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INSULATED TENSION LINK AND METHOD OF MAKING SAME

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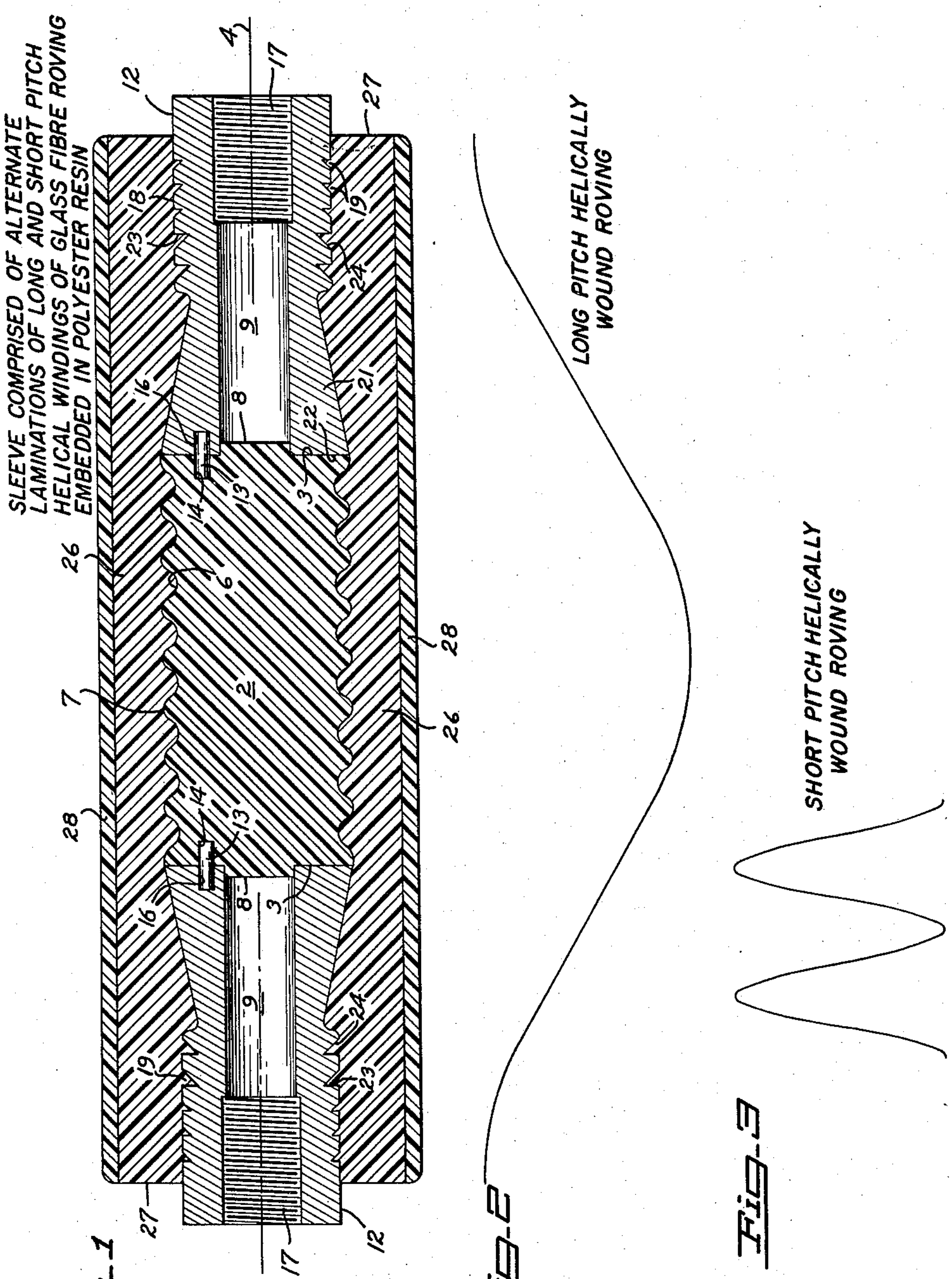

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INSULATED TENSION LINK AND METHOD OF MAKING SAME

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My invention relates to links; and particularly to an electrically insulated link.

