United States Patent [19]

Liddell

[11] **3,870,009**

[45] **Mar. 11, 1975**

[54] **PROTECTIVE COVERING APPARATUS FOR A SUBMERGED STRUCTURE**

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[22] Filed: **Feb. 16, 1971**

[21] Appl. No.: **115,831**

Related U.S. Application Data

[62] Division of Ser. No. 837,259, June 27, 1969, Pat. No. 3,581,305.

[52] **U.S. Cl.** **114/222,** 61/54

[51] **Int. Cl.** **B63c 1/00,** E03c 3/00

[58] **Field of Search** ..... 114/222, 69, 84, 86; 52/101, 515, 517, 202; 61/54, 46 R

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Primary Examiner—Trygve M. Blix
Assistant Examiner—Gregory W. O'Connor
Attorney, Agent, or Firm—Fulwider, Patton, Rieber, Lee & Utecht

[57] **ABSTRACT**

A protective covering for a submerged structure such as a boat, drydock, barge, float, pier, bulk head, and the like. The covering includes a pliable generally waterproof sheet and attachment means for securing spaced portions of the sheet to the surface of the structure to be protected whereby the sheet will resist deterioration of the structure. A novel method of installing the protective covering utilizing a plurality of buoyancy units is disclosed. The use of such buoyancy units permits the covering to be readily maneuvered underneath a floating structure so that the structure may be easily covered in situ.

