CLAIMS

[Claim 1]

A cartridge to be removably installed in a main body of an image forming apparatus comprising:

a housing accommodating a developer therein, wherein the housing has a first side wall and a second side wall, both of which face each other;

a passive unit for receiving a driving force from an operating output unit provided in the main body, wherein the passive unit is mounted on the first side wall, and is rotatable around a first axis line extending in an opposite direction in which the first and second side walls face each other; and

a detected body mounted on the first side wall and having a detected part to be detected by a detecting unit provided in the main body,

wherein the detected body advances outwards in the opposite direction with respect to the first side wall by the driving force received by the passive unit, and retracts inwards in the opposite direction with respect to the first side wall.

[Claim 2]

The cartridge according to claim 1, further comprising an agitator for agitating a developer contained in the housing, wherein the agitator is supported on the first and second side walls so as to be rotatable around a second axis line extending parallel with the first axis line, and rotates by the driving force received by the passive unit,

wherein the detected body is installed oscillataly movably in a moving direction parallel with the first axis line, and

wherein, the detected body is movable from a first position where the distance in the moving direction between the detected body and the first side wall is a first distance, via a second position where the distance in the moving direction between the detected body and the first side wall is a second distance larger than the first distance, to a third position where the distance in the moving direction between the detected body and the first side wall is a third distance smaller than the second distance.

[Claim 3]

The cartridge according to claim 2, wherein the first distance is the same as the third distance.

[Claim 4]

The cartridge according to claim 2 or 3, wherein the detected body is rotatably

mounted around a third axis line extending parallel with the first axis line, and is movable from the first position, via the second position, to the third position, by the rotation in a first direction,

wherein the first side wall has a sliding part on which a contact part of the detected body slides as the detected body moves from the first position to the third position, and

wherein either of the contact part and the sliding part has an inclined surface so tilted as to be more apart from the first side wall as it goes downstream in the first direction.

[Claim 5]

The cartridge according to claim 4, wherein the either of the contact part and the sliding part, having the inclined surface, comprises a parallel surface extending continuously from the inclined surface downstream in the first direction and running parallel with the first side wall.

[Claim 6]

The cartridge according to claim 4 or 5, further comprising a transmission gear for transmitting the driving force received by the passive unit to the detected body,

wherein the detected body has a circumferential surface around the third axis line,

wherein the detected body has a toothless portion formed on a portion of the circumferential surface, and gear teeth formed on the remaining portion other than the toothless portion of the circumferential surface, and

wherein the gear teeth are engaged with the transmission gear as the detected body moves from the first position to the third position.

[Claim 7]

The cartridge according to claim 4, 5, or 6, further comprising a pressing member for pressing the detected body against the first side wall.

[Claim 8]

The cartridge according to claim 7, further comprising a boss extruding from the first side wall and extending in the moving direction,

wherein the pressing member is a wire spring coiled around the boss and having one end contact with the side of the detected body opposite to the first side wall.

[Claim 9]

The cartridge according to claim 8, wherein the detected body has a pressed surface with which the one end of the wire spring is in contact in the first direction when the detected

body is in the third position.

[Claim 10]

The cartridge according to claim 7, wherein the first side wall has a side wall main body and a cover so attached to the outer side of the side wall main body in the opposite direction as to cover the detected body, and

wherein the pressing member is a coil spring interposed between the detected body and the cover and being in contact with the detected body.

[Claim 11]

The cartridge according to claim 2 or 3, further comprising a rotational body installed on the first side wall so as to be rotatable around a third axis line extending parallel with the first axis line, wherein the rotational body rotates in a second direction by the driving force received by the passive unit,

wherein the detected body is installed so as to be returnably movable in a moving direction parallel with the first axis line, and to maintain the position of the detected body around the third axis line, and

wherein the rotational body has an inclined surface on which a contact part of the detected body slides as the detected body moves from the first position to the third position, wherein the inclined surface is tilted so as to be more apart from the first side wall as it goes upstream in the second direction.

[Claim 12]

The cartridge according to claim 11, wherein the rotational body has a parallel surface extending continuously from the inclined surface upstream in the second direction and running parallel with the first side wall.

