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PATENT SPECIFICATION

DRAWINGS ATTACHED

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Int. Cl.:—B 05 c 1/06

COMPLETE SPECIFICATION

Method and apparatus for Applying Protective Coatings to Surfaces Under Water

- I, DAVID FITZHERBERT JONES, a British Subject, of Plummers Water, Norley Wood, Lymington, Hampshire, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- This invention relates to a method of applying protective coatings to surfaces under water and provides an apparatus for carrying such a method into effect.
- A method of satisfactorily applying protective coatings to surfaces under water would have substantial advantages over conventional methods of applying such coatings to surfaces which are normally submerged, particularly in the maintenance of marine vessels. In the case of yachts and smaller vessels, it is necessary to haul the vessel out of the water in order to apply paint to the surface of the vessel which is normally under water. In the case of larger vessels, the ship must be placed in a dry dock in order to carry out painting of the lower parts of the hull. In both cases, substantial time and expense is involved in putting the vessel into a condition where the paint can be applied using normal methods. In the case of merchant vessels, the time involved in waiting for a dry dock to be vacant and putting the vessel into the dock is frequently a substantial proportion of the time actually involved in preparing and painting the hull. This, of course, represents a substantial amount of lost revenue while the vessel is out of commission.
- Nowadays, with larger and larger merchant vessels being built, there are fewer dry docks available for the very large vessels and maintenance of the lower parts of the hulls under water becomes an increasingly intractable problem.
- Protective coating compositions are, however, available which are capable of curing to form an adherent coating under water but difficulty has been experienced in devising a satisfactory method of applying such coatings to surfaces under water.
- According to the present invention, there is provided a method of applying protective coatings to surfaces under water which comprises forcing a suitable protective coating composition to an applicator pad at a pressure at least equal to the ambient pressure of the water at the depth at which the coating is applied, and applying the composition to the surface by a smearing action. Normally, the protective coating is forced to the applicator by means of compressed air.
- The invention also provides apparatus for carrying out the method of the present invention which includes an applicator pad, a reservoir for a protective composition to be supplied to the applicator pad, a sensing device for sensing the ambient water pressure, and a control device operative to maintain the pressure at which the composition is supplied to the applicator pad at least as high as the sensed pressure.
- Preferably the porous pad is a pad of flexible foamed plastics material having an inter-connecting cellular structure. Examples of suitable foam plastics materials are polyether, polyester and polyurethane foams. It has been found advantageous in practice to cover the free face of the plastics foam with a porous fabric and a particularly useful fabric has been found to be towelling.
- One embodiment of an apparatus in accordance with the present invention will now be described with reference to the accompanying drawings in which:
- Figure 1 is a schematic drawing showing the layout of the apparatus including the applicator.
- Figure 2 is a perspective view of the applicator.
- Figure 3 is a partial section in elevation of the applicator as shown in Figure 2.
- Referring to Figure 1 of the drawings, the

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apparatus broadly comprises an applicator 1 connected by a conduit 2 to a paint reservoir 3. The paint reservoir 3 may be located on a quay or diving tender, but where the apparatus is portable, it is conveniently carried on the back of the diver. Paint is forced from the reservoir 3 to the applicator by means of compressed air which is fed along a conduit 4 from a control unit 5. The control unit 5 is connected to a source of compressed air (not shown) by means of a conduit 6 having a suitable self-sealing adaptor 7. The pressure in the compressed air conduits is monitored by means of a gauge 8 which is connected to conduit 4 by means of an air line 9. The gauge 8 is conveniently worn on the diver's wrist. It will be appreciated that each of the conduits 2, 4, 6 and 9 are constructed from a flexible material such as rubber or a thermoplastics material. The air supply system also includes a bleed valve 10 which can be operated by the diver in order to release pressure from the system and thus to stop the flow of paint to the applicator. Pressure in the system can be increased by operating a regulator valve 11 in the control unit 5. The effect of this is to increase the air pressure fed to the reservoir 3 and thus to increase the flow of paint to the applicator 1.

