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1 Navy Case No. 75688

2
3 DEVICE FOR REDUCING FLOW OF FLUID
4 FROM A RUPTURED VESSEL

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6 STATEMENT OF GOVERNMENT INTEREST

7 The invention described herein may be manufactured and used
8 by or for the Government of the United States of America for
9 governmental purposes without payment of any royalties thereon or
10 therefor.

11
12 BACKGROUND OF THE INVENTION

13 (1) Field of the Invention

14 This invention relates to damage control devices for marine
15 vessels and is directed more particularly to a device and method
16 for reducing the flow of fluid from a ruptured ferrous hull of a
17 marine vessel, when the rupture is located beneath the waterline.

18 (2) Description of the Prior Art

19 It is known to provide flexible patches for covering holes
20 in vessels to prevent escape and/or entry of fluid through the
21 hole. Many of the previous closure systems employ electromagnets
22 used to hold oil impervious sheets against a ruptured wall of the
23 vessel. U.S. Patent No. 635,939, issued October 31, 1899 to D.
24 Mason discloses a canvas patch held in place by electromagnets.
25 U.S. Patent No. 5,009,179, issued April 23, 1991 to Roscoe F.
26 Johnson shows an oil-impervious flexible sheet held in place

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1 along top and side edges by electromagnets; the bottom edge being
2 left open. In U.S. Patent No. 5,036,786, issued August 6, 1991
3 to Joseph Uri, there is presented a patch including a steel mesh
4 blanket and a steel sheet, the patch having electromagnetic bars
5 therein. Willard E. Williams, in U.S. Patent No. 5,165,356,
6 issued November 24, 1992, provides a patch including a rigid
7 plate member, a cushion layer, and a pliable sealing layer, held
8 in place against a ruptured wall by electromagnets. In each of
9 the above references, the patch is held in operative position by
10 electromagnets in some manner attached to the periphery of the
11 patch.

12 In U.S. Patent No. 5,038,701, issued August 13, 1991 to
13 Floyd A. Riddell and U.S. Patent No. 5,195,446, issued March 23,
14 1993 to Floyd A. Riddell there is disclosed a flexible covering
15 material for covering an opening in a hull of a ship. The
16 covering material includes four layers of material, and between
17 two of the layers are embedded an array of electromagnets.

18 In all of the above systems, a power source is required for
19 providing energy for activating the electromagnets.

20 William T. Holt, in U.S. Patent No. 5,009,180, issued
21 April 23, 1991, provides a patch system free of electromagnets,
22 but utilizing a series of ropes or cables, sealing hoses,
23 inflatable bladders, and the like to set a sheet in place
24 covering a rupture in the hull of a ship. The system requires on
25 deck of the stricken ship a compressor and, preferably, a winch.
26 Thus, though power is not required to activate electromagnets,

1 power is required to activate the system by running of a
2 compressor and, perhaps, a winch.

3 In some instances, there is no power on a stricken ship, and
4 in remote areas no power readily available to an oil tank, tank
5 car, or tower. Thus, there is a need for a device for covering
6 openings in fluid-containing vessels, which device may be
7 operated without electrical power. A need further exists for
8 such a device as may be utilized without components in addition
9 to the patch itself, such as cables, hoses, bladders, and the
10 like. A still further need exists for such a device devoid of
11 bulky and heavy electromagnets fixed to, or embedded in, the
12 device.

13 14 SUMMARY OF THE INVENTION

15 An object of the invention is to provide a damage control
16 device for reducing flow of fluid from a ruptured ferrous hull of
17 a marine vessel, when the rupture is located beneath the
18 waterline.

19 A further object of the invention is to provide such a
20 device requiring no electrical power for utilization.

21 A still further object of the invention is to provide such a
22 device having facility for use without additional components
23 other than the device itself.

24 A still further object of the invention is to provide such a
25 device devoid of heavy and bulky components, such as electro-
26 magnets in block or bar form.

1 With the above and other objects in view, as will
2 hereinafter appear, a feature of the present invention is the
3 provision of a damage control device for reducing flow of fluid
4 from a ruptured ferrous hull of a marine vessel, the device
5 comprising a flexible blanket including chips of permanently
6 magnetized metal embedded in a sheet of flexible oil-impermeable
7 material, such that the blanket, as a whole, comprises a flexible
8 permanent magnet. Generally peripheral portions of the blanket
9 are adapted to engage and magnetically fix to wall portions of
10 the vessel surrounding a rupture therein, and a generally central
11 portion of the blanket is adapted to overlie the rupture.

12 Strength strands are provided in the blanket, with each
13 strand having a portion fixedly embedded in the blanket and a
14 terminal portion extending beyond an edge of the blanket with an
15 attachment ring secured thereto.

