[0004] A potential method to detect that the consumer plate in position is the use of an imaging system integrated into the main lab automation system. The imaging system may capture an image and, through complex algorithms, determine the presence of a sample holder on the sample block of the PCR system. Such a method is complex, costly, and tedious to implement. Other methods include the embedding of a sensitive load cell on the sample block module or the use of a barcode reader, which can detect the presence of the plate through a weight change or a barcode on the sample holder, respectively. However, such methods are costly to implement.

[0005] There is an increasing need to provide improved thermal cycler systems that address one or more of the above drawbacks.

Summary

[0006] In accordance with one embodiment, a thermal cycler system for use with a sample holder configured to receive a plurality of samples includes a sample block configured to receive the sample holder, a cover lid, a heated cover operatively coupled to the cover lid, and a drive assembly for moving the cover lid and the heated cover. The cover lid is configured to move in a direction toward the sample block from an open position to a closed position. The heated cover is configured to move in a direction toward the sample block from a raised position to a first lowered position, in which the heated cover contacts the sample holder when the sample holder is received by the sample block. The drive assembly includes a motion guide operatively coupled to the cover lid and to the heated cover. The motion guide is configured to move in a direction toward the sample block from a first position, wherein the cover lid is in the open position and the heated cover is in the raised position, to a second position, wherein the cover lid is in the closed position. The motion guide is further configured to move in a direction toward the sample block from the first position to a third position that is intermediate the first and second positions, wherein the cover lid is in the closed position and the heated cover is in the raised position.

CLAIMS

1. A thermal cycler system for use with a sample holder configured to receive a plurality of samples, the system comprising:

a sample block configured to receive the sample holder;

a cover lid configured to move in a direction toward the sample block from an open position to a closed position;

a heated cover operatively coupled to the cover lid, the heated cover configured to move in a direction toward the sample block from a raised position to a first lowered position, in which the heated cover contacts the sample holder when the sample holder is received by the sample block; and

a drive assembly for moving the cover lid and the heated cover, the drive assembly including a motion guide operatively coupled to the cover lid and to the heated cover, the motion guide being configured to move in a direction toward the sample block from a first position, wherein the cover lid is in the open position and the heated cover is in the raised position, to a second position, wherein the cover lid is in the closed position, the motion guide being further configured to move in a direction toward the sample block from the first position to a third position that is intermediate the first and second positions, wherein the cover lid is in the closed position and the heated cover is in the raised position.

2. The thermal cycler system of claim 1, wherein the heated cover is in the first lowered position when the motion guide is in the second position.

3. The thermal cycler system of claim 1, wherein the cover lid and the motion guide are coupled by at least one spring, the at least one spring being configured to compress when the motion guide moves in a direction toward the sample block from the third position to the second position.

4. The thermal cycler system of claim 1, wherein the motion guide includes at least one slot, the system further comprising:

a pressure bar coupled to the heated cover, the pressure bar including at least one projection configured to extend through the at least one slot,

wherein the at least one projection is configured to move through the at least one slot when the motion guide moves in a direction toward the sample holder from the third position to the second position.

5. The thermal cycler system of claim 4, wherein the heated cover moves in a vertical direction toward the sample block from the raised position when the motion guide moves from the third position toward the second position and the at least one projection slides through the at least one slot.

6. The thermal cycler system of claim 1, wherein when the sample holder is removed from the sample block the heated cover is configured to move in a direction toward the sample block from the first lowered position to a second lowered position, wherein the heated cover is in a position intermediate of the first lowered position and the sample block.

7. The thermal cycler system of claim 6, wherein the motion guide is configured to move in a direction toward the sample block from the second position to a fourth position, wherein the cover lid is in the closed position and the heated cover is in the second lowered position.

8. The thermal cycler system of claim 1, further comprising:

at least one guide for guiding the movement of the heated cover in a vertical direction from the raised position to the first lowered position.

9. The thermal cycler system of claim 1, wherein the drive assembly includes a belt drive system.

10. The thermal cycler system of claim 1, further comprising:

a housing configured to house the cover lid when the cover lid is in the open position.

11. The thermal cycler system of claim 10, wherein the housing comprises projections configured to prevent further movement of the cover lid in a direction away from the open position when the cover lid is in the closed position.

12. The thermal cycler system of claim 6, further comprising:

a first sensor configured to detect whether the heated cover is in the first lowered position.

13. The thermal cycler system of claim 12, further comprising:

a second sensor configured to detect whether the heated cover is in the second lowered position.

14. The thermal cycler system of claim 13, wherein the motion guide is configured to move in a direction toward the sample block from the second position to a fourth position when the sample holder is removed from the sample block, and the second sensor is configured to detect whether the motion guide is in the fourth position.

15. The thermal cycler system of claim 13, further comprising:

a third sensor configured to detect whether the motion guide is in the first position.