5 Claims, 14 Drawing Figures

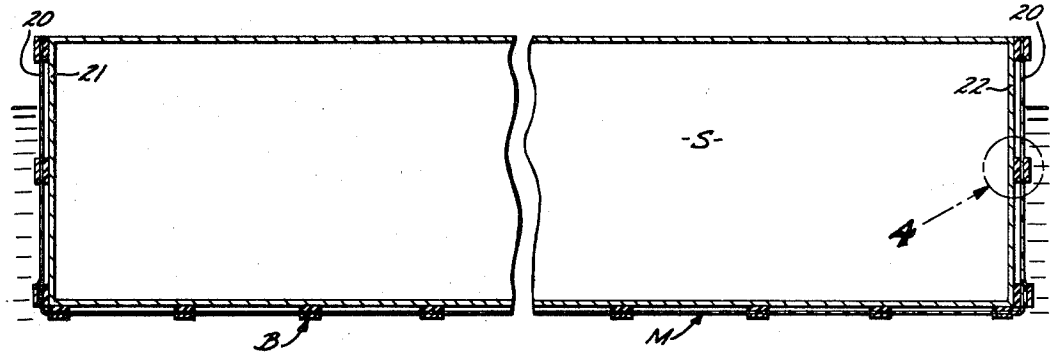


FIG. 1

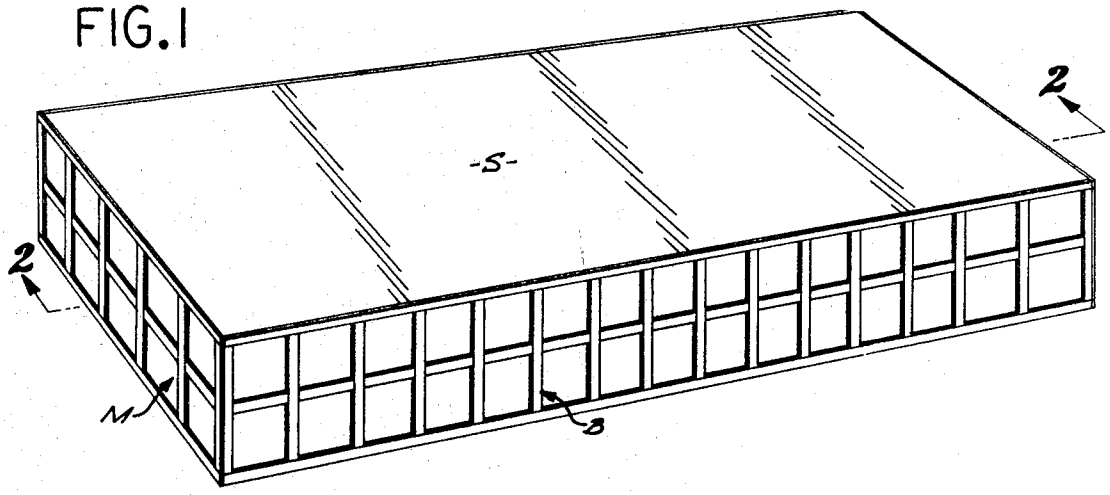


FIG. 2

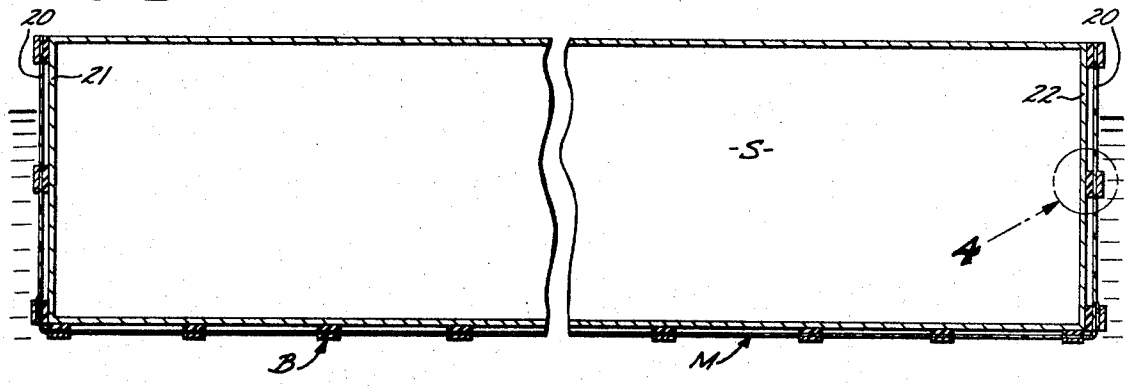


FIG. 3

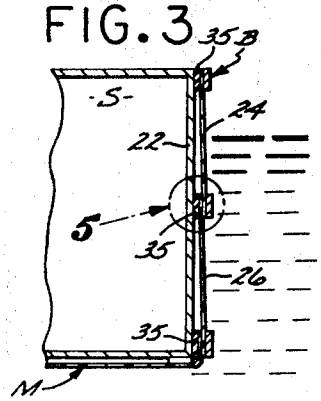


FIG. 4

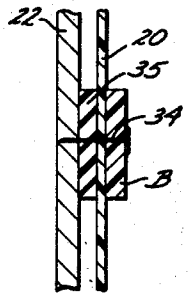


FIG. 5

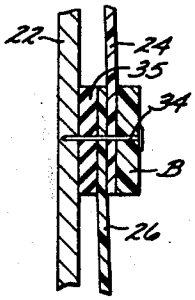
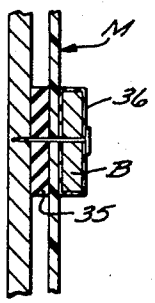


