

CLAIMS:

1. A bonding apparatus, comprising:
 - a bonding tool for bonding a wire to a bonding surface;
 - 5 a bonding tool retainer configured to releasably retain the bonding tool;
 - a bonding tool holder configured to hold at least one bonding tool;
 - a bonding tool manipulator configured to transfer said bonding tool between said bonding tool holder and said bonding tool retainer; and
 - a bonding tool guide configured to guide said bonding tool to be received by said
 - 10 bonding tool retainer during transfer by said bonding tool manipulator;
 - wherein said bonding tool guide is locatable between the bonding tool manipulator and the bonding tool retainer, and defines a guiding aperture for the bonding tool manipulator to pass the bonding tool through the bonding tool guide from one side of the guiding aperture to an opposite side thereof to be received by the said bonding tool
 - 15 retainer during transfer by the bonding tool manipulator.
2. The bonding apparatus of claim 1, wherein said bonding tool retainer defines a retaining aperture configured to releasably retain said bonding tool and said bonding tool guide is configured to guide said bonding tool to be received by said retaining aperture
- 20 during transfer by said bonding tool manipulator.
3. The bonding apparatus of claim 2, wherein said bonding tool guide is shaped to direct said bonding tool to be received by said retaining aperture during transfer by said bonding tool manipulator.
- 25 4. The bonding apparatus of claim 2 or 3, wherein said bonding tool guide defines a receiving aperture which has a variable internal diameter to receive and guide said bonding tool during transfer by said bonding tool manipulator.
- 30 5. The bonding apparatus of claim 4, wherein said receiving aperture is dimensioned to have an internal diameter which is larger than a diameter of an external surface of said bonding tool.

6. The bonding apparatus of claim 4, wherein said receiving aperture narrows to fit an external surface of said bonding tool.

5 7. The bonding apparatus of claim 4, wherein the guiding aperture is coupled with said receiving aperture, and said guiding aperture is orientated to direct said bonding tool to be received by said retaining aperture during transfer by said bonding tool manipulator.

10 8. The bonding apparatus of claim 7, wherein said guiding aperture is elongate and has an internal diameter which is larger than a diameter of an external surface of said bonding tool for the bonding tool to pass through the guiding aperture.

15 9. The bonding apparatus of claim 7, comprising an alignment mechanism configured to align said bonding tool guide with said bonding tool retainer to align said bonding tool with said retaining aperture during transfer by said bonding tool manipulator.

20 10. The bonding apparatus of claim 9, wherein said alignment mechanism comprises a position indicator located at a fixed offset position with respect to said bonding tool guide and a position indicator detector configured to derive a position of said bonding tool guide from said position indicator.

11. The bonding apparatus of claim 10, wherein said position indicator detector comprises an optical detector configured to identify said position indicator.

25 12. The bonding apparatus of claim 10, wherein said alignment mechanism is configured to coaxially align said retaining aperture with respect to said guiding aperture of said bonding tool guide in response to said position derived from said position indicator.

30 13. The bonding apparatus of claim 2 or 3, comprising a misalignment sensor configured to identify a misalignment between said tool and said retaining aperture during transfer by said bonding tool manipulator.

14. The bonding apparatus of claim 13, wherein said misalignment sensor comprises a bond head motor controller configured to detect an increase in motor current indicative of said misalignment between said tool and said retaining aperture during transfer by said bonding tool manipulator.

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15. The bonding apparatus of claim 7, wherein said bonding tool holder is configured to be positionable to present a bonding tool at a transfer position for transfer by said bonding tool manipulator to said retaining aperture, said bonding tool at said transfer position being coaxially aligned with said guiding aperture.

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16. The bonding apparatus of any one of claims 1 to 3, wherein said bonding tool manipulator comprises a gripper configured to releasably grip said bonding tool.

17. The bonding apparatus of any one of claims 1 to 3, wherein said bonding tool manipulator is configured to grip said bonding tool held by said bonding tool holder and transfer said bonding tool to said bonding tool retainer by inserting said bonding tool through said bonding tool guide.

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18. The bonding apparatus of claim 2 or 3, wherein said bonding tool retainer comprises a clamping gripper configured to vary a size of said retaining aperture and a clamping actuator configured to actuate said clamping gripper.

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19. The bonding apparatus of claim 18, wherein said clamping gripper comprises an operating structure configured to engage with a complementary operating structure of said clamping actuator by receiving one of said operating structure and said complementary operating structure within the other of said operating structure and said complementary operating structure.

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20. A method for operating the bonding apparatus of claim 1, comprising the steps of:
providing a bonding tool holder configured to hold at least one bonding tool for bonding a wire to a bonding surface;
positioning a bonding tool retainer configured to releasably retain said bonding tool;

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positioning a bonding tool guide configured to guide said bonding tool during transfer of said bonding tool between said bonding tool holder and said bonding tool retainer; and

5 transferring said bonding tool between said bonding tool holder and said bonding tool retainer via said bonding tool guide with a bonding tool manipulator.