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[54] **OIL COLLECTION BOOM**
6 Claims, 5 Drawing Figs.

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B01d 17/00

[50] Field of Search **210/121,**
170, 242 (Oil-H₂O Digest); 61/1(F), 5

[56] **References Cited**
UNITED STATES PATENTS

1,397,891	11/1921	Jones.....	210/242
2,200,552	5/1940	Hook.....	61/1(EX)
2,228,529	1/1941	Moeller.....	210/(OWD)
2,240,567	5/1941	Meacham.....	61/1(F)
3,146,598	9/1964	Smith.....	61/1(F)
3,184,923	5/1965	Galvaing.....	210/242X

3,221,884	12/1965	Muller.....	210/(OWD)
3,358,838	12/1967	Kosar et al.....	210/(OWD)

FOREIGN PATENTS

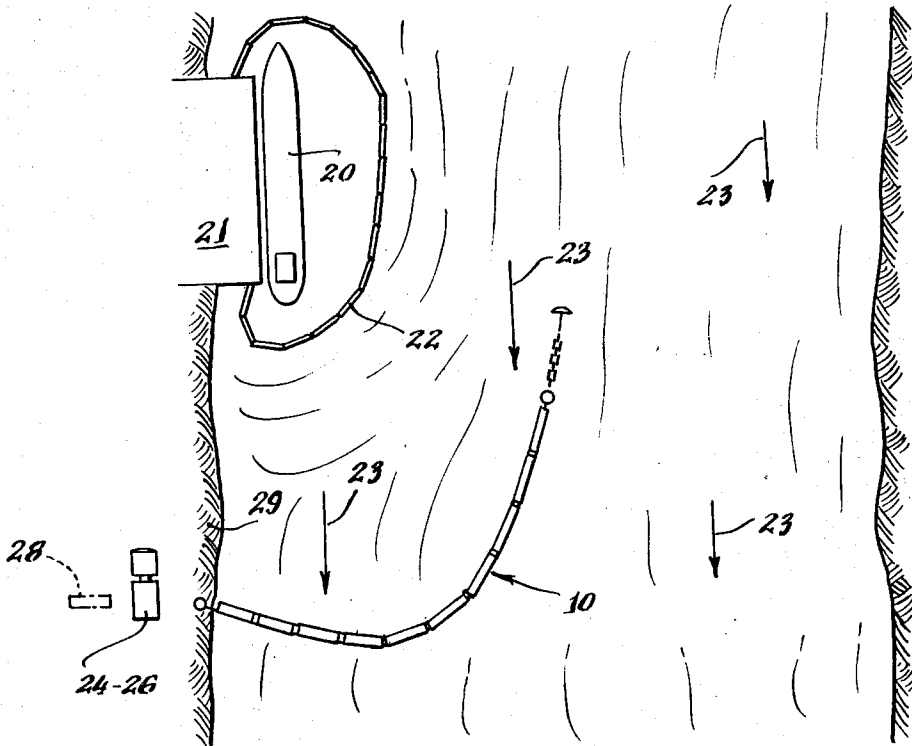
637,856	11/1936	Germany.....	61/1(F)
980,732	1/1965	Great Britain.....	61/1(F)
1,026,201	4/1966	Great Britain.....	210/(OWD)
189,188	4/1964	Sweden.....	61/1(F)

