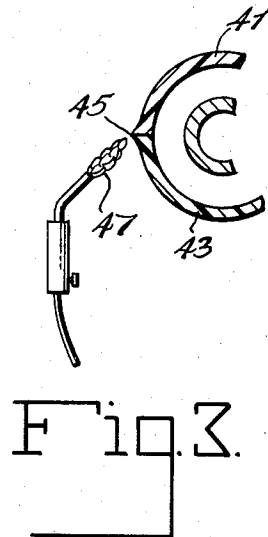
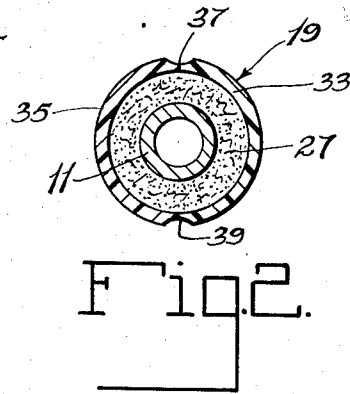
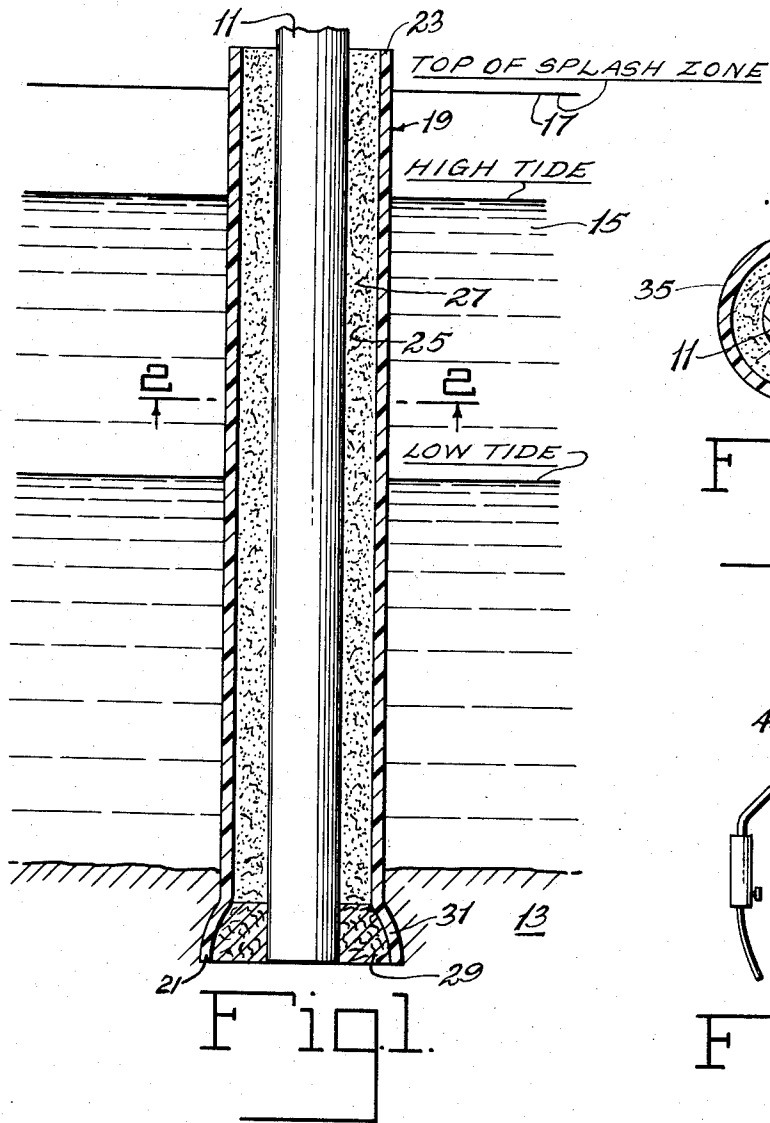


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PROTECTION AGAINST CORROSION

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PROTECTION AGAINST CORROSION

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2 Claims. (Cl. 61—54)

The present invention relates to a novel method for protecting metal members from corrosion.

When steel or other metal members such as elongated piles or oil well flow tubes are used in moist areas, as in the fresh or salt waters of lakes, rivers, marshes, and oceans, severe corrosion of the metal members is encountered. Corrosion is particularly severe when the metal member extends from below the surface of a body of water to a position above the surface so that a portion of the member is wet only intermittently by contact with the water, for example the portion above the low tide mark in tidal waters or the portion that is periodically wet by the splashing of waves.

In accordance with the present invention corrosion of a metal member under such conditions is substantially eliminated by enclosing all or a part of the member within a long sleeve of a corrosion-resistant material which is spaced annularly therefrom, and then filling the annular space between the member and the sleeve with a fixed body of corrosion resistant liquid-impermeable sealing material to engage the metal member and exclude corrosive fluids from contact therewith. Excellent results can be obtained by first converting to a liquid condition a body of solid flexible thermoplastic organic sealing material, such as grease or asphalt, and then pouring the liquid sealing material into the annular space to solidify there and engage the metal member.

The invention will be described more in detail below, with reference to the drawings wherein:

Figure 1 is a vertical sectional view, parts being in side elevation, showing a corrosion-protected metal member in accordance with the invention;

Figure 2 is a cross-sectional view taken along the line 2—2 in Figure 1, illustrating one procedure for installing a protective sleeve; and

Figure 3 is a fragmentary cross-sectional view taken through a corrosion protected metal member, illustrating a modified procedure for installing a protective sleeve.