Referring to Figures 2 and 3 of the accompanying drawings, these show in more detail the construction of the applicator. As will be seen, the applicator comprises a body 20 formed from a non-corrosive metal which is provided with a main longitudinal passage 21 for feeding paint to its lower surface. A transverse passage 22 extends from a side wall of body 20 and communicates with the end of passage 21 remote from the lower surface of body 20. Passage 22 is appropriately sized to receive the constricted end of a stainless steel tube 23 which is formed with an aperture which coincides with the upper end of passage 21. Tube 23 is clamped into the body 20 by means of two nuts and bolts 24 and sealed into the body by means of an epoxy resin glue such as the material sold under the Registered Trade Mark "Araldite". Tube 23 is conveniently provided with a handle 25 and at its free end with a pipe union 26 for connection to the rest of the apparatus. As shown in Figure 3, the lower face of body 20 is generally curved and a layer 27 of flexible foam plastics material is held in contact with the lower face of body 20. Desirably, this foam layer is about 2" thick and its flexibility enables it to conform to the shape of the surface being painted and to exclude water from the interface. A ring 28 of brass or other non-corrosive metal serves to clamp the pad comprising the foam 27 and a towelling outer cover 29 into contact with body 20. Snap fasteners 30 are conveniently provided to hold the ring 28 to the body 20.

It will be appreciated that the body 20 of

the applicator, the tube 23 and the ring 28 may alternatively be manufactured from a plastics material, such as nylon, and in this case the tube 23 could be moulded integrally with the body in manufacture.

In the use of the apparatus, air is fed along conduits 6 to the control unit 5 which is a pressure reducing valve arranged to operate with an input pressure of 100 p.s.i.g. and with an output of 0 to 50 p.s.i.g. The control unit 5 includes means for sensing the ambient pressure at which the apparatus is used and is arranged to supply air along conduit 4 at a pressure which is at least the same as the prevailing ambient pressure at which the diver is operating. This ensures that water is not forced backwardly through the applicator head into the apparatus. When the diver wishes to vary the rate at which paint is fed to the applicator head, he operates the regulator valve 11 to increase or decrease the rate of supply of compressed air and applies the paint by moving the applicator 1 across the surface to be painted using a smearing action. If the diver wishes to arrest the flow of paint to the applicator this can be done by turning the regulator valve 11 back and pressing the button 10. The control unit 5, however, ensures that the pressure does not drop below the prevailing ambient pressure.

It is found that using the apparatus in accordance with the invention, it is possible to apply an anti-fouling paint to a thickness of 0.002 of an inch in one pass of the applicator. It will be appreciated that there are no cocks, valves or other moving parts in contact with the paint and this eliminates the possibility of clogging and makes cleaning and maintenance fairly easy. When a particular painting operation has been completed and the apparatus returned to the surface, the paint line can be cleaned by simply replacing the reservoir 3 with a receptacle filled with a suitable paint solvent. By blowing the solvent through the conduit 2 and the applicator 1, the apparatus is effectively and conveniently cleaned.

It will be appreciated that the applicator 1 can be modified in such a way that it is moved over the surface to be painted mechanically. The applicator head can, for example, be driven so that it performs an orbital movement and the operator would then simply hold the head in contact with the surface to be painted. In a further development of the apparatus, the applicator head could be arranged to travel on a magnetic track along the ship's bottom or other steel surface and the operator can simply follow the applicator and control its direction and the flow of paint to the applicator head.

