

'162 Independent Claims

<p>[1.1] An end fitting for a sucker rod comprising:</p>	<p>[11.1] A sucker rod comprising a fiber composite rod having a first end and a second end; and end fittings on each end of the fiber composite rod for coupling together a plurality of fiber composite rods, the end fitting comprising:</p>	<p>[20.1] A sucker rod comprising: a fiber composite rod having a first end and a second end; and end fittings on each end of the fiber composite rod for coupling together a plurality of fiber composite rods, the end fitting comprising:</p>	<p>[31.1] A method for manufacturing a sucker rod comprising the steps of: constructing an end fitting comprising</p>
<p>[1.2] an exterior surface, a closed end, an open end, and an interior surface,</p>	<p>[11.2] an exterior surface, a closed end, an open end, and an interior surface,</p>	<p>[20.2] an exterior surface, a closed end, an open end, and an interior surface,</p>	<p>[31.2] an exterior surface, a closed end, an open end, and an interior surface,</p>
<p>[1.3] the interior surface comprising a wedge system defining a cavity, wherein the wedge system comprises three wedge shaped portions having an apex, a leading edge and a trailing edge, each apex forming a perimeter of equal dimension within the cavity that is the narrowest part of the cavity associated with each wedge shaped portion such that the leading edge is longer than the trailing edge with the leading edge facing the open end and the trailing edge facing the</p>	<p>[11.3] the interior surface comprising a wedge system defining a cavity, wherein the wedge system comprises three wedge shaped portions having an apex, a leading edge and a trailing edge, each apex forming a perimeter of equal dimension within the cavity that is a narrowest part of the cavity associated with each wedge shaped portion, such that the leading edge is longer than the trailing edge with the leading edge facing the open end and the trailing edge facing the closed end with respect to each wedge shaped portion,</p>	<p>[20.3] wherein the interior surface comprises a wedge system defining a cavity wherein the wedge system comprises an interior wedge shaped portion, at least one intermediate wedge shaped portion and an exterior wedge shaped portion, each wedge shaped portion having an apex, a leading edge and a trailing edge, each apex forming a perimeter of equal dimension within the cavity that is a narrowest part of the cavity associated with each wedge shaped portion, such that the leading edge is longer than the trailing edge with the leading</p>	<p>[31.3] the interior surface comprising a wedge system defining a cavity wherein the wedge system comprises an interior wedge shaped portion, at least one intermediate wedge shaped portion and an exterior wedge shaped portion, wherein each wedge shaped portion comprises an apex, a leading edge and a trailing edge, wherein each apex forms a perimeter of equal dimension within the cavity that is a narrowest part of the cavity associated with each wedge shaped portion such that the leading edge is longer than the trailing edge</p>

<p>closed end with respect to each wedge shaped portion,</p>		<p>edge facing the open end and the trailing edge facing the closed end with respect to each wedge shaped portion,</p>	<p>with the leading edge facing the open end and the trailing edge facing the closed end with respect to each wedge shaped portion;</p>
<p>[1.4] wherein the leading edge is shorter at the closed end and increases progressively from the closed end to the open end thereby compensating for a compression of the sucker rod in the end fitting,</p>	<p>[11.4] wherein the leading edge is shorter at the closed end and increases progressively from the closed end to the open end thereby compensating for a compression of the sucker rod in the end fitting,</p>	<p>[20.4] wherein each leading edge is shorter at the closed end and increases progressively from the closed end to the open end thereby compensating for a compression of the sucker rod in the end fitting,</p>	<p>[31.4] engaging an end of a fiber composite rod into the cavity of the end fitting for creating a symmetrical void between the fiber composite rod and the wedge shaped portions of the end fitting, whereby the symmetrical void has symmetry along the longitudinal axis of the fiber composite rod;</p>
<p>[1.5] the trailing edge is shorter at the closed end and increases progressively from the closed end to the open end thereby compensating for a back pressure associated with the sucker rod in the end fitting,</p>	<p>[11.5] the trailing edge is shorter at the closed end and increases progressively from the closed end to the open end thereby compensating for a back pressure associated with the sucker rod in the end fitting,</p>	<p>[20.5] each trailing edge is shorter at the closed end and increases progressively from the closed end to the open end thereby compensating for a back pressure associated with the sucker rod in the end fitting,</p>	<p>[31.5] injecting an epoxy into the symmetrical void to bond with the fiber composite rod and to fixedly engage the wedge shaped portions of the wedge system of the end fitting for securing the end fitting to the fiber composite rod such that as the epoxy is uniform in thickness between the wedge shaped portions and the fiber composite rod, and whereby the maximum thickness is substantially constant and the minimum thickness is</p>