FIG. 6



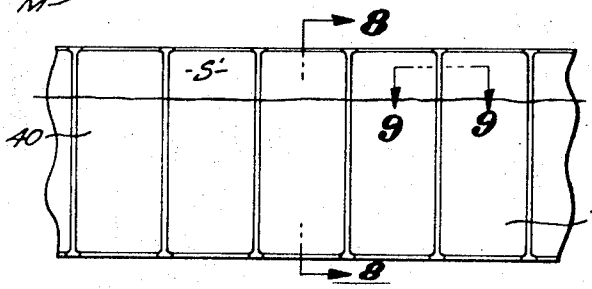


FIG. 7

FIG.8

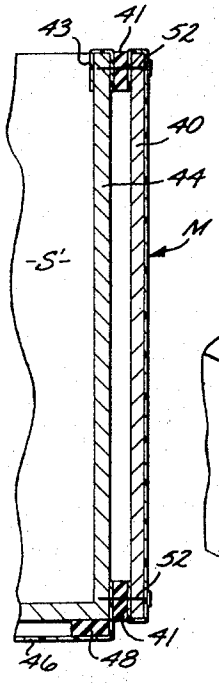


FIG.9

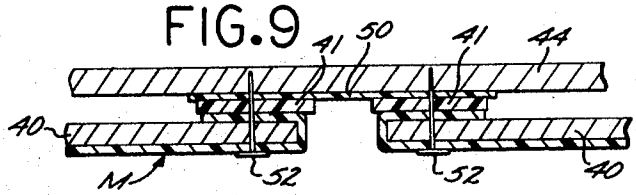


FIG.10

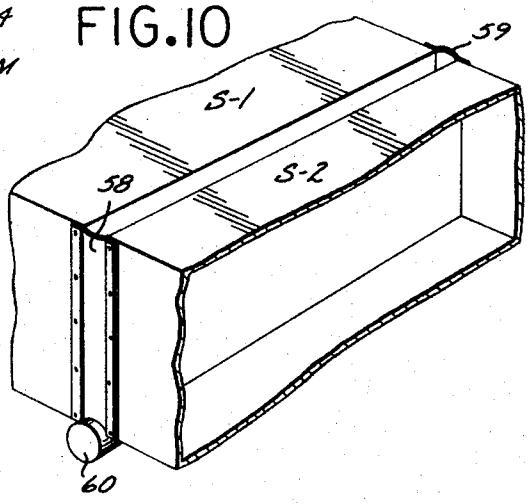


FIG.11

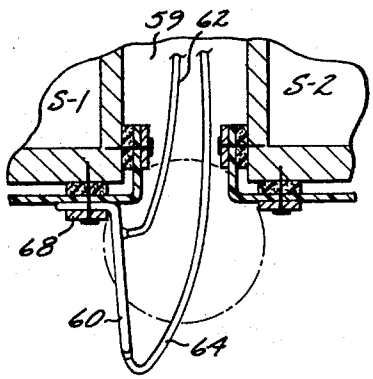


FIG.12

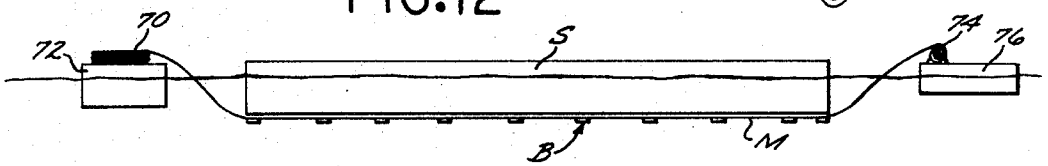


FIG.13

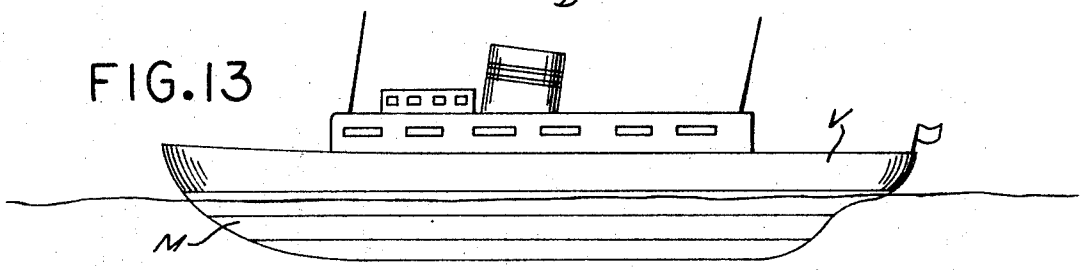
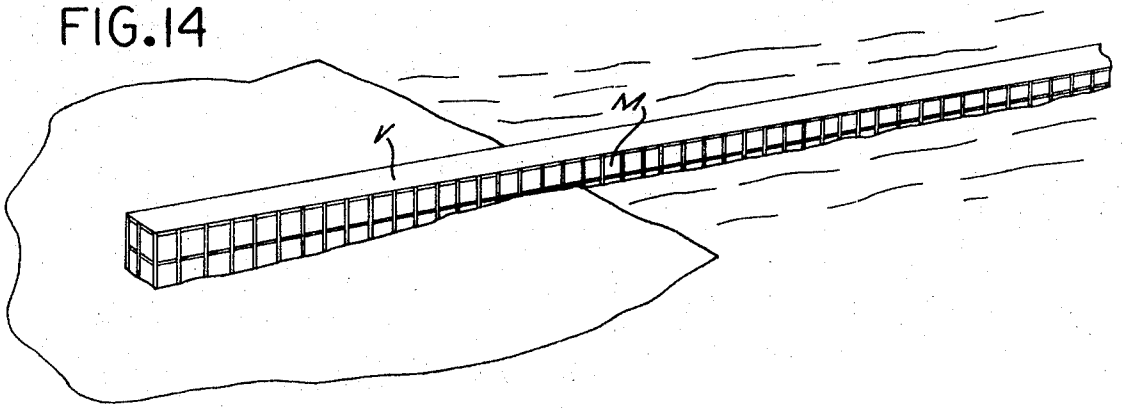


