Certain methods and apparatus for generating a thin monolayer of cells on a slide advantageous for visual examination are described in U.S. Patent Nos. 5,143,627, 5,240,606, 5,269,918, 5,282,978, 6,572,824, 6,562,299 and 7,579,190.

According to one method in these patents, a patient's cells in a preservative fluid in a sample container are dispersed using a spinning sample collector disposed therein. A controlled vacuum is applied to the sample collector to draw the fluid through a screen filter thereof until a desired quantity and spatial distribution of cells is collected against the filter. Thereafter, the sample collector is removed from the sample container and the filter portion impressed against a glass slide to transfer the particles of interest to the slide in substantially the same spatial distribution as collected.

While apparatus manufactured according to the teachings of one or more of these patents have been commercially successful, such as the ThinPrep® 2000 and ThinPrep® 3000 Systems manufactured and sold by Cytyc Corporation located in Marlborough, Mass., such apparatuses require substantial capital investment and laboratory bench space.

Once a specimen is prepared, fixed, and stained, the specimen may be manually visually inspected by a cytotechnologist, typically under magnification, and with or without various sources of illumination. Alternatively or additionally, automated machine vision systems have been adapted to aid cytological inspection. For example, an automated vision system may perform a preliminary assessment of the entire slide on which the specimen is disposed to alert the cytotechnologist to potentially the most relevant areas of the slide for close inspection, or may be used to rescreen specimens already analyzed by the cytotechnologist.

SUMMARY

According to an aspect of the invention, a handheld apparatus for preparing a specimen slide is described, the handheld apparatus comprising a handle having a grip portion and an extension portion projecting from the grip portion; a filter holder assembly coupled to and extending from the extension portion of the handle; and a slide holder assembly coupled to and extending from the extension portion of the handle at a location spaced apart from the filter holder assembly, wherein the slide holder assembly comprises a first positioning member movably coupled to a second positioning member, and a slide holder movably coupled to the second positioning member by a hinge configured to allow a slide mounted in the slide holder to make rolling contact across a filter membrane of a filter

mounted on the filter holder assembly, wherein the first and second positioning members are configured to allow the slide holder to be rotated away from the filter holder assembly to facilitate access to the filter holder assembly for removing a filter therefrom or attaching a filter thereto.

In one embodiment, a handheld apparatus for preparing a specimen slide includes a handle, a filter holder assembly coupled to and extending from the handle, and a slide holder assembly coupled to and extending from the handle spaced apart from the filter holder assembly, wherein the slide holder assembly comprises a plurality of positioning members movably coupled to one another, and a slide holder movably coupled to one of the positioning members to allow a slide mounted on the slide holder to make rolling contact with an outward facing surface of a filter mounted on the filter holder assembly. The positioning members are preferably configured to allow the slide holder to be rotated away from the filter holder assembly to facilitate access to the filter holder assembly for removing a filter therefrom or attaching a filter thereto. In an exemplary embodiment, the handle has a

CLAIMS

1. A handheld apparatus for preparing a specimen slide, comprising:

a handle;

a filter holder assembly coupled to and extending from the handle; and

a slide holder assembly coupled to and extending from the handle spaced apart from the filter holder assembly, wherein the slide holder assembly comprises a plurality of positioning members movably coupled to one another, and a slide holder movably coupled to one of the positioning members to allow a slide mounted on the slide holder to make rolling contact with an outward facing surface of a filter mounted on the filter holder assembly.

2. The apparatus of claim 1, wherein the positioning members are configured to allow the slide holder to be rotated away from the filter holder assembly to facilitate access to the filter holder assembly for removing a filter therefrom or attaching a filter thereto.

3. The apparatus of claim 1, the handle having a grip portion and an extension portion projecting from the grip portion.

4. The apparatus of claim 3, wherein the respective filter holder assembly and slide holder assembly are attached to the extension portion of the handle at spaced apart locations.

5. The apparatus of claim 4, wherein the filter holder assembly extends from the extension portion of the handle in approximately the same direction as the grip portion extends from the extension portion.

6. The apparatus of claim 4, the filter holder assembly comprising a center shaft and a reciprocating cylindrical body disposed around and slidably coupled to the center shaft, the center shaft having a proximal end and a distal end relative to the extension portion of the handle, the center shaft including a shoulder at the proximal end and a sponge receptacle at the distal end, the sponge receptacle having an opening directed away from the extension portion.

7. The apparatus of claim 6, the filter holder assembly further comprising a spring disposed around the center shaft between the shoulder and the cylindrical body, wherein the spring generates a reciprocating counterforce when the cylindrical body is moved toward the shoulder.

