CLAIMS

1. A shaft distortion correcting apparatus comprising:

a measurement unit configured to measure runout of a workpiece; and

a controller configured to control the measurement unit,

wherein the measurement unit includes:

a plurality of measurement modules configured to measure the runout of the workpiece; and

a first measurement module moving unit configured to move the plurality of measurement modules individually in an X direction being an axial direction of the workpiece.

2. The shaft distortion correcting apparatus according to claim 1,

wherein the first measurement module moving unit is configured to change spacing between the plurality of measurement modules.

3. The shaft distortion correcting apparatus according to claim 1,

wherein the first measurement module moving unit is configured to move each of the measurement modules to a corresponding predetermined position in the X direction.

4. The shaft distortion correcting apparatus according to claim 1,

wherein the first measurement module moving unit includes a first linear actuator configured to drive the measurement modules in the X direction.

5. The shaft distortion correcting apparatus according to claim 1,

wherein the first measurement module moving unit includes a catcher configured to releasably connect a movable part of the first measurement module moving unit and the measurement modules.

6. The shaft distortion correcting apparatus according to claim 5,

wherein the catcher includes:

a convex part; and

a concave part configured to engage with the convex part,

wherein the convex part is attached to one of the movable part of the first measurement module moving unit and the measurement module, and the concave part is attached to the other of the first measurement module moving unit and the measurement module.

7. The shaft distortion correcting apparatus according to claim 6,

wherein one of the convex part and the concave part is attached to the movable part,

wherein the first measurement module moving unit includes a second linear actuator configured to move the one of the convex part and the concave part toward and away from the other, and

wherein operation of the second linear actuator causes engagement and disengagement between the convex part and the concave part.

8. The shaft distortion correcting apparatus according to claim 1,

comprising a second measurement module moving unit configured to move the measurement module in a direction toward and away from the workpiece.

9. The shaft distortion correcting apparatus according to claim 8,

wherein the second measurement module moving unit includes a third linear actuator configured to drive the measurement module in the direction toward and away from the workpiece.

10. The shaft distortion correcting apparatus according to claim 1,

comprising a first linear guide configured to support the measurement module so as to be movable in the X direction,

wherein the first linear guide includes:

a first rail extending in the X direction; and

a first carriage movable along the first rail,

wherein the measurement module is supported by the first carriage.

11. The shaft distortion correcting apparatus according to claim 10,

wherein the first linear guide includes a plurality of the first carriages, and

wherein one of the measurement modules is provided on each of the first carriages.

12. The shaft distortion correcting apparatus according to claim 10,

comprising a base,

wherein the first rail is attached to the base.

13. The shaft distortion correcting apparatus according to claim 10,

comprising a second measurement module moving unit configured to move the measurement module in a direction toward and away from the workpiece,

wherein the second measurement module moving unit includes a third linear actuator configured to drive the measurement module in the direction toward and away from the workpiece,

wherein the second measurement module moving unit includes a base supported by the first linear guide so as to be movable in the X direction,

wherein the third linear actuator is mounted on the base, and

wherein the measurement module is mounted on a movable part of the third linear actuator.

14. The shaft distortion correcting apparatus according to claim 13,

wherein the second measurement module moving unit includes a plurality of the bases, and

wherein one of the third linear actuators is mounted on each of the bases.

15. The shaft distortion correcting apparatus according to claim 8,

wherein the measurement module includes a probe extending in a direction perpendicular to the X direction,

wherein the measurement module moving unit is configured to move the measurement module between:

a measurement position where the probe contacts the workpiece and can measure runout of the workpiece; and

a retracted position where the probe is separated from the workpiece.

16. The shaft distortion correcting apparatus according to claim 15,

wherein the measurement module includes a first pivot drive unit configured to pivotally drive the probe about a first pivot axis parallel to the workpiece.

17. The shaft distortion correcting apparatus according to claim 1, comprising:

an anvil configured to support the workpiece;

and

an anvil moving unit configured to move the anvil in the X direction,

wherein the anvil moving unit includes a second linear guide configured to support the anvil so as to be movable in the X direction.

18. The shaft distortion correcting apparatus according to claim 17,

comprising a correction unit configured to bend the workpiece to correct distortion of the workpiece,

wherein the correction unit includes:

the anvil;

and

the anvil moving unit,

wherein the anvil moving unit includes a driving unit configured to drive the anvil in the X direction,

wherein the controller controls the driving unit to move the anvil to a predetermined position in the X direction according to the workpiece.

19. The shaft distortion correcting apparatus according to claim 18,

wherein the correction unit includes a workpiece driving unit configured to rotationally drive the workpiece,

wherein the workpiece driving unit includes:

a second fixed frame;

a second movable frame connected to the second fixed frame pivotably about a pivot axis perpendicular to the X direction;

a second pivot drive unit configured to pivotally drive the second movable frame;

a shaft rotatably supported by the second movable frame;

an actuator configured to rotationally drive the shaft; and

a second roller attached to a distal end portion of the shaft,

wherein the second pivot drive unit pivots the second roller between:

an operating position where the second roller contacts an end portion of the workpiece such that the second roller and the workpiece constitute a friction wheel; and

a retracted position where the second roller is separated from the workpiece.

20. The shaft distortion correcting apparatus according to any one of claim 17,

wherein the controller:

determines a correction location of the workpiece based on a measurement result obtained by the measurement unit; and

controls the anvil moving unit to move the anvil to a position corresponding to the correction location.