What is claimed is:

1. A tensioner (11) for maintaining a tensile force in a riser (13) having an axis (39) and extending from a subsea wellhead assembly through an opening (15) in a floating platform deck (17), the tensioner (11) comprising:

a tensioner ring (21) coupled to the riser (13);

a plurality of hydro-pneumatic cylinders (35), each having flexible joints (33) on opposite ends for coupling the cylinders (35) between the deck (17) and the tensioner ring (21);

the plurality of hydro-pneumatic cylinders (35) moveable in at least one plane between a running position and a tensioning position by remote actuation; and

the cylinders (35) adapted to automatically couple to the tensioner ring (21) after moving from the running position to the tensioning position.

2. The tensioner (11) of Claim 1, wherein:

the plurality of cylinders (35) comprise cylinder pairs (35G, 35G'), each cylinder pair (35G, 35G') having a first cylinder (35G) and a second cylinder (35G'), the first and second cylinders (35G, 35G') having lower ends arranged circumferentially around the opening (15) such that the lower end of the first cylinder (35G) of each cylinder pair (35G, 35G') is near the lower end of the second cylinder (35G');

the upper end of the first cylinder (35G) couples to the tensioner ring (21) offset from a plane (42) passing through the lower end of the first cylinder (35G) and the axis (39); and

the upper end of the second cylinder (35G') couples to the tensioner ring (21) offset from a plane (44) passing through the lower end of the second cylinder (35G') and the axis (39), the second cylinder (35G') offset equivalent to the first cylinder (35G) offset in the opposite direction, thereby causing the first and second cylinders (35G, 35G') to exert rotational forces in opposite directions.

3. The tensioner (11) of Claim 1, further comprising a plurality of mechanical stops (31) for limiting pivot of the cylinders (35) relative to the riser axis (39), each mechanical stop (31) adapted to be coupled to the deck (17) outboard from a corresponding cylinder (35) to limit outboard tilting of a corresponding cylinder (35).

4. The tensioner (11) of Claim 1, further comprising a plurality of extensible fluid placement cylinders (53), each coupled to one of the hydro-pneumatic cylinders (35) for tilting each hydro-pneumatic cylinder (35) from the running position when the riser (13) is being installed to the tensioning position.

5. The tensioner (11) of Claim 1, further comprising:

a guide roller assembly (23) that is adapted to mount to the deck (17) and roll along the riser (13); and

a conductor sleeve (61) extending from the tensioner ring (21) parallel to the riser (13) and adapted to interface with rollers (47) of the guide roller assembly (23) so that when the riser (13) rotates relative to the deck (17), the conductor sleeve (61) will resist rotation of the tensioner (11) and the riser (13) through react forces exerted by the guide roller assembly (23).

6. The tensioner (11) of Claim 1, wherein the conductor sleeve (61) defines axial slots (73) for receiving the rollers (47) and allowing the rollers (47) to abut a surface of the riser (13).

7. The tensioner (11) of Claim 1, where the tensioner (11) further comprises:

a plurality of guidance receptacles (22) mounted to a lower portion of the tensioner ring (21), each guidance receptacle (22) corresponding to a respective hydro-pneumatic cylinder (35);

the guidance receptacles (22) each defining an interior cavity adapted to receive an upper end of a respective cylinder (35); and

a plurality of engagement assemblies mounted to the guidance receptacles (22) and the upper ends of the cylinders (35) so that the cylinders (35) will automatically couple to the tensioner ring (21) when the upper end of each cylinder (35) is inserted into a respective interior cavity of a guidance receptacle (22).

8. The tensioner (11) of Claim 7, wherein the engagement assemblies comprise:

an annular channel defined by an exterior surface of an upper end (33) of the cylinder (35);

a lock ring (36) mounted within the annular channel and biased to a radially outward position;

a lock channel (28) defined in an interior diameter surface of the guidance receptacle (22);

the lock ring (36) and the lock channel (28) having matching mating profiles adapted to allow axial movement upward relative to one another and prevent axial movement downward relative to one another when the lock ring (36) inserts into the lock channel (28);

a retraction ring (52) circumscribing the upper end of the cylinder (35) axially beneath the lock ring (36); and

the retraction ring (52) adapted to move axially upward and release the lock ring (36) from engagement with the lock channel (28).

9. The tensioner (11) of Claim 1, wherein each cylinder (35) within the plurality of cylinders (35) being capable of assuming a different amount of extension when the riser (13) is tilted relative to the deck (17).