Among the objects of the invention is the provision of an electrically insulated link characterized by high dielectric and great tensile strength.

Another object of the invention is the provision of an electrically insulated tension link having a resilient outer covering highly resistant to blows and hard usage.

The invention possesses other objects, some of which with the foregoing will be brought out in the following description of the invention. I do not limit myself to the showing made by the said description and the drawings, since I may adopt variant forms of the invention within the scope of the appended claims.

Referring to the drawings:

Fig. 1 is a half-sectional view of my insulated tension link.

Fig. 2 is a diagrammatic view of a winding indicating the approximate pitch of the majority of the spirally wound roving in the link.

Fig. 3 is a diagrammatic view of a winding indicating the approximate pitch of another portion of the spirally wound roving in the link.

Broadly considered, my electrically insulated tension link comprises a core of dielectric material, abutting at each end a cable connecting shank adapted to be secured to the end of a cable. Means are provided to prevent relative rotation between the assembled parts. Spirally wound around the assembled parts is a roving made up of strands of a dielectric material having a high tensile strength. The roving forms a sleeve which secures the parts against longitudinal displacement when tension is applied to the link. Preferably, the roving is embedded or impregnated with a self-curing synthetic resin so that displacement of the roving and shanks under stress is resisted by the homogenous connecting sleeve.

The electrically insulated tension link of my invention finds useful application and versatility in many different industries. A specific application lies in the fied of hoisting equipment, used in the vicinity of high tension electrical conductors. If contact is established between the conductive hoisting cable and high potential conductors, grave danger may exist for workmen near the short circuit. This type of accident generally results in charging the safety hook on the end of the cable with a dangerously high electrical potential. Its proximity to apparatus at ground potential may cause a flash-over, and workmen nearby may be burned or electrocuted.

My tension link is designed to be interposed between the safety hook and the hoisting cable, or in similar applications where high dielectric characteristics, together with great tensile strength are prerequisite.

The link specifically comprises a central core 2 of a non-conductive material such as one of the phenolic resins characterized by high dielectric strength. The central dielectric core may incorporate suitable fibrous fillers, such as glass fibers. Conveniently it is cylindrically shaped to provide end surfaces 3 at right angles to a longi-

tudinal axis 4, and grooves 6 in the cylindrical surface 7, evenly spaced between the ends. The grooves lengthen the effective path which electrical energy would follow in shorting through the link.

Each end of the core is provided with an integrally formed and concentric boss 8, projecting beyond the surface 3, and seated in the central bore 9 of a cable connecting shank or sleeve 12, abutting the core and axially aligned therewith. Alignment of the parts is further assured, and relative rotation between the parts is prevented, by steel dowel pins 13 lying in complementary bores 14 and 16 in the core and connecting shanks or sleeves, respectively. The pins are spaced outwardly from the longitudinal axis a short distance, and are conveniently parallel therewith.

Each of the cable anchoring sleeves 12 at its outer end is provided with interior threads 17, so that a threaded socket is provided for connection to the threaded shank of a cable element such as an eye or safety hook, neither of which is shown. The sleeves are preferably formed from hard steel to provide a cylindrical connecting portion 18 having grooves 19 formed therein; and a conically tapered anchor portion 21, terminating in end face 22 abutting the core. Each of the grooves 19 is preferably formed by a transversely perpendicular forward wall 23, and a backwardly divergent wall 24 tapered in the same direction as anchor portion 21.

To bind the central dielectric core and metallic cable connecting shanks or sleeves into a composite structure able to withstand tremendous tensile stresses, the aligned parts are provided with a dielectric wrapping or sleeve 26, of considerable thickness, and comprised of multi-strand spun-glass roving, continuously and spirally wound back and forth from end to end between fixed collars defining the final length of the dielectric sleeve. As the roving is wound on the parts, a self-curing polyester resin in liquid form, and possessing the desired characteristics of high dielectric and mechanical strength, is applied to the roving so that as the thickness of the winding builds up between the fixed end collars, the roving lies embedded in the polyester resin. Curing of the resin is conveniently effected at room temperature and atmospheric pressure, but heat may be applied if desired.

