PROVISIONAL PATENT APPLICATION

Under 35 U.S.C. § 111(b)

Rope-Core Reinforced Polyurethane Universal Joint with Woven Mesh Sleeve for Sailing Tiller Extensions

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TITLE OF THE INVENTION

Rope-Core Reinforced Polyurethane Universal Joint with Woven Mesh Sleeve for Sailing Tiller Extensions

CROSS-REFERENCE TO RELATED APPLICATIONS

Not applicable.

FIELD OF THE INVENTION

The present invention relates generally to sailboat accessories, and more particularly to sailboat tiller extension joints that connect a tiller extension to the tiller of the sailboat.

BACKGROUND OF THE INVENTION

Due to harsh conditions due to usage and environment, tiller extension joints must be durable to avoid failure. Sailing can take place in saltwater and freshwater environments, with saltwater being especially corrosive due to it acting as an electrolyte, which will degrade tiller extensions joints varying on their material composition. During harsh weather or sailing competitions tiller extension joints will experience a large amount of force input and stress due to extreme user inputs, leading to an increased chance of failure compared to normal usage.

Current tiller extension joints rely on trade secret polymer blends to ensure the maximum amount of free movement while maintaining durability. These blends vary but the balance of maintaining durability and free movement is a tradeoff that each manufacturer will determine. However, for many tiller extension joints this will function as the only mechanism keeping the tiller and tiller extension attached, leading to negative outcomes if tiller extension joint failure is reached.

The second approach uses a rope core embedded into the tiller extension joint to allow for the tiller extension to remain connected to the tiller in the case of the polymer joint failing. This is typically done by having a rope injected molded into the polymer joint and having a pin mechanism attach the tiller extension to both the polymer joint as well as the rope. As such when the polymer joint detaches, rips, or breaks the rope core will function in a decreased capacity until a replacement can be used.

A need therefore exists for a tiller extension joint that (a) can avoid corrosion in sailing conditions, (b) can endure harsh human input, (c) can be unobtrusive during use, and (d) can continue to function even after failure.

SUMMARY OF THE INVENTION

Disclosed is a reinforced universal joint assembly for sailing tiller extensions comprising three integrated structural elements: a polyurethane elastomeric body, a nylon rope core disposed axially through the center of the elastomeric body, and a woven polymer mesh sleeve circumferentially encasing the exterior of the elastomeric body. The joint assembly is configured to mechanically connect a tiller extension rod to a sailboat tiller, transmitting steering forces from an operator to the vessel's rudder while accommodating angular deflection required during sailing maneuvers.

When steering loads are applied to the tiller extension rod, the woven polymer mesh sleeve acts to distribute tensile and compressive forces across the outer surface of the elastomeric body, reducing stress concentration at the pivot region and thereby extending the fatigue life of the elastomeric material under cyclic loading conditions. As the elastomeric body deflects angularly under applied load, the axially disposed nylon rope core maintains mechanical continuity between the tiller extension rod and the tiller in the event of elastomeric fracture, preventing sudden and complete disengagement of the steering assembly. Upon removal of the applied load, the elastic recovery properties of the polyurethane body return the joint to its neutral axial position.

The joint assembly further comprises a rigid base plate configured with a compression clamp attachment mechanism adapted to interface with tiller fittings across a range of standard sailing vessel configurations, enabling installation and replacement of the joint without specialized tooling or permanent modification to the tiller.

BRIEF DESCRIPTION OF THE DRAWINGS

1. Polyurethane elastomeric body
2. Nylon rope core
3. Woven polymer mesh sleeve
4. Plastic weather cover
5. Rigid base plate and compression fitting
6. Tiller bar
7. Tiller extension
8. Transverse pin

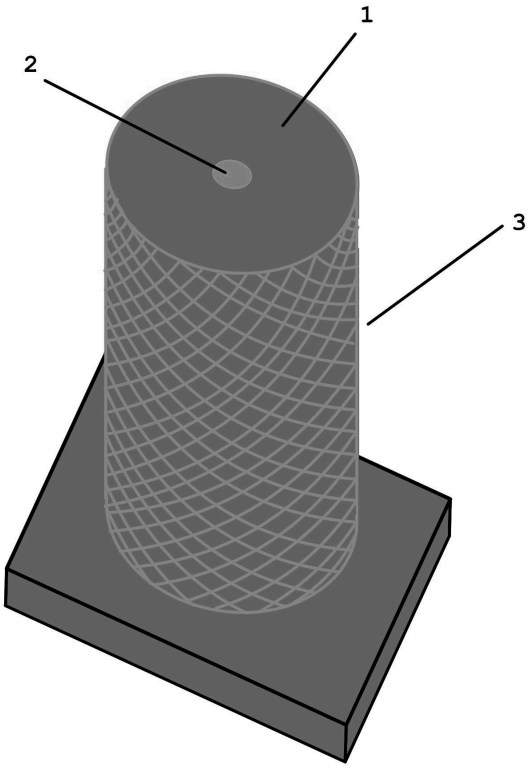


FIG. 1 is a perspective view of just the universal joint, with the Polyurethane elastomeric body(1), Nylon rope core (2) and Woven polymer mesh sleeve (3). As it would be after manufacturing, before assembly with the rest of the components