10. A tensioner (11) for maintaining a tensile force in a riser (13) having an axis (39) and extending from a subsea wellhead assembly through an opening (15) in a floating platform deck (17), the tensioner (11) comprising:

a tensioner ring (21) for coupling to the riser (13);

a plurality of hydro-pneumatic cylinders (35), extending between the deck (17) and the tensioner ring (21);

a guide roller assembly (23) that is adapted to mount to the deck (17) and roll along the riser (13); and

a conductor sleeve (61) extending from the tensioner ring (21) parallel to the riser (13) and adapted to interface with rollers (47) of the guide roller assembly (23) so that when the riser (13) rotates relative to the deck (17), the conductor sleeve (61) will resist rotation of the tensioner (11) through react forces exerted by the guide roller assembly (23) and when the tensioner (11) imparts rotation to the riser (13), the conductor sleeve (61) will resist rotation of the riser (13) through react forces exerted by the guide roller assembly (23).

11. The tensioner (11) of Claim 10, wherein:

the plurality of hydro-pneumatic cylinders (35) being moveable in at least one plane between a running position and a tensioning position by remote actuation;

the cylinders (35) adapted to automatically couple to the tensioner ring (21) after moving from the running position to the tensioning position;

a plurality of extensible fluid placement cylinders (53), each coupled to one of the hydro-pneumatic cylinders (35) for tilting each hydro-pneumatic cylinder (35) from the running position when the riser (13) is being installed to the tensioning position; and

a plurality of mechanical stops (31) for limiting pivot of the cylinders (35) relative to the riser axis (39), each mechanical stop (31) adapted to be coupled to the deck (17) outboard from a corresponding cylinder (35), each mechanical stop (31) has a partially cylindrical receptacle (37) to receive one of the hydro-pneumatic cylinders (35) when the hydro-pneumatic cylinder (35) is perpendicular to the deck (17).

12. The tensioner (11) of Claim 11, further comprising:

a plurality of guidance receptacles (22) mounted to a lower portion of the tensioner ring (21), each guidance receptacle (22) corresponding to a respective hydro-pneumatic cylinder (35);

the guidance receptacles (22) each defining an interior cavity adapted to receive an upper end (33) a respective cylinder (35);

an annular channel defined by an exterior surface of an upper end (33) of each cylinder (35);

a lock ring (36) mounted within each annular channel and biased to a radially outward position;

a lock channel (28) defined in an interior diameter surface of each guidance receptacle (22) ;

the lock ring (36) and the lock channel (28) having matching mating profiles adapted to allow axial upward movement relative to one another and prevent axial downward movement relative to one another when the lock ring (36) inserts into the lock channel (28);

a retraction ring (52) circumscribing the upper end of the cylinder (35) axially beneath the lock ring (36); and

the retraction ring (52) adapted to move axially and release the lock ring (36) from engagement with the lock channel (28).

13. The tensioner (11) of Claim 10, wherein the conductor sleeve (61) defines axial slots (73) for receiving the rollers (47) and allowing the rollers (47) to abut a surface of the riser (13).

14. The tensioner (11) of Claim 10, wherein ribs (63) are formed in an exterior diameter portion of the conductor sleeve (61), the ribs (63) extending the axial length of the conductor sleeve (61).

15. A method for tensioning a riser (13) passing through an opening (15) in a deck (17) of a platform comprising:

(a) placing a plurality of hydro-pneumatic cylinders (35) around the opening (15);

(b) flexibly connecting a first end of each cylinder (35) to the deck (17);

(c) moving the cylinders (35) from a running position perpendicular to the deck (17) to a tensioning position at an angle to the deck (17);

(d) automatically coupling a second end of each cylinder (35) to a tensioner ring (21) coupled to the riser (13); and

(e) as the riser (13) tilts relative to the platform, allowing the cylinders (35) to move in more than one plane.

16. The method of Claim 15, wherein step (c) comprises:

flexibly securing lower ends of the cylinder (35) to the deck (17);

tilting upper ends of the cylinder (35) outboard relative to an axis (39) of the opening (15);

lowering the riser (13) through the opening (15); then

tilting the upper ends of the cylinders (35) inboard.

17. The method of Claim 16, wherein tilting the upper ends inboard comprises coupling placement cylinders (53) to the hydro-pneumatic cylinders (35) and actuating the placement cylinders (53) to tilt the hydro-pneumatic cylinders (35).

