CLAIMS

What is claimed is:

1. A flexible high pressure fluid cleaning lance positioning and drive apparatus comprising:

a guide rail having a portion adapted to be inserted into a heat exchanger water box and having a longitudinal axis;

a tractor drive module mounted on the guide rail for movement along the guide rail into and out of the water box;

a high pressure fluid hose drive module connected to the tractor drive module on the guide rail operable to propel a flexible high pressure fluid lance hose along an axis parallel to the guide rail longitudinal axis; and

an angle guide rotator module mounted on the guide rail and connected to the tractor module for adjustably positioning an angle guide tube in registry with a tubular object accessible from the water box to be cleaned and guiding the flexible high pressure fluid lance hose through the angle guide tube into the tubular object to be cleaned.

2. The apparatus according to claim 1 wherein the tractor drive module is connected to the hose drive module by a conduit for carrying the flexible high pressure fluid lance hose.

3. The apparatus according to claim 1 further comprising a hose take-up drum module proximate the guide rail and spaced from the hose drive module operable to collect and dispense the high pressure fluid hose from and to the hose drive module.

4. The apparatus according to claim 2 wherein the high pressure fluid hose is a helix coil clad hose.

5. The apparatus according to claim 2 wherein the rotator module includes a curved tube having one end aligned with the hose drive module and an open end

directed at a right angle from the guide tube axis and a drive motor connected to the curved tube for rotating the curved tube about the one end.

6. The apparatus according to claim 1 wherein the tractor module is rollably supported on the guide rail.

7. The apparatus according to claim 6 wherein the rotator module is rollably supported on the guide rail.

8. The apparatus according to claim 1 wherein each of the rotator and tractor modules are rollably supported on the guide rail by two rollers riding on one rib of the guide rail and one roller riding on a parallel rib of the guide rail.

9. The apparatus according to claim 1 wherein the rotator module rotates a tubular sleeve receiving therein a guide tube fastened to both the tractor module and the hose drive module.

10. The apparatus according to claim 9 wherein the rotator module is connected to the tractor module by an elongated link and the tubular sleeve does not contact the guide tube.

11. A flexible high pressure fluid cleaning lance positioning and drive apparatus comprising:

an elongated guide rail having a longitudinal axis, a portion adapted to be inserted into a heat exchanger water box and a top wall defined by two parallel ribs extending parallel to the longitudinal axis of the guide rail;

a tractor drive module mounted on the ribs of the guide rail;

a high pressure fluid hose drive module connected to the tractor drive module on the guide rail operable to propel a flexible high pressure fluid lance hose along an axis parallel to the guide rail longitudinal axis; and

an angle guide rotator module mounted on the ribs of the guide rail and connected to the tractor module for positioning an angle guide tube carrying a rotatable high pressure nozzle carried by the flexible lance hose in registry with a tubular object accessible from the water box to be cleaned.

12. The apparatus according to claim 11 wherein the tractor drive module is connected to the hose drive module by a conduit for carrying the flexible lance hose and has a spur gear engaging notches in the top wall of the guide rail to propel the tractor drive module along the guide rail.

13. The apparatus according to claim 11 further comprising a hose take-up drum module mounted on the guide rail and spaced from the hose drive module operable to collect and dispense the flexible lance hose from and to the hose drive module.

14. The apparatus according to claim 12 wherein the tractor module is connected to the rotator module by a link spaced from a guide tube for carrying the flexible lance hose.

15. The apparatus according to claim 12 wherein the rotator module includes a tubular geared sleeve receiving the flexible lance hose guide tube, a curved guide tube having one end aligned with the flexible lance hose guide tube from the hose drive module, wherein the curved guide tube has an open end directed at an angle from the guide tube axis, and a drive motor connected to the sleeve for rotating the curved tube about the one end.

16. The apparatus according to claim 11 wherein the tractor module is rollably supported on the guide rail.

17. The apparatus according to claim 16 wherein the rotator module is rollably supported on the guide rail.

18. The apparatus according to claim 11 wherein each of the rotator and tractor modules are rollably supported on the guide rail by two rollers riding on one rib of the guide rail and one roller riding on a parallel rib of the guide rail.

19. The apparatus according to claim 11 wherein the rotator module rotates a tubular sleeve receiving therein the hose guide tube and wherein the guide tube is fastened to both the tractor module and the flexible lance hose drive module.

20. The apparatus according to claim 19 wherein the rotator module is connected to the tractor module by an elongated link and the tubular sleeve is concentric to the hose guide tube.