FIG.14



PROTECTIVE COVERING APPARATUS FOR A SUBMERGED STRUCTURE

This is a division of application Ser. No. 837,259, filed June 27, 1969 now U.S. Pat. No. 3,581,505.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to the protection of submerged structures by means of a protective cover sheet.

2. Description of Prior Art

It is well known to protect floating or submerged wood or metal objects by protective coatings so as to restrain deterioration of such objects by marine organisms and/or oxidation in the case of metal surfaces. It is also known to encase submerged objects with a synthetic plastic sheet to prevent marine borer damage. See, for example, my United States Letters Pat. No. 3,027,610.

SUMMARY OF THE INVENTION

It is a major object of the present invention to provide protective covering apparatus for a submerged structure which includes a pliable, generally waterproof sheet capable of resisting attack by the elements such as water, air and sunlight which is applied either with the structure in situ or out of the water. Such sheet is held to the exposed surfaces of the object to be protected with unique attachment means which can provide positive and permanent securement of the sheet to the object. Suitable sealing means are provided to restrain the inflow of water or air between the sheet and the exterior surface of the object being protected.

An additional object of the present invention is to provide apparatus of the aforedescribed nature utilizing a plurality of individual sealed modular sections, each such section creating a stagnant environment independent of the other sections whereby failure of one section will not adversely affect the protection afforded by means of the other sections.

Another object of the present invention is to provide apparatus of the aforedescribed nature which is particularly useful in protecting submerged wooden structures against marine borer attack.

A further object of the present invention is to provide apparatus of the aforedescribed nature which utilizes battens to secure the sheet to the object being protected.

A particular object of the present invention is to provide a method of installing the protective sheet beneath a partially submerged structure utilizing a plurality of buoyancy units which will retain the sheet and attachment means against the structure while such attachment means are secured to the structure.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view showing a structure which has been equipped with a preferred form of protective covering apparatus embodying the present invention;

FIG. **2** is a broken vertical sectional view taken in enlarged scale along line **2—2** of FIG. **1**;

FIG. **3** is a broken view similar to the right-hand portion of FIG. **2** showing a second form of protective covering embodying the present invention;

FIG. **4** is an enlarged view of the encircled area designated **4** in FIG. **2**;

FIG. **5** is an enlarged view of the encircled area designated **5** in FIG. **3**;

FIG. **6** is a view similar to FIGS. **4** and **5** showing a third form of batten arrangement which may be utilized with apparatus embodying the present invention;

FIG. **7** is a fragmentary side elevational view showing another form of protective covering apparatus embodying the present invention installed upon a submerged structure;

FIG. **8** is a broken vertical sectional view taken in enlarged scale along line **8—8** of FIG. **7**;

FIG. **9** is a horizontal sectional view taken in enlarged scale along line **9—9** of FIG. **7**;

FIG. **10** is a broken horizontal sectional view of a seal construction which may be utilized with apparatus embodying the present invention;

FIG. **11** is a broken vertical sectional view showing the seal arrangement of FIG. **10**;

FIG. **12** is a side elevational view illustrating a method which may be employed to install apparatus embodying the present invention;

FIG. **13** is a side elevational view of a vessel equipped with apparatus embodying the present invention; and

