METHOD OF COATING DOME-LIKE STRUCTURES

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ABSTRACT OF THE DISCLOSURE

Domes are quickly and easily coated with a flexible spreading element such as a rope by securing the rope to an upper portion of the dome, placing a quantity of paint on the upper portion of the dome, rotating the rope about the dome, spreading the paint as gravity causes the paint to flow downwardly.

This invention relates to the coating of dome-like structures, and more particularly relates to the coating of dome-like structures thereof having a positive curvature on the surface to be coated.

The use of dome-like structures is increasing primarily due to the ease with which they may be fabricated. Particularly advantageous and beneficial dome-like structures are prepared from synthetic resinous materials such as are disclosed in U.S. Pat. 3,200,899. Occasionally, it is desirable to apply a protective coating to the surface of a dome-like structure, for example, the plastic of foam plastic domes of the hereinbefore mentioned patent. It is usually desirable to apply coatings such as protective coatings to dome-like or spheroidal structures having a relatively smooth surface. Most often, such a protective coating is applied by means of brushing, rolling, or spraying. Such operations usually involve a substantial amount of time and equipment such as staging and supports for the workers. Consequently, the application of such a coating is time consuming and expensive.

It would be advantageous if there were available a method of applying a coating to a generally spheroidal or dome-like structure which required a minimum of time, effort and equipment.

Furthermore, it would be advantageous if such a coating and method would permit the coating to be accomplished with a minimum number of personnel in a minimum length of time.

It would also be advantageous if such a method of coating would allow the application of successive coats with a minimum effort.

These benefits and advantages in accordance with the present invention are achieved in a method for the application of a liquid coating medium to a curved surface having a generally dome-like configuration having a positive curvature on at least a major portion of the surface thereof, the dome having an upper portion and a lower portion, the steps of the method comprising, providing an anchor means generally adjacent the center of the upper portion of the dome, the anchor means having secured thereto an elongate member adapted to contact at least a major portion of the surface of the dome between the anchor and the lower portion of the dome, contacting the linear element with a portion of the dome surface in such a manner that it extends generally outwardly from the anchor portion to a location generally adjacent the lower portion of the dome, applying a predetermined quantity of coating material to the upper portion of the dome generally adjacent the anchor means, moving the elongate element along the surface of the dome to contact the liquid coating material at a rate such that the coating material is urged by gravity toward the lower portion of the dome and contacts at least a major portion of the elongate element thereby spreading the coating material on the dome as the elongate element is rotated about the anchor point in contact with the surface of the dome.

Further features and advantages of the present invention will become more apparent from the following specification when taken in connection with the drawings wherein:

FIG. 1 schematically depicts the method of the invention; and

FIGS. 2 and 3 are cross-sectional views of elongate elements suitable for the practice of the method.

In FIG. 1 there is schematically illustrated a generally spheroidal or dome-like structure generally designated by the reference numeral 10. The structure 10 has a generally hemi-spheroidal surface 11 having a positive curvature over at least a major portion thereof. The outer surface 11 has an upper portion 12 and a lower portion 13, the portions 12 and 13 of the surface 11 correspond generally to the upper and lower portions of the dome 10. The dome 10 has a lower peripheral edge 14. An anchor means 16 is generally centrally secured to and adjacent the upper portion of the dome generally in the area of the reference numeral 12. The anchor means 16 has affixed thereto an elongate generally linear flexible element 17 which extends generally radially outwardly and downwardly therefrom along the surface 11 of the dome 10, toward the lower edge 14. The elongate element 17 has a first or tethered end 18 and a peripheral or movable end 19 disposed adjacent to the lower edge 14 of the dome 10. Affixed to the end 19 of the elongate linear element 17 is a means 20 particularly adapted and suited to rotate the end 19 of the element 17 generally about the lower portion of the dome 13. A coating supply or reservoir 22 is disposed generally adjacent to the dome 10, a pump or metering means 23 is in operative communication with reservoir 22 and is adapted to remove a coating material from the reservoir 22 at a predetermined rate. A discharge means or conduit 25 is in operative communication with the pump 23 by means of a first end 26, a second or discharge end 27 of the discharge means 25 is disposed generally adjacent the anchor means 16 and adapted to discharge a coating material adjacent the first end 18 onto the upper portion 12 of surface 11. The coating 29 flows by gravity downwardly along the elongate element 17 towards the second end 19. The elongate element is moved about the lower edge 14 of the dome 10 by the rotating means 20 at a rate such that the coating material 29 leaves the second end 19 at a rate sufficiently rapidly that a significant amount of the coating material does not fall onto the ground or support. Generally, the elongate element 17 urges the coating material upwardly and spreads the material upon the surface 11 of the dome may be fabricated from any flexible material which is not attacked by the coating composition applied.

In the application of such coating materials as latex paints, that is, aqueous dispersions of synthetic resinous material admixed with suitable fillers or pigments almost any known water-soluble material may be successfully utilized. Beneficially, spreading elements may be prepared from such materials as polyethylene foam and rope such as conventional 34 inch Manila rope.

