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— *with international search report (Art. 21(3))*

— *with amended claims and statement (Art. 19(1))*

[Continued on next page]

(54) **Title**: SOLENOID ACTUATOR

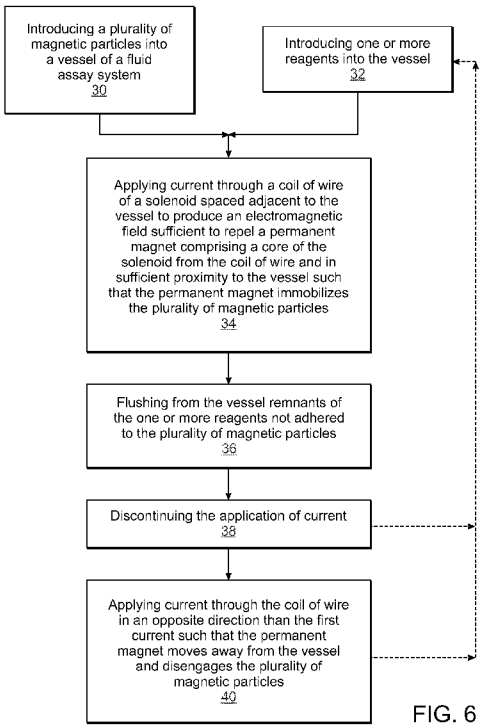

FIG. 6

(57) **Abstract**: A fluid assay system and a method for immobilizing magnetic particles within a fluid assay system are provided which employ a vessel for receiving magnetic particles and a solenoid actuator comprising a core component and a coil of wire wound around at least a portion of the core component. The solenoid actuator is configured such that an application of current through the coil of wire moves the core component toward the vessel. In some cases, core component includes a magnet to immobilize one or more magnetic particles disposed within the vessel. An embodiment of the solenoid actuator includes a telescoping body holding a core component and a coil of wire wound around at least a portion of the telescoping body.

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AMENDED CLAIMS
received by the International Bureau on
30 September 2009 (30.09.2009)

WHAT IS CLAIMED IS:

1. A fluid assay system, comprising:
a vessel; and
a solenoid actuator, comprising:
a telescoping body holding a magnetic core component; and
a coil of wire wound around at least a portion of the telescoping body, wherein the solenoid actuator is configured such that, upon application of current through the coil of wire, the magnetic core component moves toward the vessel.

2. The fluid assay system of claim 1, wherein the telescoping body is configured to extend the magnetic core component a distance from its retracted position greater than twice a length of the magnetic core component.

3. The fluid assay system of claim 1, wherein when the magnetic core component is retracted relative to the vessel, the solenoid actuator is spaced apart from the vessel by at least approximately 10 mm.

4. The solenoid actuator of claim 1, wherein a length of the telescoping body when condensed is less than approximately 15 mm.

5. The fluid assay system of claim 1, wherein the magnetic core component comprises a permanent magnet.

6. The fluid assay system of claim 5, wherein the permanent magnet is a rare earth magnet.

7. The fluid assay system of claim 5, wherein the permanent magnet comprises the opposing end of the magnetic core component.

8. The fluid assay system of claim 5, wherein the permanent magnet comprises a majority portion of the magnetic core component.

9. A solenoid actuator, comprising:
a telescoping body holding a magnetic core component; and
a coil of wire wound around at least a portion of the telescoping body.

10. The solenoid actuator of claim 9, wherein the telescoping body is configured to extend the magnetic core component a distance from its retracted position greater than twice a length of the magnetic core component.

11. The solenoid actuator of claim 9, wherein the coil of wire is wound such that the coil has a decreasing density of wire in the direction of outward movement of the magnetic core component.

12. The solenoid actuator of claim 9, wherein the inner diameter of the coil is less than three times a width dimension of the magnetic core component.

13. The solenoid actuator of claim 9, wherein a length of the telescoping body when condensed is less than approximately 15 mm.

14. The solenoid actuator of claim 9, wherein the magnetic core component comprises a permanent magnet.

15. The solenoid actuator of claim 14, wherein the permanent magnet is a rare earth magnet.

16. The solenoid actuator of claim 14, wherein the permanent magnet comprises at least a grade forty magnet.

17. A method for immobilizing magnetic particles within a fluid assay system, comprising:
introducing a plurality of magnetic particles into a vessel of a fluid assay system; and
applying a first current through a coil of wire of a solenoid spaced adjacent to the vessel to produce an electromagnetic field sufficient to repel a permanent magnet comprising a core of the solenoid from the coil of wire and in sufficient proximity to the vessel such that the permanent magnet immobilizes the plurality of magnetic particles.

18. The method of claim 17, further comprising discontinuing the application of first current, and wherein discontinuing the application of first current causes the permanent magnet to move away from the vessel and disengage the plurality of magnetic particles due to gravitational forces.

19. The method of claim 17, further comprising:
discontinuing the application of first current; and
applying a second current through the coil of wire in an opposite direction than the first current such that the permanent magnet moves away from the vessel and disengages the plurality of magnetic particles.

20. The method of claim 17, further comprising:
introducing one or more reagents into the vessel prior to applying the first current; and
during the step of applying the first current, flushing from the vessel remnants of the one or more reagents not adhered to the plurality of magnetic particles.

21. The method of claim 20, further comprising:
discontinuing the application of first current such that the permanent magnet moves away from the vessel and disengages the plurality of magnetic particles; and
introducing one or more additional reagents into the vessel subsequent to discontinuing the first current.

22. The method of claim 21, further comprising:
applying a second current through the coil such that the permanent magnet moves in sufficient proximity to the vessel to immobilize the plurality of magnetic particles subsequent to introducing the one or more additional reagents into the vessel; and
during the step of applying the second current, flushing from the vessel remnants of the one or more additional reagents not adhered to the plurality of magnetic particles.

23. A fluid assay system, comprising:
a vessel; and
a solenoid actuator, comprising:
a core with a permanent magnet; and
a coil of wire wound around at least a portion of the core, wherein the solenoid actuator is configured such that:
when the core is retracted relative to the vessel, the solenoid actuator comprises a thickness of less than approximately 15 mm from a base level of the coil of wire to an opposing end of the core and the solenoid actuator is spaced apart from the vessel by at least approximately 10 mm; and
when the core is fully extended toward the vessel, the permanent magnet is in close enough proximity to the vessel to immobilize one or more magnetic particles arranged therein.

24. The fluid assay system of claim 23, wherein the system is configured to prepare a fluid assay.

25. The fluid assay system of claim 23, wherein the solenoid actuator further comprises a telescoping body holding the core.

26. The fluid assay system of claim 23, wherein when the core is retracted relative to the vessel, the solenoid actuator is spaced apart from the vessel by at least approximately 20 mm.

27. The fluid assay system of claim 23, wherein the solenoid actuator is disposed below the vessel.

STATEMENT FOR AMENDMENTS UNDER ARTICLE 19

Via Facsimile: 011 41 22 338 8270

International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Dear Sir/ Madam:

This paper is submitted in response to the International Search Report mailed 30 July 2009 to explain the relevance of at least some of the claim amendments.

As noted in the accompanying Section 205(b) Letter for Amendments Under Article 19, claims 1-3, 5, 7-12 and 14 are replaced by amended claims bearing the same numbers. Claims 1-3, 5, 7-12 and 14 are amended to clarify that the claimed "core component" is a "magnetic core component." Support for the amendments made to claims 1-3, 5, 7-12 and 14 may be found throughout the originally filed specification, including but not limited to pages 3 and 4, which reference the claimed magnetic core component as a magnetic actuating core.

Respectfully submitted,

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