FIG. **14** is a perspective view showing a bulkhead provided with apparatus embodying the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. **1** and **2** there is shown a typical example of a floating wooden structure S, such as a barge or pontoon, which is adapted to be protected by means of apparatus embodying the present invention. It should be particularly noted that the protective apparatus of the present invention need not be applied when the structure S to be protected is new, but instead may be applied after original protection such as creosote has failed and marine borer attack has commenced. The bottom and sides of the structure S are covered with a sheet M of a pliable, generally waterproof material, such as a synthetic plastic. Suitable plastics are polyvinyl chloride, polyethylene, or polyurethane. Also, synthetic fabrics or even a synthetic metal alloy may be utilized. The sheet M is affixed to the bottom and sides of structure S by means of battens B in a permanent manner. As indicated in FIGS. **1** and **2**, the battens B may be arranged in a longitudinal and vertical intersecting pattern to define a latticework of individual sealed modules.

In FIG. **2** a single protective sheet **20** of material M is shown extending alongside each end wall **21** and **22** of the structure S. As indicated in FIGS. **3** and **5**, however, a plurality of module sheets **24** and **26** may collectively be extended from the top to the bottom of the end walls. The battens B are of like construction and are formed of a suitable material such as wood, metal or synthetic plastic. The battens B are affixed to the exterior surface of the structure S by suitable attachment means such as corrosion resistant nails **34**, screws or the like. Each of the battens B is aligned with a sealing strip **35** formed of a synthetic foam plastic such as polyurethane, polyvinyl, polyethylene, neoprene, rubber or the like. Also, a seal means such as a mastic material may be employed.

Where wood battens are employed, the batten disposed outwardly of the protective covering material M may be wrapped with a synthetic plastic or other ele-

ment resistant material such as shown at **36** in FIG. **6.**

It will be apparaent that when the battens B are nailed or otherwise fastened to structure S the seal strips **35** will be compressed so as to form a generally watertight seal between the ambient water surrounding the structure and the space inwardly of sheet **20.** The seal should be adequate to restrict the rate of circulation of sea water within the space adjacent the exterior surface of the structure S to the extent that marine borer life can not be sustained. When the salt, oxygen and organic matter which the marine borers extract from the sea to sustain themselves are not supplied at a sufficiently high rate, the borers dic as a consequence. The extent to which the rate of circulation must be restricted will vary according to the type of borer, salt, oxygen and organic matter content of the sea and other local conditions and is therefore subject to many variables. In any event, the total rate of circulation into the space exterior of the structure S through the material M or the sealed joints thereof must be low enough to arrest or prevent marine borer activity, i.e. create a toxic condition of stagnation inside sheet M wherein the water lacks supplies of salt, oxygen and organic matter in amounts sufficient to sustain life. When this has been accomplished, no marine borer attack will take place against the wood of the encased structure S.

Referring now to FIGS. **7, 8** and **9,** there is shown another form of protective covering apparatus embodying the present invention. In this form, the floating structure S′ to be protected is covered along its bottom and sides with a plurality of like panels **40** formed of a generally rigid material, such as plywood. The exterior surfaces of panels **40** are covered with modules of the protective sheet material M. As indicated particularly in FIGS. **8** and **9,** the top edge of the panels **40** are overlapped with the material. Seal strips **41** are interposed between the interior of the panels **40** and the exterior surfaces of the structure S′ to form a seal at this point. A section **43** of the material M overlaps the upper edge of the sidewall **44** of structure S′ in a waterproof manner. The lower edge of each panel **40** is also overlapped with the material M. The outer edge of the lower sheet **46** of the material M overlaps a lower seal strip **48** in a waterproof manner. Seal strips **41** and **48** may be similar to the aforedescribed seal strips **35.**

Referring to FIG. **9,** the spaces between the edges of the panels **40** may be bridged by a length **50** of the protective covering material M. The panels **40** are attached to the structure S by means of corrosion resistant nails **52** formed of a suitable alloy or synthetic plastic, and when such nails are driven the seal strips **41** and **48** will be compressed.