8. The apparatus of claim 7, the filter holder assembly further comprising a sponge disposed in the sponge receptacle, where the sponge is larger than the receptacle and extends partially out of the opening.

9. The apparatus of claim 6, wherein the cylindrical body has a proximal end and a distal end relative to the extension portion of the handle, and wherein the cylindrical body includes a flange at the proximal end, the flange configured for a filter to be mounted thereon between the flange and the sponge receptacle, such that a membrane of the filter is disposed at a distal end of the sponge receptacle.

10. The apparatus of claim 9, the filter holder assembly further including one or more sealing members disposed around the cylindrical body and configured to form a fluid tight seal between the filter and the cylindrical body.

11. The apparatus of claim 6, wherein a first positioning member is coupled to a second positioning member by a first hinge, and the second positioning member is coupled to the slide holder by a second hinge, the first and second hinges respectively configured to allow the slide holder to be rotated away from the cylindrical body to facilitate access to the cylindrical body.

12. The apparatus of claim 11, further comprising an actuating member attached to the slide holder assembly adjacent the first hinge.

13. The apparatus of claim 6, wherein the slide holder assembly is configured to bring a slide mounted in the slide holder into initial contact with a filter membrane mounted on the cylindrical body at an oblique angle.

14. The apparatus of claim 13, wherein the oblique angle is in a range of about 2.5 degrees to about 7.5 degrees.

15. A handheld apparatus for preparing a specimen slide, comprising:

a handle;

a filter holder assembly coupled to and extending from the handle; and

a slide holder assembly coupled to and extending from the handle spaced apart from the filter holder assembly, wherein the slide holder assembly comprises a first positioning member movably coupled to a second positioning member, and a slide holder coupled to the second positioning member by a hinge configured to allow a slide mounted in the slide holder to make rolling contact across a filter membrane of a filter mounted on the filter holder assembly,

wherein the positioning members are configured to allow the slide holder to be rotated away from the filter holder assembly to facilitate access to the filter holder assembly for removing a filter therefrom or attaching a filter thereto.

16. The apparatus of claim 15, the handle having a grip portion and an extension portion projecting from the grip portion, wherein the respective filter holder assembly and slide holder assembly are attached to the extension portion of the handle at spaced apart locations.

17. The apparatus of claim 16, wherein the filter holder assembly extends from the extension portion of the handle in approximately the same direction as the grip portion extends from the extension portion.

18. A handheld apparatus for preparing a specimen slide, comprising,

a handle;

a filter holder assembly coupled to the handle; and

a slide holder assembly coupled to the handle,

wherein the filter holder assembly includes a center shaft and a reciprocating cylindrical body disposed around and slidably coupled to the center shaft, the cylindrical body configured for removably coupling a filter body, and

wherein the slide holder assembly includes a plurality of pivotally coupled positioning members and a slide holder movably coupled to one of the positioning members such that the

positioning members allow the slide holder to be rotated away from the cylindrical body on the filter holder assembly to facilitate access thereto, and further allow a slide mounted in the slide holder to make rolling contact across a membrane of a filter mounted on the cylindrical body.

19. The apparatus of claim 18, wherein the center shaft of the filter holder assembly has a proximal end and a distal end relative to the extension portion, and includes a shoulder at the proximal end and a sponge receptacle at the distal end, the sponge receptacle having an opening directed away from the extension portion, the filter holder assembly further comprising a spring disposed around the center shaft between the shoulder and the cylindrical body, wherein the spring generates a reciprocating counterforce when the cylindrical body is moved toward the shoulder.

20. The apparatus of claim 19, the filter holder assembly further comprising a sponge disposed in the sponge receptacle, where the sponge is larger than the receptacle and extends partially out of the opening.

21. A handheld apparatus for preparing a specimen slide, comprising:

a handle;

a filter holder assembly coupled to and extending from the handle; and

a slide holder assembly, wherein the slide holder assembly allows a slide mounted on the slide holder to make contact with a filter mounted on the filter holder assembly.

22. The apparatus of claim 21, wherein the slide holder assembly comprises a plurality of positioning members movably coupled to one another, the slide holder being movably coupled to one of the positioning members to allow a slide mounted on the slide holder to make rolling contact with a filter mounted on the filter holder assembly.

23. The apparatus of claim 21, the handle having a grip portion and an extension portion projecting from the grip portion, wherein the respective filter holder assembly and slide holder assembly are attached to the extension portion of the handle at spaced apart locations.

