an auxiliary bias voltage applying means for applying a bias voltage between the tunnel tip and the conductive film to produce a tunnel current flow between the tunnel tip and the conductive film, and

an auxiliary tunnel current detection means for detecting the tunnel current flow produced by the bias voltage applied by said auxiliary bias voltage applying means, so that the amount of current flow of said probe may be detected in accordance with the tunnel current detected by the auxiliary tunnel current detection means.

11. A scanning probe microscope according to claim **10**, wherein:

said cantilever includes a plate like electrically insulated member having one plane and another plane, a conductive member for connection of said probe and said auxiliary tunnel current detection means when said probe is provided on said one plane and said conductive film is provided on said another plane, and means for connecting said conductive film to ground.

12. A scanning probe microscope according to claim **11**, which further comprises a logarithm arithmetic means for finding the tunnel current flow detected by said auxiliary tunnel current detection means and for computing the distance between the tunnel tip and conductive film.

13. A scanning probe microscope according to claim **7**, wherein said first three-dimensional image data forming means and said second three-dimensional image forming means comprise arithmetic means for performing a digital arithmetic process on the tunnel current detected by the tunnel current detecting means to produce respective first and second three-dimensional image data.

14. A scanning probe microscope according to claim **7**, further comprising:

an auxiliary servo control means for providing said conveying means with feedback in response to the tunnel current detected by said tunnel current detecting means so as to maintain substantially constant the distance between the probe and sample, thereby causing said conveying means to convey the sample; and

connection switching means for executing selective connections of the auxiliary servo control means and said first-mentioned servo control means with said conveying means.

15. The microscope according to claim **2**, wherein the cantilever is formed of an optically transparent member at portions thereof for passing reflected characteristic light therethrough.

16. A microscope comprising:

a cantilever including a free end portion and a probe provided on the free end portion;

light emitting means for emitting a sample examination light onto a surface of a sample through the probe so that a portion of the surface of the sample onto which light is emitted generates characteristic light thereof;

scanning means for causing the probe to scan the surface of a sample while controlling the distance between the probe and the surface of the sample to be substantially constant on the basis of an interatomic force exerted between the probe and sample; and

means for detecting the characteristic light generated by the sample to thereby detect the characteristics of said portion of the surface of the sample onto which said sample examination light is emitted.

17. The microscope according to claim **16**, wherein said probe has a transparent tip through which sample examination light is emitted onto said sample surface.

18. A microscope comprising:

a lever means including a flexible portion and a probe provided on the flexible portion;

light emitting means for emitting a sample examination light onto a surface of a sample through the probe so that a portion of the surface of the sample onto which light is emitted generates characteristic light thereof;

scanning means for causing the probe to scan the surface of a sample while controlling the distance between the probe and the surface of the sample to be substantially constant on the basis of an interatomic force exerted between the probe and sample; and

means for detecting the characteristic light generated by the sample to thereby detect the characteristics of the portion of the surface of the sample onto which said sample examination light is emitted.

19. The microscope according to claim **18**, wherein:

said light emitting means includes a light source for emitting the sample examination light, and a guide means for guiding the sample examination light from the light source onto the flexible portion of the lever means; and

said lever means includes transparent portions at said flexible portion thereof and transparent portions of said probe portion through which said sample examination light passes and is radiated onto said sample surface portion.

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