[Claim 13]

The cartridge according to claim 11 or 12, further comprising a transmission gear for transmitting the driving force received by the passive unit to the rotational body,

wherein the rotational body has a toothless portion formed on a portion of a circumferential surface around the third axis line, and gear teeth formed on the remaining portion other than the toothless portion of the circumferential surface, and

wherein the gear teeth are engaged with the transmission gear as the detected body moves from the first position to the third position.

[Claim 14]

The cartridge according to claim 11, 12, or 13, further comprising a pressing member for pressing the detected body against the first side wall.

[Claim 15]

The cartridge according to claim 14, further comprising a boss extruding from the first side wall and extending in the moving direction,

wherein the pressing member is a wire spring coiled around the boss and having one end contact with the side of the detected body opposite to the first side wall.

[Claim 16]

The cartridge according to claim 14, wherein the first side wall has a side wall main body and a cover so attached to the outer side of the side wall main body in the opposite direction as to cover the detected body, and

wherein the pressing member is a coil spring interposed between the detected body and the cover and being in contact with the detected body.

[Claim 17]

The cartridge according to one of claims 2 to 16, wherein the first side wall has a side wall main body and a cover so attached to the outer side of the side wall main body in the opposite direction as to cover the detected body, and

wherein the detected body is arranged within the cover when the detected body is in the first and third positions, and the detected body is exposed from the cover when the detected body is in the second position.

[Claim 18]

The cartridge according to one of claims 1 to 17, further comprising a developing roller installed between the first and the second side walls so as to be rotatable around a fourth axis line extending parallel with the first axis line at a distance, and to rotate by the driving force received by the passive unit.

What is claimed is:

1. A cartridge detachably attachable to an image forming apparatus which includes a main body, a driving unit provided in the main body and a detecting unit provided in the main body, the cartridge comprising:

a housing that is configured to accommodate a developer therein, and includes a first side wall and a second side wall opposed to the first side wall in a longitudinal direction;

a passive unit that is configured to receive a driving force from the driving unit, is mounted on the first side wall, and is rotatable around a first axis line parallel to the longitudinal direction; and

a detected body mounted on the first side wall and including a detected part which is detected by the detecting unit,

wherein the detected body advances outwards in the longitudinal direction with respect to the first side wall and retracts inwards in the longitudinal direction with respect to the first side wall by the driving force received by the passive unit.

2. The cartridge according to claim 1 further comprising an agitator configured to agitate the developer contained in the housing,

wherein the agitator is supported on the first and second side walls so as to be rotatable around a second axis line extending parallel to the first axis line, and is rotated by the driving force received by the passive unit,

wherein the detected body is oscillateable in a moving direction parallel to the first axis line, and

wherein, the detected body is movable from a first position where a distance in the moving direction between the detected body and the first side wall is a first distance, via a second position where the distance in the moving direction between the detected body and the first side wall is a second distance larger than the first distance, to a third position where the distance in the moving direction between the detected body and the first side wall is a third distance smaller than the second distance.

3. The cartridge according to claim 2, wherein the first distance is the same as the third distance.

4. The cartridge according to claim 2, wherein the detected body is rotatably mounted around a third axis line extending parallel to the first axis line, and is movable from the first position, via the second position, to the third position, by the rotation in a first direction,

wherein the first side wall includes a sliding part on which a contact part of the detected body slides as the detected body moves from the first position to the third position, and

wherein one of the contact part and the sliding part includes an inclined surface so tilted as to be more apart from the first side wall as the inclined surface goes downstream in the first direction.

5. The cartridge according to claim 4, wherein the one of the contact part and the sliding part, including the inclined surface, includes a parallel surface extending continuously from the inclined surface downstream in the first direction and running parallel to the first side wall.

6. The cartridge according to claim 4 further comprising a transmission gear configured to transmit the driving force received by the passive unit to the detected body,

wherein the detected body includes a circumferential surface around the third axis line,

wherein a toothless portion is formed on a part of the circumferential surface, and gear teeth is formed on the remaining portion other than the toothless portion of the circumferential surface, and

wherein the gear teeth are engaged with the transmission gear while the detected body moves from the first position to the third position.