18. The method of Claim 15, wherein step (d) comprises:

inserting an upper end of each cylinder (35) into a corresponding guidance receptacle (22) mounted to a lower portion of the tensioner ring (21); and

inserting a clip (36) secured to the upper end of each cylinder (35) into a corresponding channel (28) of each guidance receptacle, thereby coupling each cylinder (35) to the tensioner ring (21).

19. The method of Claim 15, wherein step (e) comprises allowing at least one of the cylinders (35) to contract more than at least one other of the cylinders (35).

20. The method of Claim 15, wherein step (e) further comprises preventing any of the cylinders (35) from tilting outboard more than ninety degrees relative to an axis (39) of the riser (13).

What is claimed is:

1. A tensioner for maintaining a tensile force in a riser having an axis and extending from a subsea wellhead assembly through an opening in a floating platform deck, the tensioner comprising:

a tensioner ring adapted to be coupled to the riser and having an axis;

a plurality of hydro-pneumatic cylinders, each having flexible joints on upper and lower ends for coupling the hydro-pneumatic cylinders between the deck and the tensioner ring;

the hydro-pneumatic cylinders being pivotal between a running position, wherein the upper ends of the hydro-pneumatic cylinders are pivoted outward from the axis while the riser is lowered through the opening, and a tensioning position wherein the hydro-pneumatic cylinders are pivoted inward toward the axis and coupled to the tensioner ring; and

a plurality of mechanical stops for limiting the outward pivotal movement of the hydro-pneumatic cylinders, each of the mechanical stops adapted to be coupled to the deck outboard from a corresponding one of the hydro-penumatic cylinders.

2. The tensioner of claim 1, wherein:

the plurality of cylinders comprise cylinder pairs, each cylinder pair having a first cylinder and a second cylinder, the lower ends of the first and second cylinders arranged circumferentially around the opening such that the lower end of the first cylinder of each cylinder pair is near the lower end of the second cylinder;

the upper end of the first cylinder couples to the tensioner ring offset from a plane passing through the lower end of the first cylinder and the axis; and

the upper end of the second cylinder couples to the tensioner ring offset from a plane passing through the lower end of the second cylinder and the axis, the second cylinder offset equivalent to the first cylinder offset in the opposite direction, thereby causing the first and second cylinders to exert rotational forces in opposite directions.

3. The tensioner of claim 1, wherein:

the mechanical stops are adapted to be coupled to the deck at a position that allows the hydro-pneumatic cylinders to be at least vertically oriented while in the running position.

4. The tensioner of claim 1, further comprising a plurality of extensible fluid placement cylinders, each coupled to one of the hydro-pneumatic cylinders for tilting each hydro-pneumatic cylinder from the running position when the riser is being installed to the tensioning position.

5. The tensioner of claim 1,

wherein each of the mechanical stops comprises a curved receptacle for receiving a portion of one of the hydro-pneumatic cylinders while in the running position.

6. The tensioner of claim 1, wherein each of the mechanical stops has a substantially shorter length than each of the hydro-pneumatic cylinders while the hydro-pneumatic cylinders are in contracted positions.

7. The tensioner of claim 1, further comprising a plurality of extensible pivoting devices, each having one end coupled to one of the hydro-pneumatic cylinders and another end adapted to be coupled to the deck for pivoting each hydro-pneumatic cylinder from the running position when to the tensioning position.

8. A tensioner for maintaining a tensile force in a riser extending from a subsea wellhead assembly through an opening in a floating platform deck, the tensioner comprising:

a tensioner ring coupled to the riser and having an axis;

a plurality of hydro-pneumatic cylinders, each having flexible joints on upper and lower ends for coupling the cylinders between the deck and the tensioner ring;

the cylinders being tiltable between a running position wherein the upper ends are tilted outward from the axis to enable the riser to be lowered through the opening and a tensioning position wherein the upper ends are tilted inward toward the axis for engaging the tensioner ring;

a plurality of guidance receptacles mounted to a lower portion of the tensioner ring, each guidance receptacle corresponding to a respective hydro-pneumatic cylinder;

the guidance receptacles each defining an interior cavity adapted to receive the upper end of a respective cylinder; and

a plurality of engagement assemblies mounted to the guidance receptacles and the upper ends of the cylinders so that the cylinders will automatically couple to the tensioner

ring when the upper end of each cylinder is inserted into a respective interior cavity of one of the guidance receptacles.