Referring now to FIGS. **10** and **11,** there is shown a unique seal construction which may be utilized with protective covering apparatus embodying the present invention. This seal construction is interposed between two adjacent floating structures **S1** and **S2,** such as pontoons, where the space between such two adjoining structures is too narrow to permit encasement by protective covering material along the bottom of such space. The sides of structures **S1** and **S2** are closed by vertical flexible closures **58** and **59.** The seal construction utilizes an inflatable seal tube **60** which may be formed of a suitable synthetic plastic such as that used for the aforedescribed material M. The sides of seal tube **60** are provided with filler and deflating conduits **62** and **64.** One side of the tube **60** is fitted with a holding flap **68** affixed to one of the structures **S1.** The seal tube **60** will normally be maintained in its deflated position shown in solid outline in FIG. **11** so as to avoid damage from falling objects between the structures **S1** and **S2.** When it is desired to seal the space between structures **S1** and **S2** the seal tube will be inflated into its phantom-outline position of FIG. **11** with air, gas, water or other fluid or media to provide buoyancy. Thereafter, the water within the space between structures **S1** and **S2** may be chemically treated for marine borer control, tube **60** forming a seal with the lower surfaces of the vertical closures **58** and **59** to prevent excessive loss of the chemical. After such chemical treatment, the seal tube **60** is deflated by using jet ejectors in the deflating tube conduit **64** or applying air pressure to the filler conduit.

Referring now to FIG. **12,** there is shown a method which may be employed to install apparatus embodying the present invention. In this figure a sheet of the protective covering material M is first arranged in a stack **70** on a barge **72** positioned at one side of the structure S to be protected. One end of the stacked material M is then pulled across the underside of the structure S, as by means of a reel **74** disposed on a barge **76** positioned at the side of the structure S opposite the first mentioned barge **72.** The intermediate length of the sheet of material M is provided with floating battens B which maintain the material M in close contact with the underside of the structure S. If the material of the battens B is not buoyant suitable buoyancy can be provided by means of suitable floatation elements (not shown). After the material M has been stretched along the underside of the structure S in the manner indicated in FIG. **12,** battens B may be nailed to the underside of such structure. Thereafter, the side and end walls of the structure S may be covered with the material M and all of the joints in such material suitably sealed in a manner described herein before.

Referring now to FIG. **13,** there is shown a vessel V equipped with a plurality of rows of the aforedescribed protective covering material M. In FIG. **14** there is shown a bulkhead H provided with the protective covering material M. Where the vessel V or the bulkhead H are of wooden construction the protective covering material M will afford protection against marine borer attack in the manner described hereinabove. Where the vessel V or bulkhead H are formed of metal, the protective covering material M will serve to protect the encased surfaces against oxidation.

It will be apparent that each of the forms of the present invention disclosed hereinbefore provides a plurality of individual and independent modules defining a plurality of separate stagnant environments. Should any module fail as from outside damage the remaining modules will not be affected.

Various modifications and changes may be made with respect to the foregoing detailed description without departing from the spirit of the present invention.

I claim:

1. Protective covering apparatus for a submerged structure, comprising:

a pliable, generally waterproof sheet;

a plurality of battens;

attachment means for securing said battens to spaced portions of said structure to define a plurality of independent modules; and

seal means interposed between said battens, said sheet and said structure whereby circulation of water in the space defined by said modules and the ambient water outside said modules is restricted to thereby maintain the water in said space stagnant to marine borer attack on the submerged portion of said structure.

2. Appartus as set forth in claim **1** wherein said seal means include synthetic plastic foam strips.

3. Apparatus as set forth in claim **1** wherein said battens are covered with a watertight sheet material.

4. Apparatus as set forth in claim **1** wherein said attachment means further include a plurality of generally rigid panels that are covered on their exterior surfaces with complementary sections of the material from which said sheet is formed and said seal means are disposed at the outer edges of said panels.

5. Apparatus as set forth in claim **2** wherein said attachment means further include a plurality of generally rigid panels that are covered on their exterior surfaces with complementary sections of the material from which said sheet is formed and said seal means are disposed at the outer edges of said panels.

* * * * *