CLAIMS

What is claimed is:

1. An apparatus configured for at least one of removing or installing a turbine of a turbomachine, wherein the turbomachine includes a casing in which the turbine is housed while the turbine is in operation and during use of the apparatus; the apparatus comprising:

an operative head configured to engage an axial sidewall of a turbine blade base;

an actuator configured to move the operative head to selectively engage the axial sidewall of the turbine blade base and impart an axial force against the turbine blade base to remove or install the turbine blade; and

a support gantry configured to position the actuator substantially vertically above the turbine blade in position in the turbomachine, the support gantry configured to mount to the casing in which the turbine is positioned for the removing or installing a turbine blade.

2. The apparatus of claim 1, wherein the support gantry is configured to mount to a portion of the turbomachine in which the turbine blade is positioned, the portion of the turbomachine including a structure that is at least one of: adjacent to the turbine, or in which the turbine is positioned.

3. The apparatus of claim 2, wherein the support gantry is configured to mount to opposing sides of a lower half-joint casing in which the turbine is positioned, and an exhaust hood adjacent to the turbine.

4. An apparatus configured for at least one of removing or installing a turbine of a turbomachine, wherein the turbomachine includes a casing in which the turbine is housed while the turbine is in operation and during use of the apparatus; the apparatus comprising:

an operative head configured to engage an axial sidewall of a turbine blade base;

an actuator configured to move the operative head to selectively engage the axial sidewall of the turbine blade base and impart an axial force against the turbine blade base to remove or install the turbine blade; and

a support gantry configured to position the actuator substantially vertically above the turbine blade in position in the turbomachine, the support gantry configured to mount to the casing in which the turbine is positioned for the removing or installing a turbine blade,

wherein the actuator includes:

a mount member configured to couple to the support gantry;

a slide system configured to slidably move the operative head relative to the mount member; and

a linear actuator configured to selectively move the slide system axially relative to the mount member to apply the axial force; and

wherein the operative head includes an arm operatively coupled to the actuator, and wherein the actuator further includes a coupler configured to selectively position the mount member between:

a first state in which the mount member is axially and pivotally fixed to an axially-extending support member of the support gantry and the arm is configured to extend substantially vertically adjacent a first stage of a plurality of turbine blade stages, and

a second state in which the mount member is pivotable relative to the axially-extending support member to position the arm radially outside of any turbine blade on the turbine, and axially movable along the axially-extending support member of the support gantry,

wherein, in the second state, the actuator is movable along the axially-extending support member for positioning relative to a different second stage of the plurality of turbine blades.

5. An apparatus configured for at least one of removing or installing a turbine blade from a turbine of a turbomachine, wherein the turbomachine includes a casing in which the turbine is housed while the turbine is in operation and during use of the apparatus, the apparatus comprising:

an operative head configured to engage an axial sidewall of a turbine blade base, the operative head including an arm;

an actuator configured to move the operative head to selectively engage the axial sidewall of the turbine blade base and impart an axial force against the turbine blade base for the at least one of removing or installing the turbine blade; and

a support gantry configured to position the actuator substantially vertically above the turbine blade while the turbine is positioned within the casing,

wherein the actuator further includes:

a mount member configured to couple to the support gantry; and

a coupler configured to selectively position the mount member between:

a first state in which the mount member is axially and pivotally fixed to an axially-extending support of the support gantry and the arm extends substantially vertically adjacent a first stage of a plurality of turbine blade stages, and

a second state in which the mount member is pivotable relative to the axially-extending support member to position the arm radially outside of any turbine blade on the turbine, and axially movable along the axially-extending support member of the support gantry,

wherein, in the second state, the actuator is movable along the axially-extending support member for positioning relative to a different second stage of the plurality of turbine blades.

6. The apparatus of claim 5, further comprising a vibrating assembly including a vibratory drive mechanism coupled to the arm.

7. The apparatus of claim 5, wherein the support gantry includes a plurality of adjustable support members configured to accommodate a plurality of different turbines.

8. The apparatus of claim 5, wherein the operative head includes a vertically extending arm operatively coupled to the actuator, wherein the vertically extending arm is selected from a set of different length arms.

9. The apparatus of claim 8, wherein the actuator further includes:

a slide system configured to slidably move the operative head relative to the mount member; and

a linear actuator configured to selectively move the slide system axially relative to the mount member.

10. The apparatus of claim 5, wherein the support gantry mounts to opposing sides of a half-joint casing in which the turbine is positioned, and an exhaust hood adjacent to the turbine.

11. A method for at least one of removing or installing a turbine blade from a turbine of a turbomachine, wherein the turbomachine includes a casing in which the turbine is housed while the turbine is in operation and during the method of at least one of removing or installing, the method comprising:

mounting an apparatus to a portion of a turbomachine, the apparatus including an operative head configured to engage an axial sidewall of a turbine blade base, an actuator configured to move the operative head to selectively engage the axial sidewall of the turbine blade base and impart an axial force against the turbine blade base, and a support gantry configured to position the actuator and the operative head substantially vertically above the turbine blade; and

mechanically actuating the turbine blade base relative to the turbomachine by applying the axial force against the turbine blade base through the operative head, such that the turbine blade base transfers into or out of a rotor wheel of a first stage of turbine blades.

12. The method of claim 11, further comprising:

coupling a vibrating assembly to the operative head of the apparatus; and

vibrating the turbine blade base concurrently with applying the axial force.

13. The method of claim 11, further comprising moving the operative head to engage the turbine blade base, before mechanically actuating the turbine blade base.

14. A method for installation or removal of a turbine blade from a turbine of a turbomachine, the method comprising:

mounting an apparatus to a portion of a turbomachine, the apparatus including an operative head configured to engage an axial sidewall of a turbine blade base, an actuator

configured to move the operative head to selectively engage the axial sidewall of the turbine blade base and impart an axial force against the turbine blade base, and a support gantry configured to position the actuator and the operative head substantially vertically above the turbine blade; and

mechanically actuating the turbine blade base relative to the turbomachine by applying the axial force against the turbine blade base through the operative head, such that the turbine blade base transfers into or out of a rotor wheel of a first stage of turbine blades;

wherein the operative head includes an arm extending from the actuator, and further comprising:

first rotating the actuator so as to rotate the arm from a first operative position adjacent the rotor wheel of the first stage of turbine blades to a position radially outside of any turbine blades on the turbine;

axially moving the actuator along an axially-extending support member of the support gantry to an inoperative position in which the arm is radially outside of and axially over a space adjacent a different, second stage of turbine blades of the turbomachine;

second rotating the actuator so as to rotate the arm from the inoperative position to a second operative position adjacent the different, second stage of turbine blades; and

repeating the mechanical actuating the turbine blade base relative to the turbomachine by applying the axial force against the turbine blade base through the

operative head, such that a turbine blade base transfers into or out of a rotor wheel of the different, second stage of turbine blades.

15. The method of claim 14, wherein the mounting includes mounting the support gantry to opposing sides of a half-joint casing in which the turbine is positioned, and an exhaust hood adjacent to the turbine in the turbomachine.