

United States Patent
Humphries

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[54] **SEAL FOR MULTIWIRE STRAND**

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[73] Assignee: **Bethlehem Steel Corporation**

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[52] U.S. Cl. **161/143, 52/309, 156/48, 174/23 R**

[51] Int. Cl. **H02g 15/00**

[58] Field of Search **161/143, 144, 175, 176; 57/149; 156/48; 174/23, 23.1**

[56] **References Cited**

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[57] **ABSTRACT**

A short length of a multiwire strand is surrounded with a mold to provide an annular space about said length. Said space is filled with a thermosetting plastic sealant and pressure is applied to force said sealant into and along the interstices of said strand. During said application of pressure, the strand is circumferentially heated at the ends of said mold to provide a radial temperature gradient across said ends. Pressure is applied to said sealant until the ends of the seal are substantially convex.

1 Claims, 2 Drawing Figures

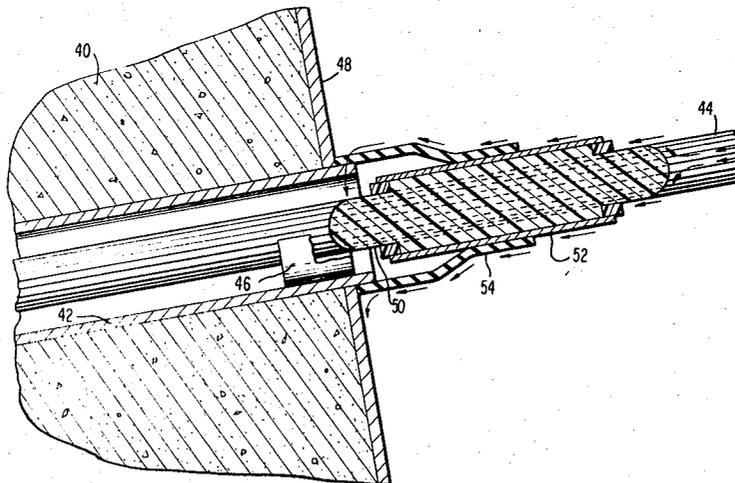


FIG. 1

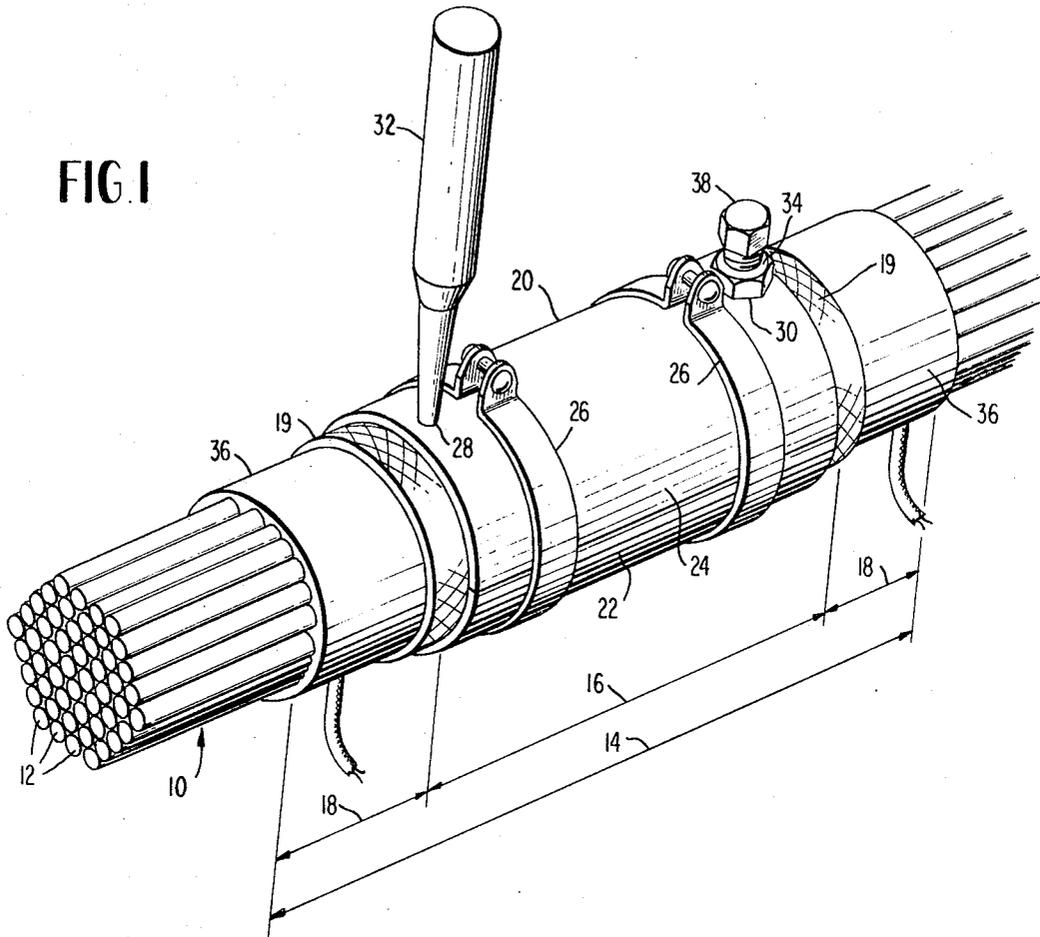
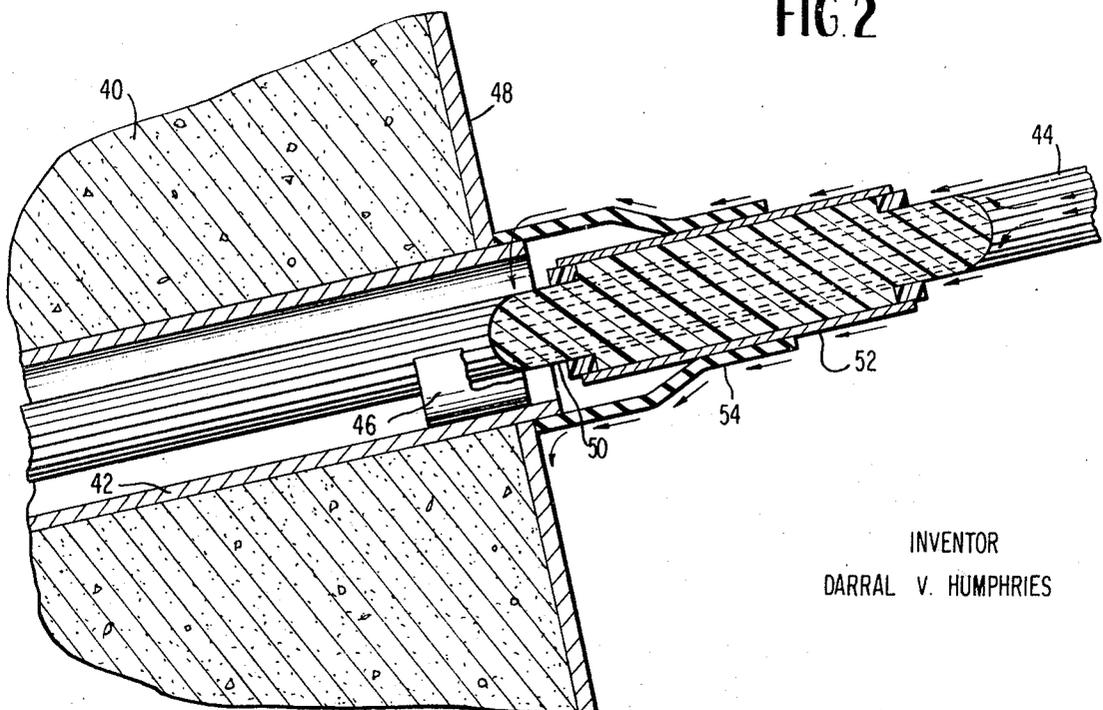