24. The apparatus of claim 23, wherein the filter holder assembly extends from the extension portion of the handle in approximately the same direction as the grip portion extends from the extension portion.

25. The apparatus of claim 24, the filter holder assembly comprising a center shaft and a reciprocating cylindrical body disposed around and slidably coupled to the center shaft, the center shaft having a proximal end and a distal end relative to the extension portion of the handle, the center shaft including a shoulder at the proximal end and a sponge receptacle at the distal end, the sponge receptacle having an opening directed away from the extension portion.

26. The apparatus of claim 25, the filter holder assembly further comprising a spring disposed around the center shaft between the shoulder and the cylindrical body, wherein the spring generates a reciprocating counterforce when the cylindrical body is moved toward the shoulder.

27. The apparatus of claim 26, the filter holder assembly further comprising a sponge disposed in the sponge receptacle, where the sponge is larger than the receptacle and extends partially out of the opening.

28. The apparatus of claim 25, wherein the cylindrical body has a proximal end and a distal end relative to the extension portion of the handle, and wherein the cylindrical body includes a flange at the proximal end, the flange configured for a filter to be mounted thereon between the flange and the sponge receptacle, such that a membrane of the filter is disposed at a distal end of the sponge receptacle.

29. The apparatus of claim 28, the filter holder assembly further including one or more sealing members disposed around the cylindrical body and configured to form a fluid tight seal between the filter and the cylindrical body.

30. The apparatus of claim 25, wherein the slide holder is attached to the extension portion of the handle via one or more rotatably coupled members configured to allow the

slide holder to be rotated away from the cylindrical body in order to facilitate access to the cylindrical body.

31. The apparatus of claim 25, wherein the slide holder assembly is configured to bring a slide mounted in the slide holder into initial contact with a filter membrane mounted on the cylindrical body at an oblique angle.

32. The apparatus of claim 31, wherein the oblique angle is in a range of about 2.5 degrees to about 7.5 degrees.

CLAIMS

1. A handheld apparatus for preparing a specimen slide, comprising:

a handle having a grip portion and an extension portion projecting from the grip portion;

a filter holder assembly coupled to and extending from the extension portion of the handle; and

a slide holder assembly coupled to and extending from the extension portion of the handle at a location spaced apart from the filter holder assembly, wherein the slide holder assembly comprises a first positioning member movably coupled to a second positioning member, and a slide holder movably coupled to the second positioning member by a hinge configured to allow a slide mounted in the slide holder to make rolling contact across a filter membrane of a filter mounted on the filter holder assembly,

wherein the first and second positioning members are configured to allow the slide holder to be rotated away from the filter holder assembly to facilitate access to the filter holder assembly for removing a filter therefrom or attaching a filter thereto.

2. The apparatus of claim 1, wherein the filter holder assembly extends from the extension portion of the handle in approximately the same direction as the grip portion extends from the extension portion.

3. The apparatus of claim 1, the filter holder assembly comprising a center shaft and a reciprocating cylindrical body disposed around and slidably coupled to the center shaft, the center shaft having a proximal end and a distal end relative to the extension portion of the handle, the center shaft including a shoulder at the proximal end and a sponge receptacle at the distal end, the sponge receptacle having an opening directed away from the extension portion.

4. The apparatus of claim 1, wherein the filter holder assembly includes a center shaft and a reciprocating cylindrical body disposed around and slidably coupled to the center shaft, the cylindrical body configured for removably coupling a filter body.

5. The apparatus of claim 4, wherein the center shaft of the filter holder assembly has a proximal end and a distal end relative to the extension portion, and includes a shoulder at the proximal end and a sponge receptacle at the distal end, the sponge receptacle having an opening directed away from the extension portion, the filter holder assembly further comprising a spring disposed around the center shaft between the shoulder and the cylindrical body, wherein the spring generates a reciprocating counterforce when the cylindrical body is moved toward the shoulder.

6. The apparatus of claim 5, the filter holder assembly further comprising a sponge disposed in the sponge receptacle, where the sponge is larger than the receptacle and extends partially out of the opening.

7. The apparatus of claim 5, wherein the cylindrical body has a proximal end and a distal end relative to the extension portion of the handle, and wherein the cylindrical body includes a flange at the proximal end, the flange configured for a filter to be mounted thereon between the flange and the sponge receptacle, such that a membrane of the filter is disposed at a distal end of the sponge receptacle.

8. The apparatus of claim 4, wherein the slide holder assembly is configured to bring a slide mounted in the slide holder into initial contact with a filter membrane mounted on the cylindrical body at an oblique angle.