16 The above and other features of the invention, including
17 various novel details of construction and combinations of parts,
18 will now be more particularly described with reference to the
19 accompanying drawings and pointed out in the claims. It will be
20 understood that the particular device and method embodying the
21 invention are shown by way of illustration only and not as
22 limitations of the invention. The principles and features of
23 this invention may be employed in various and numerous
24 embodiments without departing from the scope of the invention.

1 and sold by E.I. Dupont Company. The word "Kelvar" is a
2 trademark of that company. The strands 16 preferably include
3 portions 18 extending beyond an edge of the blanket. Secured to
4 free ends of strand portions 18 are rings 20, or other similar
5 attachment means, by which the blanket may be lifted and moved
6 into place.

7 In use, the blanket is positioned by helicopter, crane,
8 divers with powered handling mechanisms, divers performing manual
9 handling, or the like; such that a continuous strip all around
10 peripheral portions 12 of hull H will extend over the edge of
11 rupture R with the total area and distribution of confronting
12 surfaces of hull H and peripheral portions providing sufficient
13 magnetic adhesion forces to retain the blanket over rupture. The
14 peripheral portions 12 of blanket 10 are then brought into
15 contact with external wall portions H of vessel V, whereupon
16 peripheral portions 12 magnetically fix to the wall portions H of
17 vessel V. The central portion 14 of the blanket 10 thereby
18 overlies the rupture R, as shown in FIG. 1, or overlies a portion
19 of the rupture if the rupture is large relative to the sizes of
20 blankets available.

21 In selection of a proper size of blanket for a particular
22 rupture, it is important to select a size of blanket which not
23 only covers as much of the rupture as possible, but which is
24 large enough such that the peripheral portions 12 thereof provide
25 sufficient magnetic holding power to retain the blanket over the

1 rupture, given the pressure exerted by fluid in the vessel
2 seeking escape through the rupture.

3 There is thus provided a device and method for effectively
4 reacting to oil cargo ruptures, and the like, to greatly diminish
5 the flow of oil, or other fluid, from the vessel, thereby to
6 diminish the usually severe consequences of fluid flow for
7 extended periods of time. In use of the present invention, there
8 is no need to electrically magnetize the blanket, and therefore
9 no need for an electrical power source; and no separate
10 components, such as bladders, vessel borne winches, or the like,
11 are required to effect connection on the blanket to the ruptured
12 surface.

13 It is to be understood that the present invention is by no
14 means limited to the particular construction and method herein
15 disclosed and shown in the drawing,
16 For
17 example, while a ship is illustrated as a vessel to which the
18 device herein is applied, it will be apparent that the device may
19 be applied by the method herein to oil and other fluid storage
20 vessels. Further, while the invention has been described
21 principally with respect to impeding outflow of fluids from a
22 marine vessel carrying the fluid, the invention has applicability
23 in situations in which it is desired to prevent inflow of fluids,
24 as in the case of a rupture in the hull of a freighter-type ship.
25 The device has applicability with ruptures exposing fluid to the
26 atmosphere, as well as ruptures under the waterline.

1 Navy Case No. 75688

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3 DEVICE FOR REDUCING FLOW OF FLUID
4 FROM A RUPTURED VESSEL

5
6 ABSTRACT OF THE DISCLOSURE

7 There is presented a damage control device for reducing flow
8 of fluid from a ruptured vessel. The device comprises a flexible
9 blanket including chips of permanently magnetized metal embedded
10 in a molded blanket of flexible oil-impermeable elastomeric
11 material, such that the blanket as a whole comprises a flexible
12 permanent magnet Strength strands are provided with each strand
13 having a portion embedded in molded blanket and a terminal
14 portion extending beyond a blanket edge. An attachment rings is
15 secured to the terminal portion of each strand. Generally
16 peripheral portions of the blanket are adapted to engage and
17 magnetically fix to wall portions of the vessel surrounding a
18 rupture therein. A generally central portion of the blanket is
19 adapted to overlie the rupture.