WHAT I CLAIM IS:—

1. A method of applying protective coatings to surfaces under water which comprises forcing a suitable protective coating composition to an applicator pad at a pressure at least equal

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Referring to Figures 2 and 3 of the accompanying drawings, these show in more detail the construction of the applicator. As will be seen, the applicator comprises a body 20 formed from a non-corrosive metal which is provided with a main longitudinal passage 21 for feeding paint to its lower surface. A transverse passage 22 extends from a side wall of body 20 and communicates with the end of passage 21 remote from the lower surface of body 20. Passage 22 is appropriately sized to receive the constricted end of a stainless steel tube 23 which is formed with an aperture which coincides with the upper end of passage 21. Tube 23 is clamped into the body 20 by means of two nuts and bolts 24 and sealed into the body by means of an epoxy resin glue such as the material sold under the Registered Trade Mark "Araldite". Tube 23 is conveniently provided with a handle 25 and at its free end with a pipe union 26 for connection to the rest of the apparatus. As shown in Figure 3, the lower face of body 20 is generally curved and a layer 27 of flexible foam plastics material is held in contact with the lower face of body 20. Desirably, this foam layer is about 2" thick and its flexibility enables it to conform to the shape of the surface being painted and to exclude water from the interface. A ring 28 of brass or other non-corrosive metal serves to clamp the pad comprising the foam 27 and a towelling outer cover 29 into contact with body 20. Snap fasteners 30 are conveniently provided to hold the ring 28 to the body 20.

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It is found that using the apparatus in accordance with the invention, it is possible to apply an anti-fouling paint to a thickness of 0.002 of an inch in one pass of the applicator. It will be appreciated that there are no cocks, valves or other moving parts in contact with the paint and this eliminates the possibility of clogging and makes cleaning and maintenance fairly easy. When a particular painting operation has been completed and the apparatus returned to the surface, the paint line can be cleaned by simply replacing the reservoir 3 with a receptacle filled with a suitable paint solvent. By blowing the solvent through the conduit 2 and the applicator 1, the apparatus is effectively and conveniently cleaned.

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WHAT I CLAIM IS:—

1. A method of applying protective coatings to surfaces under water which comprises forcing a suitable protective coating composition to an applicator pad at a pressure at least equal

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to the ambient pressure of the water at the depth at which the coating is applied, and applying the composition to the surface by a smearing action.

2. A method according to claim 1 in which the coating composition is forced to the applicator by means of compressed air.

3. A method according to claim 1 or claim 2 in which the ambient water pressure is sensed by a sensing device, and the coating composition is supplied to the pad at a pressure dependent on, and at least as high as, the sensed pressure.

4. Apparatus for applying a protective coating to surfaces under water by the method of any one of claims 1 to 3, including an applicator pad, a reservoir for a protective composition to be supplied to the applicator pad, a sensing device for sensing the ambient water pressure, and a control device operative to maintain the pressure at which the composition is supplied to the applicator pad at least as high as the sensed pressure.

5. Apparatus according to claim 4 in which the applicator pad is a layer of foamed plastics material having an interconnecting cellular structure.

6. Apparatus according to claim 5 in which the free face of the layer of foamed plastics material is covered with a porous fabric.

7. Apparatus according to claim 6 in which the fabric is towelling.

8. Apparatus according to any one of claims 4 to 7 in which the pad is held between a

retaining ring and a housing member, said housing member having a passage or passages for supplying the coating composition to the pad.

9. Apparatus according to claim 8 in which the housing member is connected to the reservoir, and the reservoir is connected by a supply line to a source of compressed air for forcing coating composition from the reservoir to the applicator.

10. Apparatus according to claim 9 in which a regulator is disposed in the supply line whereby the pressure in the apparatus and hence the rate of feed of the coating composition can be controlled.

11. Apparatus according to claim 9 or claim 10 in which the supply line includes a normally closed bleed valve which is adapted on operation to release compressed air from the supply line and thus to reduce the pressure in the supply line.

12. Apparatus according to claim 11 in which a pressure gauge is connected into the supply line.

13. Apparatus for applying a protective coating composition to a surface under water substantially as described with reference to the accompanying drawings.

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