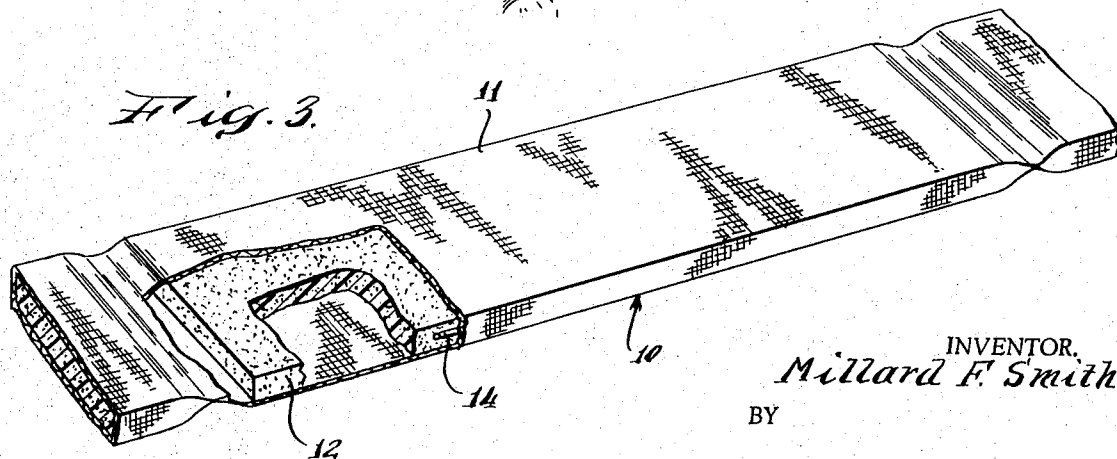
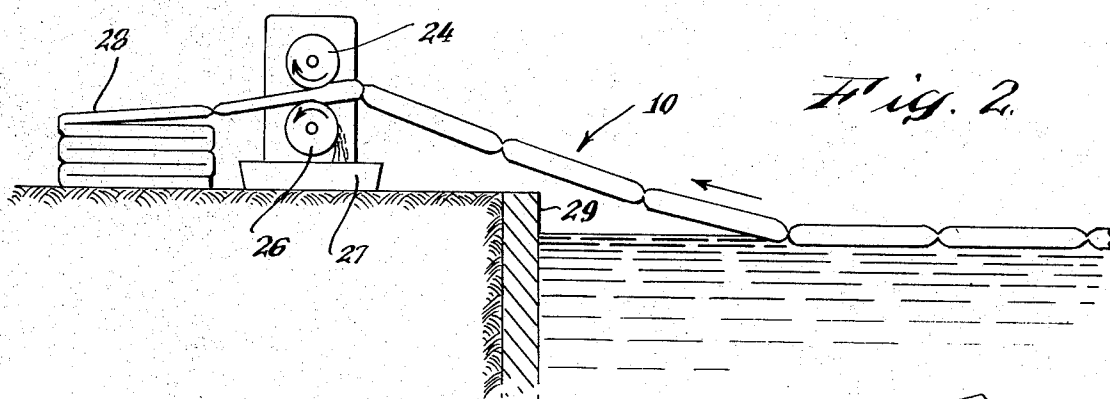
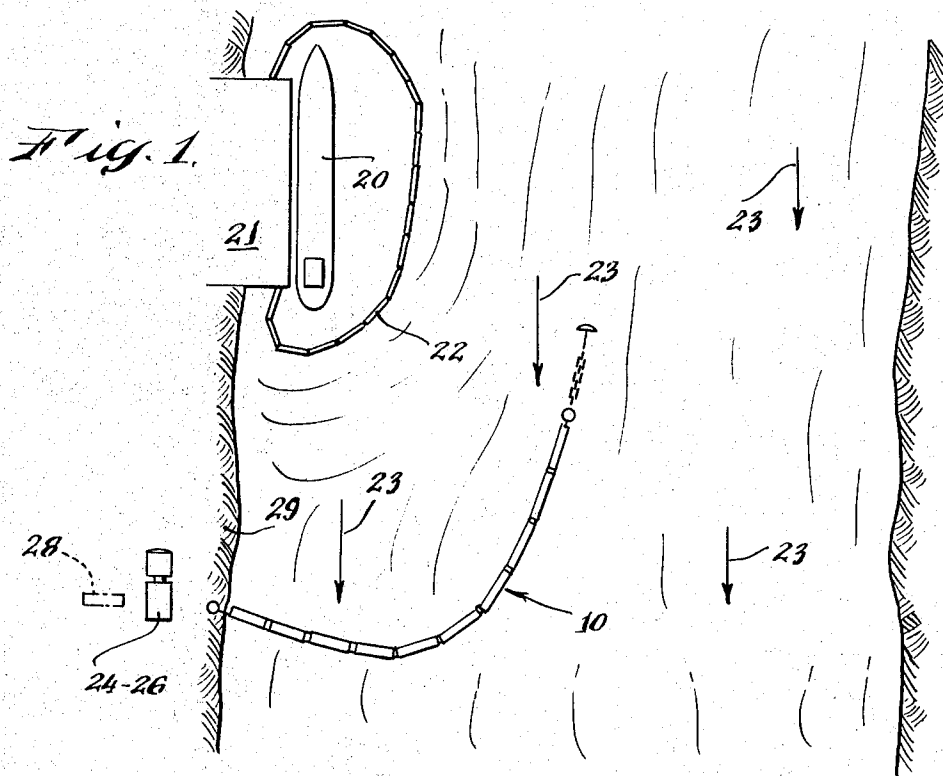
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ABSTRACT: An oil-absorbing boom for the purpose of collecting and removing from water thin films of oil comprising an elongated flat tubular sleeve of polymer netting enclosing within itself a plurality of flat elongated slabs or bats of "picker-lap" fibrous polymer material such as blown polypropylene film arrayed end to end within the tubular sleeve and sufficiently spaced apart to permit accordion folding of the sleeve at fold lines between adjacent bats, with a tension-bearing rope or cable being positioned within the tubular sleeve alongside the successive plurality of absorbent bats to reinforce the structure for carrying its own weight or impact loads placing it in tension between its ends.