FIG. 2



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SEAL FOR MULTIWIRE STRAND

CROSS-REFERENCES TO RELATED APPLICATIONS

The subject invention may be used to prevent or decrease corrosion in the multiwire strands and anchorage pipes disclosed in copending application Ser. No. 614,651 to Durkee et al., filed Feb. 8, 1967, now U.S. Pat. No. 3,548,432.

BACKGROUND OF THE INVENTION

This invention relates to a seal in a multiwire strand, and more particularly to a water deflector seal in a multiwire bridge strand.

Multiwire strands exposed to the weather are subject to corrosion. While it is relatively easy to inspect the exterior of a strand for corrosion, no simple method of inspecting the interior of a strand, or the strand anchorage, e.g., the anchorage pipes disclosed in the above-referred-to Durkee et al. application, is known. It is therefore desirable to prevent the ingress of water into the interstices of a strand, particularly at the lowest point thereof, which is the point where water will accumulate due to gravitational forces.

In the past, attempts have been made to provide multiwire strands with waterproof seals. Such seals have been formed, for example, by placing a mold around a length of strand and injecting a sealant into the interior of the strand by applying pressure to said sealant. However, by reason of the decrease in pressure from the outside to the center of the strand, the ends of the resultant seal have been concave. A seal with concave ends tends to entrap, rather than deflect, moisture, and probably accelerates corrosion of the strand.

It is an object of this invention to provide a method of sealing a multiwire strand whereby the ends of the seal so formed are substantially convex.

It is a further object to provide such a method which is relatively simple and inexpensive.

SUMMARY OF THE INVENTION

I have discovered that the foregoing objects can be attained by a method comprising the following five steps: (1) A length of multiwire strand is surrounded with a mold to provide an annular space about said length. (2) Said space is filled with a liquid sealant settable at ambient temperatures and capable of accelerated setting at temperatures different from said ambient temperatures. (3) Pressure is applied to said sealant within said mold to force said sealant into and along the interstices of said strand. (4) During said application of pressure, a radial temperature gradient is applied across said strand at the ends of said mold whereby across said ends the wires of said strand are at temperatures at which said accelerated setting takes place, said temperatures being such that the rate of setting progressively decreases as the distance from the center of the strand decreases. (5) Pressure upon said sealant is continued until the ends of said seal are substantially convex.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of a strand provided with apparatus for forming the seal of the invention.