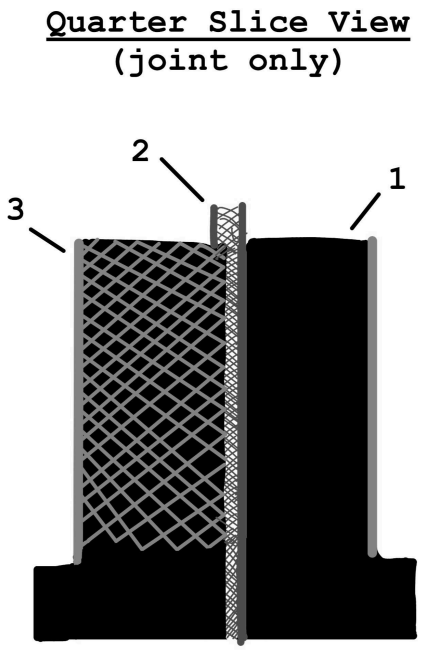


FIG. 2 is a vertical quarter sectional view of FIG. 1, showing the internal layout of the joint

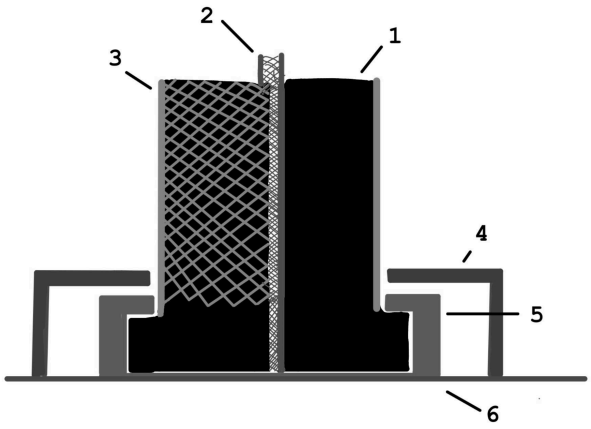


FIG. 3 is a vertical quarter-sectional view of FIG. 1, showing the joint held within the compression clamp (5) attachment mechanism to the external tiller (6), and the weather cover (4)

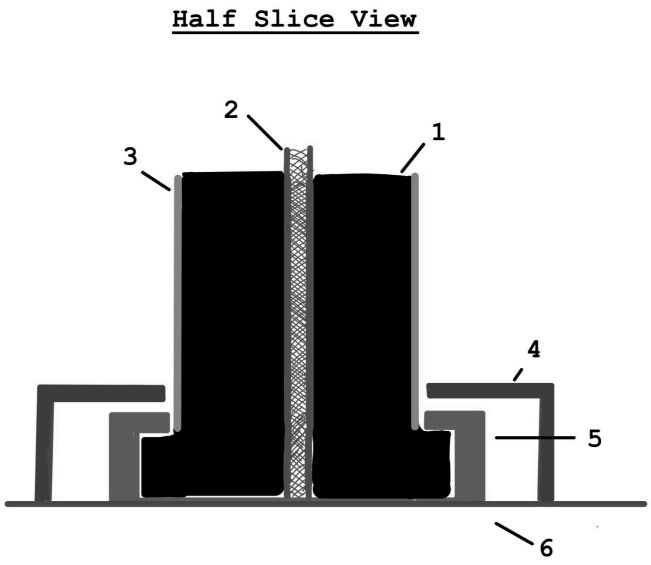


FIG. 4 is a vertical half-sectional view of FIG. 1, showing the joint held within the compression clamp attachment mechanism

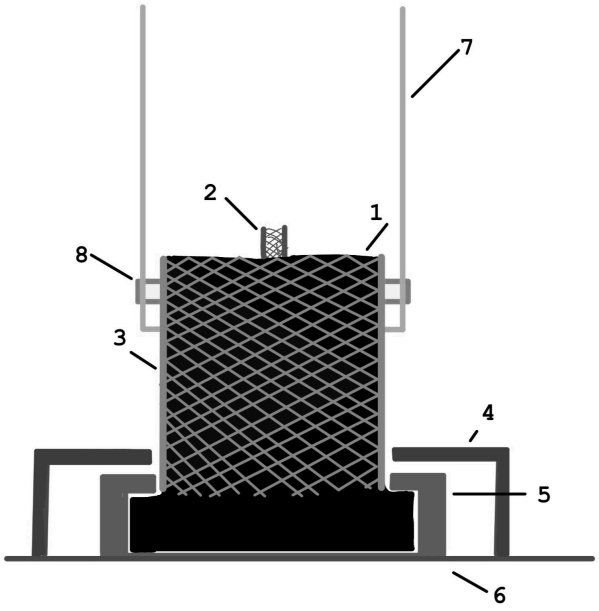


FIG. 5 is a side elevation view showing the joint of FIG. 1 attached to the compression clamp attachment mechanism and tiller extension (7) through the transverse pin (8).