7. The cartridge according to claim 4 further comprising a pressing member configured to press the detected body to the first side wall.

8. The cartridge according to claim 7, further comprising a boss projecting from the first side wall in the moving direction,

wherein the pressing member includes a wire spring coiled around the boss and having one end contact with a side of the detected body opposite to the first side wall.

9. The cartridge according to claim 8, wherein the detected body includes a pressed surface with which the one end of the wire spring is in contact in the first direction when the detected body is in the third position.

10. The cartridge according to claim 7, wherein

the first side wall includes a side wall main body and a cover attached to an outer side of the side wall main body in the longitudinal direction to cover the detected body, and

the pressing member includes a coil spring interposed between the detected body and the cover and contacting the detected body.

11. The cartridge according to claim 2, further comprising a rotational body provided on the first side wall so as to be rotatable around a third axis line extending parallel to the first axis line,

wherein the rotational body is rotated in a second direction by the driving force received by the passive unit,

wherein the detected body is provided so as to be oscillateable in a moving direction parallel to the first axis line, and to maintain the position of the detected body around the third axis line,

wherein the rotational body includes an inclined surface on which a contact part of the detected body slides while the detected body moves from the first position to the third position, and

wherein the inclined surface is tilted so as to be more apart from the first side wall as the inclined surface goes upstream in the second direction.

12. The cartridge according to claim 11, wherein the rotational body includes a parallel surface extending continuously from the inclined surface upstream in the second direction and running parallel to the first side wall.

13. The cartridge according to claim 11 further comprising a transmission gear configured to transmit the driving force received by the passive unit to the rotational body,

wherein a toothless portion is formed on a portion of a circumferential surface around the third axis line, and gear teeth is formed on the remaining portion other than the toothless portion of the circumferential surface, and

wherein the gear teeth are engaged with the transmission gear while the detected body moves from the first position to the third position.

14. The cartridge according to claim 11 further comprising a pressing member configured to press the detected body against the first side wall.

15. The cartridge according to claim 14, further comprising a boss projecting from the first side wall in the moving direction,

wherein the pressing member includes a wire spring coiled around the boss and having one end contact a side of the detected body opposite to the first side wall.

16. The cartridge according to claim 14, wherein the first side wall includes a side wall main body and a cover so attached to an outer side of the side wall main body in the longitudinal direction to cover the detected body, and

wherein the pressing member includes a coil spring interposed between the detected body and the cover and contacting the detected body.

17. The cartridge according to claim 2, wherein the first side wall includes a side wall main body and a cover so attached to an outer side of the side wall main body in the longitudinal direction so as to cover the detected body, and

wherein the detected body is arranged within the cover when the detected body is in the first and third positions, and the detected body is exposed from the cover when the detected body is in the second position.

18. The cartridge according to claim 1 further comprising a developing roller provided between the first and the second side walls so as to be rotatable around a further axis line extending parallel to the first axis line at a distance, and to be rotated by the driving force received by the passive unit.

19. A cartridge comprising:

a housing configured to accommodate a developer therein, and including a first side wall and a second side wall opposed to the first side wall in a longitudinal direction;

a receiving unit configured to receive a driving force from outside, mounted at the first side wall, and configured to rotate around a first axis line parallel to the longitudinal direction; and

a detected body mounted at the first side wall and including a detected part configured to be detected by a detecting unit,

wherein the detected body is configured to advance outwards in the longitudinal direction with respect to the first side wall and is configured to retract inwards in the longitudinal direction with respect to the first side wall by the driving force received by the receiving unit.

20. The cartridge according to claim 19, further comprising an agitator configured to agitate the developer contained in the housing,

wherein the agitator is received by the first and second side walls so as to be rotatable around a second axis line extending parallel to the first axis line, and is configured to be rotated by the driving force received by the receiving unit,

wherein the detected body is configured to move in a moving direction parallel to the first axis line, and

wherein, the detected body is configured to move from a first position where a distance in the moving direction between the detected body and the first side wall is a first distance, via a second position where the distance in the moving direction between the detected body and the first side wall is a second distance larger than the first distance, to a third position where the distance in the moving direction between the detected body and the first side wall is a third distance smaller than the second distance.