FIG. 2 is a sectional side elevation view of a sealed bridge strand in a pipe anchorage.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 discloses a strand 10 consisting of a plurality of zinc-coated parallel wires 12. A short length 14 of said strand is to be provided with a water-deflecting seal.

The first step in providing said seal comprises coating a portion 16 of the length 14 with a wash primer, e.g., a mixture of phosphoric acid, zinc tetroxychromate, and polyvinyl butyl. Said primer may be applied with a brush, and dries in about 5 minutes. The purpose of the primer is to improve the adhesion between the seal and the zinc coating on the strand, and is desirable in cases where there are shearing forces applied to

the seal, e.g., in the application which will be described in connection with FIG. 2. If there are no shearing forces applied to the seal, this step may be omitted.

After the wash primer has dried, a short length 18 of strand contiguous to each end of the length 16 is wrapped with silicone rubber tape. The purpose of the tape is to prevent the heating elements, subsequently to be wrapped about the strand, from contacting the sealant, as such contact may damage the heating elements.

Caulking tape 19 is next applied to the strand at points overlapping the junction of the wash primer and the silicone rubber tape, and a mold 20 is then pressed into place about the strand. The mold 20 comprises two fiberglass half shells 22 and 24 which are clamped together by hose clamps 26. The upper half shell 24 is provided with openings 28 and 30 into which are inserted a cartridge 32 and a vent nipple 34, respectively, the vent nipple 34 being disposed at substantially the uppermost point of the mold 20.

Prior to inserting the cartridge 32 into the mold 20, heating elements 36, which may comprise silicone rubber tape containing electrical resistance elements, are clamped about the strand at each end of the mold 20. Said heating elements 36 are adapted to heat the outermost interstices of the strand to a temperature of about 260° F. in about 7 minutes.

The cartridge 32 is next filled with a liquid sealant, e.g., the polyether polyurethane sold under the trademark Conathane 1546. The Conathane 1546 contained 0.5 percent by weight of dibutyltindilaurate to accelerate the gel time of the sealant at elevated temperatures, e.g., 260° F. Conathane 1546 was selected as a sealant for multiwire bridge strand because it is characterized by the following properties: (a) resistance to water, air, ozone and fungus growth; (b) adequate resiliency, which does not deteriorate with the passage of time, to accommodate flexing and dimensional changes over a temperature range of -40° to +120° F.; (c) a maximum viscosity of 3,000 centipoise, at ambient temperatures, so that the interstices of the strand can be impregnated at pressures of 15 p.s.i. or less; (d) curability at ambient temperatures without loss of volatiles; and (e) ease of applicability, nontoxicity and low cost.

When the liquid sealant begins to emerge from the vent nipple 34, the vent is closed with a cap 38 and a caulking gun is connected to the cartridge 32. The heating elements 36 are then energized and those sections of the strand beneath said elements are heated for several minutes until the temperature of the outermost interstices is about 260° F. A pressure of about 7 p.s.i. is then applied to the caulking gun, forcing the sealant into and along the interstices of the strand. The pressure is removed after the sealant appears at the outer edge of the heating elements, the heating elements 36 are removed, and the sealant is allowed to cure at ambient temperatures for 16 to 24 hours. It has been found that when the sealant appears at said outer edge, the sealant has penetrated the interstices in such a manner that the ends of the resultant seal are substantially convex. These results have been obtained on multiwire strand comprising both parallel and helical wires.

FIG. 2 discloses a typical application of the above-described seal, viz as a water deflector in a bridge strand in a pipe anchorage. The anchorage comprises an anchorage block 40 which is cast about a pipe 42. The strand 44 passes through the pipe 42 and is suitably anchored. The strand 44 is provided with a zinc fair-lead 46 and the forward section of the anchorage block 40 is provided with a spacing plate 48.

A water-deflecting seal 50, prepared in the same manner as the seal shown in FIG. 1, is disposed in the strand 44 immediately above the spacing plate 48. In this case, the mold 52 is not removed from the strand, and a neoprene boot 54, in the shape of a conical frustum, is sealed to the mold 52 and to a portion of the pipe 42 extending beyond the spacing plate 48.

The arrows in FIG. 2 show the paths of water traveling along the interstices of the strand. As can be seen, when water contacts the end of the seal 50, it progressively moves to the outside of the strand, around the mold 52, along the boot 54 and

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down the spacing plate 48. As a result, the probability of corrosion within the strand and the anchorage pipe is substantially reduced.

I claim:

1. A multiwire strand having a seal therein, said seal comprising a thermosetting plastic surrounding said strand and filling the interstices thereof along a length of said strand, the

interstices in the center of said strand being filled along a greater length than those closest to the outer surface of said strand, intermediate interstices being filled along a length progressively decreasing as the distance from the center of said strand increases, whereby each end of said seal defines a substantially convex surface.

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