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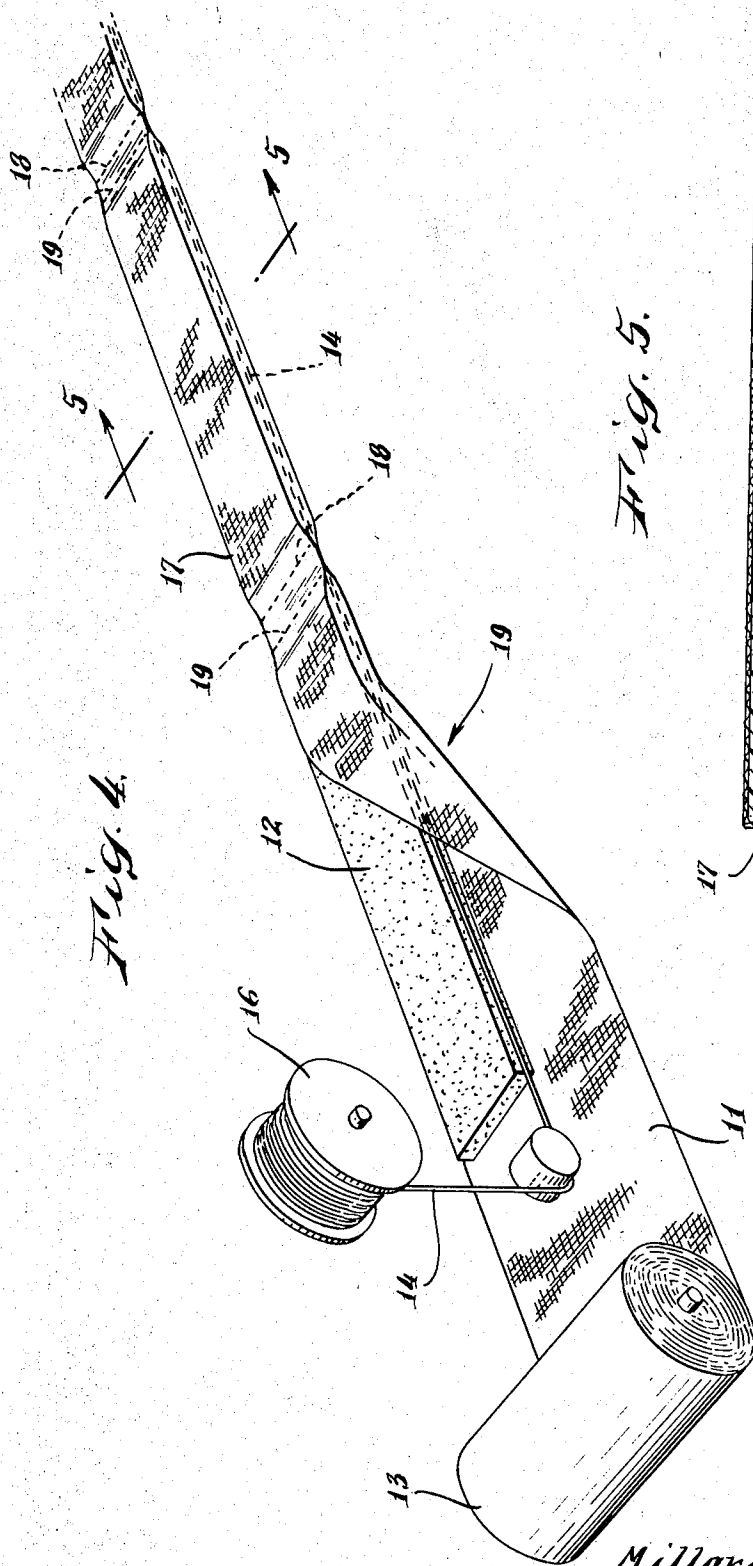
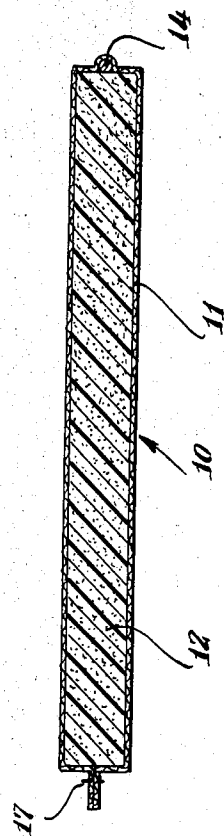