21. The cartridge according to claim 20, wherein the first distance is the same as the third distance.

22. The cartridge according to claim 20, wherein the detected body is rotatably mounted around a third axis line extending parallel to the first axis line, and is configured to move from the first position, via the second position, to the third position, by the rotation in a first direction,

wherein the first side wall includes a sliding part on which a contact part of the detected body slides as the detected body moves from the first position to the third position, and

wherein one of the contact part and the sliding part includes an inclined surface tilted to be more apart from the first side wall as the inclined surface goes downstream in the first direction.

23. The cartridge according to claim 22, wherein the one of the contact part and the sliding part, including the inclined surface, includes a parallel surface extending continuously from the inclined surface downstream in the first direction and running parallel to the first side wall.

24. The cartridge according to claim 22, further comprising a transmission gear configured to transmit the driving force received by the receiving unit to the detected body,

wherein the detected body includes a circumferential surface around the third axis line,

wherein a toothless portion is formed on a part of the circumferential surface, and gear teeth is formed on the remaining portion other than the toothless portion of the circumferential surface, and

wherein the gear teeth are engaged with the transmission gear while the detected body moves from the first position to the third position.

25. The cartridge according to claim 22, further comprising a pressing member configured to press the detected body to the first side wall.

26. The cartridge according to claim 25, further comprising a boss projecting from the first side wall in the moving direction,

wherein the pressing member includes a wire spring coiled around the boss and having one end contact with a side of the detected body opposite to the first side wall.

27. The cartridge according to claim 26, wherein the detected body includes a pressed surface with which the one end of the wire spring is in contact in the first direction when the detected body is in the third position.

28. The cartridge according to claim 25, wherein

the first side wall includes a side wall main body and a cover attached to an outer side of the side wall main body in the longitudinal direction to cover the detected body, and

the pressing member includes a coil spring interposed between the detected body and the cover and contacting the detected body.

29. The cartridge according to claim 20, further comprising a rotational body provided at the first side wall so as to be rotatable around a third axis line extending parallel to the first axis line,

wherein the rotational body is configured to be rotated in a second direction by the driving force received by the receiving unit,

wherein the detected body is provided so as to move in a moving direction parallel to the first axis line, and to maintain the position of the detected body around the third axis line,

wherein the rotational body includes an inclined surface on which a contact part of the detected body slides while the detected body moves from the first position to the third position, and

wherein the inclined surface is tilted so as to be more apart from the first side wall as the inclined surface goes upstream in the second direction.

30. The cartridge according to claim 29, wherein the rotational body includes a parallel surface extending continuously from the inclined surface upstream in the second direction and running parallel to the first side wall.

31. The cartridge according to claim 29, further comprising a transmission gear configured to transmit the driving force received by the receiving unit to the rotational body,

wherein a toothless portion is formed on a portion of a circumferential surface around the third axis line, and gear teeth is formed on the remaining portion other than the toothless portion of the circumferential surface, and

wherein the gear teeth are engaged with the transmission gear while the detected body moves from the first position to the third position.

32. The cartridge according to claim 29, further comprising a pressing member configured to press the detected body against the first side wall.

33. The cartridge according to claim 32, further comprising a boss projecting from the first side wall in the moving direction,

wherein the pressing member includes a wire spring coiled around the boss and having one end contact a side of the detected body opposite to the first side wall.

34. The cartridge according to claim 32, wherein the first side wall includes a side wall main body and a cover attached to an outer side of the side wall main body in the longitudinal direction to cover the detected body, and

wherein the pressing member includes a coil spring interposed between the detected body and the cover and contacting the detected body.

35. The cartridge according to claim 20, wherein the first side wall includes a side wall main body and a cover attached to an outer side of the side wall main body in the longitudinal direction to cover the detected body, and

wherein the detected body is covered by the cover when the detected body is in the first and third positions, and the detected body is exposed from the cover when the detected body is in the second position.

36. The cartridge according to claim 19, further comprising a developing roller provided between the first and the second side walls so as to be rotatable around a further axis line extending parallel to the first axis line at a distance, and to be rotated by the driving force received by the receiving unit.