CLAIMS

What is claimed is:

1. A system for hanging tubing in a wellbore, comprising:
   a tubular body;
   a plurality of lower slips mounted along the tubular body;
   a spring cone disposed around the tubular body and fixed to the plurality of lower slips, the spring cone comprising a cone profile, a spring including a plurality of slots, and a lock ring including a ratchet profile, wherein the lock ring is disposed between a first slot and a second slot
   of the plurality of slots; and
   a packer element disposed around the tubular body, below and adjacent the spring cone.

2. The system of claim 1, wherein the spring cone further comprises a cylinder having a plurality of sections arranged in sequence.

3. The system of claim 2, wherein each section of the plurality of sections comprises two or more slots of the plurality of slots.

4. The system of claim 3, wherein the plurality of slots comprises at least one straight cut slot.

5. The system of claim 3, wherein the plurality of slots comprises at least one radial cut slot.

6. The system of claim 3, wherein at least one slot of the plurality of slots comprises at least one nub.

7. The system of claim 1, wherein the spring cone is fixed to the plurality of lower slips with at least one shear screw.

8. The system of claim 1, further comprising:

an upper cone disposed around the tubular body, the upper cone comprising an engagement profile; and

a plurality of upper slips comprising a corresponding profile to the engagement profile,

wherein the plurality of upper slips is fixed to the upper cone.

9. A method, comprising:

conveying a liner hanger system downhole into a cased wellbore, the liner hanger system comprising:

a tubular body;

a plurality of lower slips mounted along the tubular body;

a spring cone disposed around the tubular body and fixed to the plurality of lower slips, the spring cone comprising:

a spring including a plurality of slots;

a lock ring including a ratchet profile, wherein the lock ring is disposed between a first slot and a second slot of the plurality of slots; and

a cone profile; and

a packer element disposed around the tubular body, below and adjacent the spring cone, the packer element comprising an elastomeric element;

actuating the plurality of lower slips against the cone profile of the spring cone to create a setting load that forces the plurality of lower slips radially outward into engagement with a casing, and compresses the spring cone; and

transferring the setting load through the spring cone to energize the packer element to seal an annulus between a liner and the casing,

wherein the lock ring having the ratchet profile prevents the spring cone from moving in an upward direction after compression.

10. The method of claim 9,

wherein the plurality of lower slips provides a hanging load in a downward direction when engaged with the casing, and

wherein, if an upward load in the liner hanger system exceeds the hanging load, a first portion of the spring cone including the first slot relaxes in the upward direction and a second portion of the spring cone including the second slot relaxes in the downward direction.

11. The method of claim 10, wherein relaxation of the first portion of the spring cone in the upward direction and relaxation of the second portion of the spring cone in the downward direction maintains the plurality of lower slips in engagement with the casing, and keeps the packer element energized to seal the annulus between the liner and the casing.

12. The method of claim 9, wherein the liner hanger system is conveyed downhole into the cased wellbore using a running tool.

13. The method of claim 9, wherein the spring cone further comprises a cylinder having a plurality of sections arranged in sequence.

14. The method of claim 9, wherein the liner hanger system further comprises:
an upper cone disposed around the tubular body, the upper cone comprising an engagement profile; and
a plurality of upper slips comprising a corresponding profile to the engagement profile,

wherein the plurality of upper slips is fixed to the upper cone,
the method further comprising:
actuating the plurality of upper slips against the engagement profile of the upper cone to force the plurality of upper slips radially outward into engagement with the casing.

15. A method of manufacture of a slotted cylindrical spring, comprising:
dividing a cylinder into a plurality of sections arranged in sequence, a first section of the plurality of sections is disposed between a second section and a third section of the plurality of sections;

cutting a plurality of slots into each section of the plurality of sections of the cylinder in a slot pattern to form the slotted cylindrical spring; and

disposing a lock ring including a ratchet profile on the first section after cutting the plurality of slots.

16. The method of claim 15, wherein cutting the plurality of slots comprises cutting at least one straight slot.

17. The method of claim 15, wherein cutting the plurality of slots comprises cutting at least one radial slot.

18. The method of claim 15, wherein at least one slot of the plurality of slots comprises at least one nub.

19. The method of claim 15, further comprising creating a cone profile near an end of the cylinder.