In winding the roving on the central core and connecting shanks, the aligned parts are arranged in a suitable fixture and rotated about their longitudinal axis 4. The roving is guided onto the rapidly revolving parts by conventional means which will maintain uniform tension in, and shuttle the roving spirally back and forth between the end collars so that the roving is evenly applied and the end surfaces 27 are flat and perpendicular to the axis.

Before the winding process is commenced, the core and shanks are wiped with liquid polyester resin. One end of the roving is then tied in one of the grooves 19, and the parts are rotated while the roving is played back and forth indiscriminately to fill all of the grooves 6 and 19 with roving and polyester of substantially uniform density.

When the grooves have all been filled and the roving has built up to a substantially even surface, the roving is played back and forth in long helical windings or spirals (Fig. 2) until approximately 25% of the final thickness of the dielectric sleeve is achieved. At this point in the winding, a layer of closely pitched helical or spiral windings or loops of roving (Fig. 3) are wound on, circumferentially binding and locking the previously wound layers below.

Additional layers of roving are wound on in long pitched spirals to bring the dielectric sleeve thickness to approximately 50% of its final thickness. Again, a roving layer is applied characterized by closely pitched and perhaps overlapping spiral loops. This process is continued until at least four layers of closely pitched windings are provided, at the conclusion of which the polyester is allowed to cure at room temperature.

If desired, the device may be placed in a suitable mold when the polyester winding material is only partially cured, and a layer **28** of polyamide ester cast or otherwise molded around the polyester sleeve body. The polyamide layer provides a tough resilient covering surface to the device, useful in resisting the shattering shock of laterally directed blows. The polyamide resin may be applied without any filler, or it may be applied to roving which is then wound on as before.

I have found that my link, designed as illustrated and having a five inch overall diameter, is capable of sustaining the stresses imposed by a five ton load, with at least a 3 to 1 safety factor. In terms of dielectric strength, one of my links seventeen inches long will withstand a 20,000 volt potential, with a 2 to 1 safety factor.

In use, my insulated tension link is interposed in a conductive cable by means of a threaded cable element engaged with threads **17** of the cable connecting shanks or sleeves. Tension applied to the cable is transferred by means of the cable connecting sleeves to the surrounding polyester sleeve with its embedded roving. Longitudinal displacement of the cable connecting sleeves is prevented by the coaction between the grooves **19** and conically tapered portion **21**, and the surrounding polyester sleeve.

I claim:

1. An insulated tension link for connecting conductive cables, comprising a dielectric core, an axially aligned integral boss extending from each end of the core, a cable connecting shank abutting each end of the central core and having an axially disposed recess to receive said boss to axially align the core and shanks, a laminated dielectric sleeve connecting both said shanks and the central core with continuous helical windings arranged to provide alternate laminations of long and short pitch coils to secure the shanks against relative axial displacement when tensile stresses are imposed, and a resilient outer cover enclosing said dielectric helically wound sleeve.

2. An insulated tension link for connecting conductive cables comprising a dielectric core having longitudinally spaced circumferential grooves, a cable connecting shank abutting each end of the core and axially aligned therewith, each said shank having a plurality of longitudinally spaced annular grooves therein, a dowel pin embedded in one end of each said shank and the associated end of the dielectric core to prevent relative rotation therebetween, and a laminated dielectric sleeve including a continuous multi-strand roving connecting the shanks and core with helical windings and filling the grooves in each to secure the shanks against relative axial displacement when tensile stresses are imposed.

3. The method of forming an insulated tension link which comprises axially arranging for rotation about a longitudinal axis a dielectric core and a connecting shank abutting each opposite end of the core, rotating the axially arranged parts at constant speed, and spirally winding on the rotating parts in alternate laminations of long and short pitch helical windings a dielectric roving played back and forth between fixed limits to form a laminated dielectric sleeve connecting the core and shanks against axial displacement.

4. The method according to claim 3, in which a self-curing polyester synthetic resin is continuously applied to the dielectric roving as it is played back and forth on the rotating parts to provide a homogenous dielectric sleeve in which the windings of dielectric roving are embedded.

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