			substantially constant,
[1.6] wherein the first wedge shaped portion is proximate to the closed end and receives compressive forces that are greater than the compressive forces which the second wedge shaped portion receives, and wherein the second wedge shaped portion receives compressive forces that are greater than the compressive forces which the third wedge shaped portion receives, such that the compressive forces create a force differential along the wedge system greater at the closed end of the fitting and decreasing toward the open end of the fitting.	[11.6] wherein the first wedge shaped portion is proximate to the closed end and receives compressive forces that are greater than the compressive forces which the second wedge shaped portion receives, and wherein the second wedge shaped portion receives compressive forces that are greater than the compressive forces which the third wedge shaped portion receives, such that the compressive forces create a force differential along the wedge system greater at the closed end of the fitting and decreasing toward the open end of the fitting.	[20.6] wherein the interior wedge shaped portion is proximate to the closed end and receives compressive forces that are greater than the compressive forces which the intermediate wedge shaped portion receives, and wherein the intermediate wedge shaped portion receives compressive forces that are greater than the compressive forces for which the exterior wedge shaped portion receives, such that the compressive forces create a force differential along the wedge system greater at the closed end of the fitting and decreasing toward the open end of the fitting.	[31.6] wherein the interior wedge shaped portion is proximate to the closed end and receives compressive forces that are greater than the compressive forces which the intermediate wedge shaped portion receives, and wherein the intermediate wedge shaped portion receives compressive forces that are greater than the compressive forces which the exterior wedge shaped portion receives, such that the compressive forces create a force differential along the wedge system greater at the closed end of the fitting and decreasing toward the open end of the fitting.

Dependent Claims 2, 12, 21, and 32			
2. The end fitting of claim 1, wherein the wedge system creates different compressive forces on each respective wedge shaped portion thereof, with the compressive force being inversely proportional to a length of each edge.	12. The sucker rod of claim 11, wherein the wedge system creates different compressive forces on each respective wedge shaped portion thereof with the compressive force being inversely proportional to a length of each edge.	21. The sucker rod of claim 20, wherein the wedge system creates different compressive forces on each respective wedge shaped portion thereof with the compressive force being inversely proportional to a length of each edge.	32. The method for manufacturing a sucker rod of claim 31, further comprising the step of creating different compressive forces on each respective surface of the wedge shaped portions with the compressive force being proportional to the length of each edge.
Dependent Claims 3, 13, 22, 34, 35, and 38			
3. The end fitting of claim 2, wherein the compressive force on each edge is inversely proportional to the length of each edge.	13. The sucker rod of claim 12, wherein the compressive force on each edge is inversely proportional to the length of each edge.	22. The sucker rod of claim 21, wherein the compressive force on each edge is inversely proportional to the length of each edge.	34. The method for manufacturing a sucker rod of claim 31, wherein the compressive force on each leading edge is inversely proportional to the length of each leading edge.
			35. The method for manufacturing a sucker rod of claim 31, wherein the compressive force on each trailing edge is inversely proportional to the length of each trailing edge.
			38. The method for manufacturing a sucker rod of claim 31, wherein each wedge shaped portion has a length inversely proportional to the compressive force applied to the wedge shaped portion.

Dependent Claims 4, 14, 23, and 36			
4. The end fitting of claim 1, wherein the wedge shaped portions are determined by an angle associated with the apex between the leading edge and the trailing edge.	14. The sucker rod of claim 11, wherein the wedge shaped portions are determined by an angle associated with the apex between the leading edge and the trailing edge.	23. The sucker rod of claim 20, wherein the wedge shaped portions are determined by an angle associated with the apex between the leading edge and the trailing edge.	36. The method for manufacturing a sucker rod of claim 31, wherein the plurality of wedge shaped portions are determined by the angle associated between a first surface and a second surface of each concaved surface.
Dependent Claims 5, 15, 24, and 37			
5. The end fitting of claim 4, wherein the angle between the leading edge and the trailing edge of each concaved surface is obtuse.	15. The sucker rod of claim 14, wherein the angle between the leading edge and the trailing edge of each concaved surface is obtuse.	24. The sucker rod of claim 23, wherein the angle between the leading edge and the trailing edge of each concaved surface is obtuse.	37. The method for manufacturing a sucker rod of claim 36, wherein the angle between the first surface and the second surface of each concaved surface is obtuse.
Dependent Claims 6, 16, and 25			
6. The end fitting of claim 1, further comprising a fiber composite rod having an end engaged centrally within the end fitting.	16. The sucker rod of claim 11, further comprising the fiber composite rod having each end engaged centrally within the end fitting.	25. The sucker rod of claim 20, further comprising the fiber composite rod having each end engaged centrally within the end fitting.	
Dependent Claims 8, 17, and 26			
8. The end fitting of claim 6, further comprising an epoxy placed in the cavity for bonding with the fiber composite rod in the cavity for fixedly securing the end fitting with the fiber composite rod.	17. The sucker rod of claim 16, further comprising an epoxy placed in the cavity for bonding with the fiber composite rod in the cavity for fixedly securing the end fitting with the fiber composite rod.	26. The sucker rod of claim 25, further comprising an epoxy placed in the cavity for bonding with the fiber composite rod in the cavity for fixedly securing the end fitting with the fiber composite rod.	

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