ribs having gaps therebetween. A multilayer wire mesh filter medium, preferably including a protective outer shroud, may be disposed around the wire wrapped drainage layer to form a sand control screen jacket which may be installed on the base pipe. Once installed on the base pipe, the ribs provide certain strength to the wire wrap and stand-off between the wire wrap and the base pipe for fluid cross flow.

[0005] It has been found, however, that such sand control screen assemblies have suffered from collapse failures in the wire mesh filter medium when the wrap wire of the drainage layer begins to spread apart and cannot adequately support the wire mesh at increased pressures. A primary cause of wrap wire spreading is wrinkling or buckling forming along the length of the wire wrap support structure which occurs as the wrap wire begins to conform to the outer diameter of the base pipe. Once wrap wire spreading occurs in the drainage layer, support is lost for the wire mesh filter medium which has led to tearing or other collapse damage to the wire mesh filter medium allowing particle infiltration therethrough.

[0006] Accordingly, a need has arisen for a sand control screen assembly that is capable of filtering fines out of a production stream from a subterranean hydrocarbon bearing formation. A need has also arisen for such a sand control screen assembly that is simple and cost-effective to manufacture and that is capable of withstanding severe downhole conditions during installation and operation. Further, a need has arisen for such a sand control screen assembly that does not suffer from collapse failures at increased pressures.

SUMMARY OF THE INVENTION

[0007] Embodiments of t~~T~~he present invention disclosed herein comprise~~s~~ a sand control screen assembly for preventing the inflow of formation particles during production. The sand control screen assembly of the present invention allows for compliant movement of a drainage layer under high-pressure conditions while maintaining the integrity of the underlying structure. In addition, the sand control screen assembly of the present invention is simple and cost-effective to manufacture and is capable of withstanding severe downhole conditions during installation and production.

[0007a] According to an aspect, there is provided a sand control screen assembly comprising: a base pipe having at least one opening in a sidewall thereof; and a screen jacket positioned exteriorly about the base pipe, the screen jacket including a drainage layer and a filter medium positioned exteriorly about the drainage layer, the drainage layer including a plurality of circumferentially distributed axially extending first ribs, a plurality of circumferentially distributed axially extending second ribs and a wrap wire securably attached exteriorly to the first ribs and the second ribs forming a plurality of turns having gaps therebetween, wherein, the first ribs contact the base pipe and have a first nominal diameter that provides a first stand-off dimension between the wrap wire and the base pipe at the locations of the first ribs; and wherein, the second ribs having a second nominal diameter that is less than the first nominal diameter such that, in a first configuration of the drainage layer, the second ribs form gaps with the base pipe and, in a second configuration of the drainage layer, the second ribs contact the base pipe to provide a second stand-off dimension, that is less than the first stand-off dimension, between the wrap wire and the base pipe at the locations of the second ribs.

[0008] Disclosed herein is~~In one aspect, the present invention is directed to~~ a sand control screen assembly including a base pipe having at least one opening in a sidewall thereof and a screen jacket positioned about the base pipe. The screen jacket includes a drainage layer and a filter

medium positioned about the drainage layer. The drainage layer includes a plurality of circumferentially distributed axially extending ribs and a wrap wire positioned around the ribs forming a plurality of turns having gaps therebetween. The ribs includes a plurality of first ribs having a first cross-sectional rib profile shaped and sized to maintain an annular space between the wrap wire and the base pipe and a plurality of second ribs having a second cross-sectional rib profile shaped and sized to provide for a gap between the second ribs and the base pipe.

[0009] In one embodiment, the screen jacket is positioned about a perforated section of the base pipe. In another embodiment, the screen jacket is positioned about a nonperforated section of the base pipe. In a further embodiment, the filter medium may be a wire mesh filter medium.

[0010] In one embodiment, the first ribs have a generally-trapezoidal cross-sectional rib profile and the second ribs have a circular cross-sectional rib profile. In another embodiment, the first ribs have a generally-trapezoidal cross-sectional rib profile and the second ribs have a rectangular cross-sectional rib profile. In certain embodiments, at least one second rib is circumferentially located between each adjacent pair of first ribs. In other embodiments, at least two second ribs are circumferentially located between each adjacent pair of first ribs.

[0011] Disclosed herein is~~In another aspect, the present invention is directed to~~ a sand control screen assembly including a base pipe having at least one opening in a sidewall thereof and a screen jacket positioned about the base pipe. The screen jacket includes a drainage layer and a filter medium positioned about the drainage layer. The drainage layer includes a plurality of circumferentially distributed axially extending ribs and a wrap wire positioned around the ribs forming a plurality of turns having gaps therebetween. The ribs include a plurality of first ribs and a plurality of second ribs. The first ribs have a nominal diameter in the radial direction that is greater than a nominal diameter in the radial direction of the second ribs to provide for a gap between the second ribs and the base pipe.

[0012] Disclosed herein is~~In a further aspect, the present invention is directed to~~ a screen jacket for positioning around a base pipe to form a sand control screen assembly. The screen jacket includes a plurality of circumferentially distributed axially extending ribs and a wrap wire positioned around the ribs forming a plurality of turns having gaps therebetween. The ribs include a plurality of first ribs and a plurality of second ribs. The first ribs have a nominal diameter in the radial direction that is greater than a nominal diameter in the radial direction of the second ribs.