In applying a protective coating to such a dome or structure, it is desirable that only sufficient coating material be applied to give a coating of the desired thickness. The quantity of coating material per unit area may be readily determined if the nature of the surface and coating material are known. Beneficially, in many applications where a smooth surfaced dome or other spheroidal structure is being coated it is desirable to determine the coating weight or volume of coating material per unit...
area prior to attempting to coat the dome. A sample portion of material identical with or generally similar to the dome is coated with the coating material and the desired coating level established. Once the desired coating weight or volume of coating material per unit area of the spheroidal surface has been determined, the total area of the spheroidal surface is readily calculated from presumably known dimensions or at least readily determined quantities. The total quantity of coating material is then readily calculated. The rate of travel of the elongated coating element such as the element 17 is known or determined and the coating material supplied to the upper portion of the dome at an appropriate rate. Precise synchronization of the pumping or forwarding rate of the coating material to the upper surface of the dome is not critical. If the coating material is discharged at a greater or lesser rate than might be initially desired, the rate of rotation of the elongated spreading element such as the element 17 may be increased or decreased. Usually, it is desirable to discharge the coating material in front of the elongated spreading element, however, as many coating materials tend to be of relatively high viscosity and flow slowly, rotation of the spreading means such as the element 17 of FIG. 1 will cause a sufficient bank of coating material to accumulate between its leading edge and the surface of the dome and be readily downwardly displaced by means of gravity.

In FIG. 2 there is schematically depicted a cross-sectional configuration of a spreading or elongating element generally designated by the reference numeral 35. The element 35 comprises an elongate cylinder or body 36 having an outer or spreading surface 37 and defining an internally disposed supply conduit 38. Advantageously, when employing a spreading element such as the element 35 coating material may be pumped or discharged upwardly from the lower end of the spreading element through the conduit 38 and discharged generally adjacent the upper portion of the dome. Beneficially, if particularly viscous materials are employed as coating compositions the spreading element 35 is perforated at spaced locations along its length to provide a plurality of discharge openings having smaller diameters adjacent the lower or inlet end of the spreading element and larger openings adjacent the uppermost portion in order to compensate for the pressure drop through the spreading element.

FIG. 3 depicts an alternative cross-sectional configuration of an elongate spreading element suitable for the practice of the present invention. The element is generally designated by the reference numeral 40. The element 40 comprises a body 41 having a dome contacting surface region 42, the body 40 adjacent to the dome contacting configuration 42 defines a plurality of generally elongate parallel dependent lands 43 having defined therebetween a plurality of narrow spaces 44, Generally centrally disposed on the surface contacting portion 43 of the body is an elongate open-sided trough or passage 45. Generally adjacent the passage 45 is an internal conduit 46 adapted to receive a coating material and distribute it to the elongate element 40 by discharging into the passage 45 generally adjacent to the upper portion thereof by means of an opening, not shown. A pair of spaced apart reinforcing elements 48 and 49 are disposed within the body 40 in order to provide adequate tensile strength in such cases when the body 40 is prepared from such materials as foamed thermoplastic or foamed elastomers such as rubber.

By way of further illustration, 30 foot diameter synthetic dome is coated with the coating composition of a latex paint employing the apparatus and method such as is depicted in FIG. 1. The painting time or coating time required for such dome is about five minutes. Generally, the equipment is set up in a period of about 20 minutes. Cleaning of the reservoir pump and spreading element 17 after the paint has been applied requires an additional 10 minutes when latex paints, that is, water based paints for coating compositions are employed. Larger domes require slightly greater time. Usually the spreading element may be manually rotated about the dome to provide adequate and satisfactory results. When coating large domes, that is, up to 80 or 100 feet in diameter, the coating element may be pulled about the base by two or more persons with ease and if greater speed is desired due to a relatively thin or low viscosity coating composition a small motor vehicle such as a tractor or the like may be employed.

Beneficially, oftentimes it is desired that the coating extend to the bottom edge of the dome. In such cases it usually is advantageous to weigh the lower portion of the spreading element and apply the rotating force a short distance from the extreme lower end. Weighting the spreading element causes it to conform closely to the configuration of the dome and permit it to be pulled or pushed about the periphery of the dome by a force applied at a convenient height.

In a manner similar to the foregoing illustration, dome-like structures are readily coated rapidly and with a variety of coating compositions and having such materials as cementitious grout, oil paints, thinned bituminous compositions and the like. Beneficial results are also obtained when the method of the invention is employed to coat dome-like structures having outer surfaces of cement, resin, impregnated glass fiber, paint, metal and the like. Generally, the synthetic resinous foams such as foam polyethylene are not advantageous when employed with bituminous materials as it is extremely difficult to clean them. For the application of sticky materials it usually is desirable to employ a rope such as conventional Manila rope or preferably a braided cotton rope.

I claim: 1. A method for the application of a liquid coating medium to a curved surface of a structure having a generally dome-like configuration and having a positive curvature on at least a major portion of the surface thereof, the structure having an upper portion and a lower portion, the steps of the method comprising providing an anchor means generally adjacent the center of the upper portion of the structure, the anchor means having secured thereto an elongate flexible member adapted to contact at least a major portion of the surface of the structure between the anchor means and the lower portion of the structure, contacting the elongate element with a portion of the structure surface in such a manner that it extends generally radially outward from the anchor portion to a location generally adjacent the lower portion of the structure, applying a predetermined quantity of coating material to the upper portion of the structure generally adjacent the anchor, moving the elongate flexible element along the surface of the structure to contact the liquid coating material, at a rate such that the coating material is urged by gravity toward the lower portion of the structure and contacts at least a major portion of the elongate element which spreads the coating material on the structure as the elongate element is rotated about the anchor means in contact with the surface of the structure.

2. The method of claim 1 wherein the structure is a synthetic resinous dome having walls of expanded plastic materials.

3. The method of claim 1 wherein the coating material is pumped from a reservoir through a conduit and discharged adjacent the upper end of the elongate element.

4. The method of claim 1 wherein the coating material is applied to the surface of the structure through an
5. The method of claim 1 wherein the elongate element is rotated manually above the anchor means of claim 1 wherein the elongate element is a flexible synthetic resin.

6. The method of claim 1 wherein the elongate element is a synthetic resin.

7. The method of claim 1 wherein the elongate element is a rope.