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a reinforced universal joint assembly for sailing tiller extensions comprises a polyurethane elastomeric body (1), a woven polymer mesh sleeve embedded within the elastomeric body (3), a nylon rope core through the center of the elastomeric body (2), a plastic weather cover (4), and a rigid base plate incorporating a compression clamp attachment mechanism (5). The assembly mechanically connects a tiller extension rod to a sailboat tiller (6), transmitting operator steering forces to the vessel rudder while accommodating angular deflection during sailing maneuvers.

The elastomeric body, shown in FIG. 2, is formed of a polymer elastomer selected for resistance to ultraviolet radiation, saltwater, and cyclic fatigue. The specific polymer composition of the elastomeric body is a proprietary formulation. Other elastomeric materials are thought of, including but not limited to castable polyurethane, nitrile rubber, silicone, or thermoplastic polyurethane, provided such materials exhibit sufficient compliance for angular deflection and generate a restoring moment upon release of load.

The woven polymer mesh sleeve, shown in FIG. 2, is embedded within the elastomeric body during manufacture, such that the mesh is fully encapsulated by the elastomeric material. The mesh sleeve distributes tensile and compressive forces throughout the body of the joint during steering loads, reducing stress concentrations and extending fatigue life under cyclic loading. The mesh sleeve may be fabricated from braided polyester, aramid fiber, or other high-tenacity synthetic fibers.

The nylon rope core, shown in FIG. 2, is inserted through the center of the elastomeric body and mechanically captured at each end by compression clamp attachment mechanism and transverse pins (8), connecting to the tiller extension rod (7) at one end and the base plate (5) at the other. In the event of elastomeric body failure, the rope core maintains mechanical continuity between the tiller extension rod and tiller, preventing sudden separation of the steering assembly. Other rope materials are considered, including braided polyester or other high-tenacity synthetic fibers selected for tensile strength and saltwater resistance.

The rigid base plate (5), shown in FIG. 4, incorporates a compression clamp attachment mechanism adapted to interface with a range of standard tiller fittings, enabling installation and replacement without specialized tooling or permanent modification to the tiller.

CLAIMS

What is claimed is:

1. A reinforced universal joint assembly for a sailing tiller extension, comprising: a polymer elastomeric body defining a central bore extending axially therethrough; a nylon rope core disposed within the central bore and mechanically captured at each end by rope anchor fittings; a woven polymer mesh sleeve embedded within the elastomeric body; and a rigid base plate incorporating a compression clamp attachment mechanism configured to secure the assembly to a sailing vessel tiller without permanent modification to the tiller.
2. The reinforced universal joint assembly of claim 1, wherein the rope core maintains tensile mechanical continuity between the tiller extension rod and the base plate independently of the structural integrity of the elastomeric body.
3. The reinforced universal joint assembly of claim 1, wherein the woven polymer mesh sleeve is fully encapsulated within the elastomeric body and configured to distribute tensile and compressive loads throughout the body under steering loads.
4. The reinforced universal joint assembly of claim 1, wherein the elastomeric body is formed of a polymer elastomer exhibiting elastic compliance sufficient to accommodate angular deflection and to generate a restoring moment upon release of applied load.
5. The reinforced universal joint assembly of claim 1, wherein the woven polymer mesh sleeve is fabricated from a material selected from the group consisting of braided polyester, aramid fiber, and high-tenacity synthetic fiber.

ABSTRACT

A reinforced universal joint assembly for sailing tiller extensions comprises a polymer elastomeric body, a nylon rope core disposed axially through the body, and a woven polymer mesh sleeve embedded within the body. The embedded mesh sleeve distributes steering loads throughout the elastomeric material, reducing stress concentrations and extending fatigue life under cyclic loading. Upon failure of the elastomeric body, the rope core maintains tensile continuity between the tiller extension rod and tiller, providing a fail-safe steering function. A rigid base plate with a compression clamp attachment mechanism enables installation on standard tiller fittings without permanent vessel modification.

INVENTOR DECLARATION AND SIGNATURE

I hereby declare that I am the original inventor of the subject matter disclosed in this provisional patent application.



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