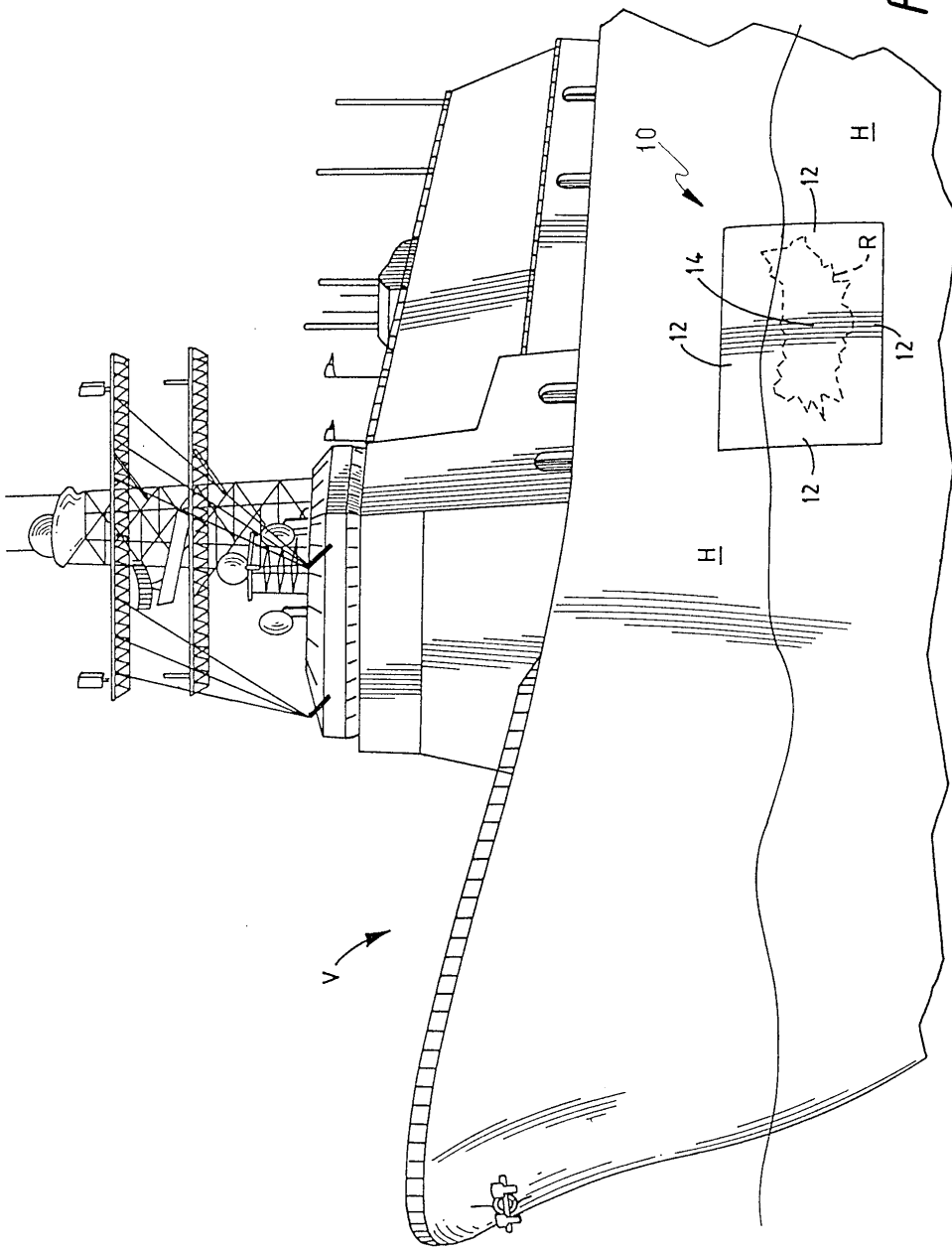


FIG. 1

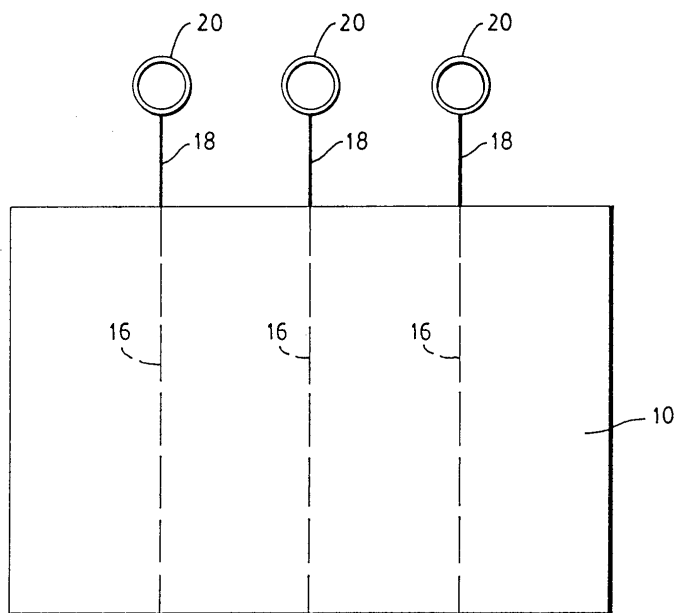


FIG. 2