Referring to Figure 1, the elongated metal member to be protected is a tubular steel pile 11 which is embedded in the earth or mud 13 at the bottom of a body of sea water 15 and extends vertically upwardly through the sea water past the low and high tide marks to a position above the top of the splash zone 17.

Enclosing the pile 11 in annularly spaced relation thereto is an imperforate cylindrical sleeve 19 of a material having high resistance to corrosion. Suitable materials are metalloids such as dielectric plastics or resins—for example, polyethylene, polyacrylic esters, poly- α -methylacrylic esters, phenol formaldehyde resins, polyvinyl resins such as polymerized vinyl acetate, polymerized vinyl chloride, or copolymers of vinyl acetate with vinyl chloride, polystyrene resins, polytetrafluoroethylene, and polyfluoro-chloro ethylene. Other usable sleeve materials are such corrosion resistant metals as nickel alloys, and 18-8 stainless steel.

Sleeve 19 extends at its lower end 21 into the earth

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13 at the bottom of the sea, and at its upper end 23 projects above the top of the splash zone so as to assure full protection of the member 11. In the space 25 between the member 11 and sleeve 19 is a body of sealing material 27 which engages the member 11 and excludes the latter from contact with corrosive sea water. Among materials suitable to fill the space 25 are heavy dielectric greases and asphalts which are sufficiently solid to remain fixed securely in place within the sleeve.

The corrosion protected structure described above is readily obtained by first positioning the sleeve 19 around the member 11 with its lower end above the water level, introducing a body of packing material 29 into the annulus 25 at the lower end 21 of the sleeve to exclude water therefrom, and then feeding the sleeve down through the water until its lower end 21 is embedded in the earth 13.

Any suitable flexible packing material 29 can be used to seal the annulus 25. One suitable material is wadded burlap, but other flexible materials such as an inflated annular rubber ring also can be used. The packing 29 can be retained in position during the sleeve lowering step by providing the sleeve 19 with an outwardly flared annular section 31 at its lower end which traps the packing material and prevents it from rising within the sleeve.

Sleeve 19 can be a unitary member which is slipped over the top of the pile 11 or other metal member. However, sometimes the presence of obstructions makes it impossible to slip such a unitary sleeve over the top, and in such cases the sleeve 19 is made up of two semi-cylindrical halves 33 and 35 which are positioned around the pile 11 and then secured together. We prefer to secure the halves 33 and 35 together by integrating the adjoining edges at 37 and 39, as by brushing them with a suitable solvent such as acetone which is then allowed to evaporate, or by welding them together with a low temperature gas flame. The latter procedure is illustrated in Figure 3 wherein the two semi-cylindrical sleeve halves 41 and 43 are provided with mating lips 45 at their abutting edges so that a flame 47 can fuse over the excess material and assure a unitary integrated construction.

After sleeve 19 has been installed, the sealing material 27 is introduced into the annulus 25. We prefer to melt the sealing material and pour it in the liquid condition through the open sleeve top 23 into the annulus, where it cools and solidifies in intimate engagement with the member 11. While the heat of the molten material ordinarily might be expected to damage the sleeve 19, such damage actually is prevented by the sea water which surrounds the sleeve and extracts heat therefrom so rapidly that its structural characteristics are not changed.

Sealing material also can be introduced by first dissolving it in a volatile solvent to form a pourable solution from which the solvent later is allowed to evaporate, or some types such as heavy greases may be extruded into the annulus and consolidated there under pressure.

While we have illustrated the invention by showing a sleeve 19 which extends down to the bottom of the sea, it is evident that effective protection in the zone of most serious corrosion attack can be accomplished with a similar sleeve which extends from a position slightly below the low tide mark to a position above the high tide mark, and preferably above the top of the splash zone 17 also. It is also apparent that the principles of the invention are applicable to the protection of equipment which is in continuous service under water.

Obviously many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

We claim:

1. A method for protecting an elongated member of metal embedded in the earth at the bottom of a body of water and extending vertically upwardly to a position above the top of the splash zone of said body of water, said method comprising enclosing at least a part of said member above the surface of said body of water within an annular sleeve in annular spaced relationship to said member, said sleeve being comprised of a solid synthetic plastic material and having an outwardly flared annular section at the lower end thereof, said outwardly flared annular section and said member forming an outwardly flared annulus therebetween, introducing into said flared annulus a body of flexible packing material in water tight contact with both said member and said flared section for excluding water from said flared annulus, and simultaneously maintaining said lower end above the surface of said body of water; lowering said sleeve containing said packing material in said flared annulus into said body of water until said sleeve extends from said earth to a point above the top of said splash zone; heating and melting a body of solid organic sealing material to a hot liquid condition and pouring said body of hot liquid sealing material into the annular space remaining between said member and said sleeve whereby said body of hot liquid sealing material is indirectly cooled by said body of water in contact with said sleeve to solidify and engage said

member and said sleeve for excluding corrosive fluids from said member.

2. A method in accordance with claim 1 wherein the step of enclosing at least a part of said member above the surface of said body of water within an annular sleeve in annular spaced relationship to said member is accomplished by placing a pair of semi-cylindrical sleeve members around at least a part of said member above the surface of said body of water in annular spaced relationship to said member and securing said semi-cylindrical sleeve members together in water tight contact by welding together the adjoining edges thereof.

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