9. The tensioner of claim 8, wherein the engagement assemblies comprise:

an annular channel defined by an exterior surface of an upper end of the cylinder;

a lock ring mounted within the annular channel and biased to a radially outward position;

a lock channel defined in an interior diameter surface of the guidance receptacle;

the lock ring and the lock channel having matching mating profiles adapted to allow axial movement upward relative to one another and prevent axial movement downward relative to one another when the lock ring inserts into the lock channel;

a retraction ring circumscribing the upper end of the cylinder axially beneath the lock ring; and

the retraction ring adapted to move axially upward and release the lock ring from engagement with the lock channel.

10. A tensioner for maintaining a tensile force in a riser extending from a subsea wellhead assembly through an opening in a floating platform deck, the tensioner comprising:

a tensioner ring for coupling to the riser and having an axis;

a plurality of hydro-pneumatic cylinders having lower ends for coupling to the deck and upper end connect to the tensioner ring;

the hydro-pneumatic cylinders being pivotal between a running position wherein the upper ends are pivoted outward from the axis and a tensioning position wherein the upper ends are tilted inward from the running position toward the axis;

the upper ends of the cylinders adapted to automatically couple to the tensioner ring after moving from the running position to the tensioning position;

a plurality of extensible placement devices, each coupled to one of the hydro-pneumatic cylinders for tilting each hydro-pneumatic cylinder from the running position when the riser is being installed to the tensioning position; and

a plurality of mechanical stops for limiting pivot of the upper ends of the cylinders outward from the axis, each mechanical stop adapted to be coupled to the deck outboard from a corresponding cylinder, each mechanical stop having a receptacle to receive one of the hydro-pneumatic cylinders when the hydro-pneumatic cylinder is in the running position.

11. The tensioner of claim 10, further comprising:

a plurality of guidance receptacles mounted to a lower portion of the tensioner ring, each guidance receptacle corresponding to a respective hydro-pneumatic cylinder;

the guidance receptacles each defining an interior cavity adapted to receive the upper end of a respective cylinder;

an annular channel defined by an exterior surface of the upper end of each cylinder;

a lock ring mounted within each annular channel and biased to a radially outward position;

a lock channel defined in an interior diameter surface of each guidance receptacle; and

the lock ring and the lock channel having mating profiles to allow axial upward movement relative to one another and prevent axial downward movement relative to one another when the lock ring inserts into the lock channel.

12. The tensioner of claim 10, wherein the mechanical stops are adapted to be coupled to the deck at a position that allows the hydro-pneumatic cylinders to be pivoted outward to at least a vertical orientation while in the running position.

13. The tensioner of claim 10, wherein the upper ends of the hydro-pneumatic cylinders circumscribe an inner diameter at least equal to an inner diameter of the lower ends of the hydro-pneumatic cylinders while in the running position.

14. A method for connecting a riser tensioner to a riser passing through an opening in a deck of a platform comprising:

(a) placing a plurality of hydro-pneumatic cylinders around the opening;

(b) flexibly connecting a lower end of each cylinder to the deck;

(c) positioning upper ends of the cylinders a selected distance outward from an axis of the opening in a running position and lowering the riser through the opening; and

(d) attaching a tensioner ring to the riser, tilting the upper ends of the cylinders from the running position inward toward the axis and coupling the upper ends of each cylinder to the tensioner ring, wherein tilting the upper ends inward comprises coupling extensible placement devices to the hydro-pneumatic cylinders and actuating the lacement devices to tilt the hydro-pneumatic cylinders.

15. The method of claim 14, wherein:

step (b) comprises mounting a mechanical stop to the deck outboard from each of the cylinders; and

step (c) comprises supporting the cylinders in the running position by the mechanical stops.

16. The method of claim 14, wherein the extensible placement devices in step (d) comprise placement cylinders.

17. The method of claim 14, wherein coupling the upper ends to the tensioner ring in step (d) comprises:

inserting the upper end of each cylinder into a corresponding guidance receptacle mounted to a lower portion of the tensioner ring; and

inserting a resilient retainer ring carried on the upper end of each cylinder into a corresponding channel of each guidance receptacle, thereby coupling each cylinder to the tensioner ring.

18. The method of claim 14, wherein while in the running position in step (c) the cylinders are oriented at an angle of at least ninety degrees relative to the deck.