in each of the plurality of insertion spaces, the plurality of contacts including a first contact and a second

contact, the first contact being disposed in the first insertion space and the second contact being disposed in the second insertion space;

a plurality of projections each disposed in each of the plurality of insertion spaces, each of the projections being positioned frontward relative to the corresponding contact in the insertion direction in each of the insertion spaces, the plurality of projections including a first projection and a second projection, the first projection being disposed in the first insertion space and the second projection being disposed in the second insertion space, a relative position between the first projection and the first contact in the widthwise direction in the first insertion space being different from a relative position between the second projection and the second contact in the widthwise direction in the second insertion space; and

a plurality of optical sensors each disposed in each of the plurality of insertion spaces, each of the optical sensors being positioned frontward relative to the corresponding projection in the insertion direction in each of the insertion spaces; and

a determiner configured to determine one of types of the printing-fluid cartridges and existence of the printing-fluid cartridges inserted into the respective insertion spaces based on signals outputted from the respective optical sensors.

[Claim 21] The system as claimed in claim 20, wherein the first printing-fluid cartridge is configured to be inserted into the first insertion space and the second printing-fluid cartridge is configured to be inserted into the second insertion space,

wherein each of the plurality of projections includes a pair of opposing walls and a slit provided between the opposing walls in the widthwise direction, the first projection including a first slit and the second projection including a second slit, a relative position between the first slit and the first contact in the widthwise direction in the first insertion space being different from a relative position between the second slit and the second contact in the widthwise direction in the second insertion space,

wherein the opposing walls of the first projection is configured to abut against the interfering surface of the second printing-fluid cartridge during

insertion of the second printing-fluid cartridge into the first insertion space; and

wherein the first slit of the first projection is configured to allow the interfering surface of the first printing-fluid cartridge to pass through the first slit during insertion of the first printing-fluid cartridge into the first insertion space.

[Claim 22] The system as claimed in claim 20, wherein each of the printing-fluid cartridges further comprising a light-blocking wall disposed at the housing, the light-blocking wall being positioned rearward relative to the interfering surface in the insertion direction in the attached posture, the light-blocking wall including a light-blocking surface extending in the insertion direction and the gravitational direction in the attached posture, each of the light-blocking walls includes a light-transmission portion configured to transmit light, the light-transmission portion extending in the widthwise direction, and the light-transmission portion is configured to transmit light emitted from the corresponding optical sensor.

[Claim 23] The system as claimed in claim 20, wherein the cartridge-attachment section further comprises:

an opening through which the plurality of printing-fluid cartridges is allowed to be inserted into the corresponding plurality of insertion spaces;

a cover movable between a closing position closing the opening and an opening position exposing the opening; and

a cover sensor configured to detect that the cover is in the closing position and output a detection signal indicative of the cover being at the closing position,

wherein, upon receipt of the detection signal from the cover sensor, the determiner is configured to detect one of types of the printing-fluid cartridges and existence of the printing-fluid cartridges inserted into the corresponding plurality of insertion spaces based on signals outputted from the respective optical sensors.

[Claim 24] The system as claimed in claim 20, wherein the first printing-fluid cartridge is configured to the inserted into the first insertion space,

wherein the supply portion of the first printing-fluid cartridge and the tube of the second insertion space are separated from each other in the insertion

direction in a state where the interfering surface of the first printing-fluid cartridge abuts against the projection provided in the second insertion space during the insertion of the first printing-fluid cartridge into the second insertion space.

[Claim 25] The system as claimed in claim 20, wherein the first printing-fluid cartridge is configured to the inserted into the first insertion space, the first printing-fluid cartridges comprising a locking surface positioned upward relative to the storage chamber in the attached posture,

wherein the cartridge-attachment section further comprises a lock portion configured to engage the locking surface of the first printing-fluid cartridge in the attached posture, and

wherein the supply portion of the first printing-fluid cartridge and the tube of the second insertion space are connected to each other and the locking surface of the first printing-fluid cartridge is separated from the lock portion in the insertion direction in a state where the interfering surface of the first printing-fluid cartridge abuts against the projection provided at the second insertion space during the insertion of the first printing-fluid cartridge into the second insertion space.

[Claim 26] The system as claimed in claim 20, each of the printing-fluid cartridges further comprising a closing member configured to close the supply hole, a distance between the interfering surface and the closing member in the insertion direction is shorter than a distance between the projection and a tip end of the tube provided at the cartridge-attachment section in the insertion direction.

[Claim 27] The system as claimed in claim 20, each of the printing-fluid cartridges further comprising a locking surface positioned upward relative to the storage chamber and configured to contact a lock portion provided at the cartridge-attachment section, the locking surface facing rearward in the insertion direction in the attached posture,

wherein a distance between the interfering surface and the locking surface in the insertion direction is longer than a distance between the projection and the lock portion in the insertion direction.