Fig. 5.



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OIL COLLECTION BOOM

BACKGROUND OF THE INVENTION

The problem of spilled oil in seaports where oil is transferred daily from tankers to shore installations or other waterborne petroleum transport vessels has become increasingly serious in recent years. Pollution of harbor waters has become the subject of new laws and increasingly firm administrative action in many localities. Oil spill booms such as those shown in Millard F. Smith U.S. Pat. No. 3,146,598 generally serve well to contain oil inadvertently spilled from ruptured hose or a leaking fitting during the normal transfer of petroleum to and from waterborne transport vessels. Occasional leakage passed by conventional oil spill booms which may be caused by a local water disturbance such as a vessel's wake, sometimes permits the escape of small quantities of oil from a spill which is otherwise successfully contained. This escaping oil spreads on the surface of the water in an extremely thin film, making it very difficult to remove. The resulting deposit of oil along shores, beaches and waterside installations creates an important source of liability for the operators of oil refineries, tankers and oil transfer installations, and the need for "skimming-type" oil film recovery devices has gone long unfilled.

OBJECTS OF THE INVENTION

Accordingly a principal object of the invention is to provide an oil recovery boom capable of being conveniently deployed downstream in the path of current-carried oil film slicks to absorb these slicks. A further object of the invention is to provide systems and apparatus cooperating with such oil absorbing booms for the removal of the boom carrying absorbed oil from the surface of the water, and for separating the absorbed oil from the absorbing boom which may then be prepared for reuse, to be redeployed as required.

Other and more specific objects will be apparent from the features, elements, combinations and operating procedures disclosed in the following detailed description and shown in the drawings.

THE DRAWINGS

FIG. 1 is a schematic plan view of a maritime oil transfer terminal showing a tanker near a dock surrounded by an oil boom with an oil collection boom of the present invention deployed downstream to collect any escaping oil;

FIG. 2 is an enlarged fragmentary elevation view schematically showing pinch roll apparatus on shore positioned to draw in the boom and separate collected oil from it by compressive pinch roll action;

FIG. 3 is a further enlarged fragmentary perspective view, partially cut away, showing an oil collecting boom of the present invention;

FIG. 4 is a comparable fragmentary perspective view showing the preferred steps in the fabrication of an oil collection boom of the present invention; and

FIG. 5 is a greatly enlarged cross-sectional elevation view of an oil collection boom fabricated by the process illustrated schematically in FIG. 4.

COMPRESSIBLE OIL COLLECTION BOOMS

The booms of the present invention take advantage of the substantial interstitial volume incorporated in light weight bats of polymer fibers or blown polymer film of such materials as polypropylene which present enormous fiber surface area on which oil film deposits itself when a passing current of water on which such a bat floats carries a film of oil into contact with the bat. When this occurs, most or all of the oil film is collected upon the fibrous surfaces inside the bat, and very little oil proceeds downstream beyond the structure.

The oil collection booms of the present invention incorporate a plurality of elongated, flat, rectangular bats of such material, which may be for example Avisun polypropylene

01011, a high molecular weight polymer formed into fine randomly oriented fibers in a bat of fiber material referred to as "picker-lap", incorporating fibers having a 2.5 denier, 2 inches long in average length. Similar Avisun polypropylene polymers passed through blown film apparatus at extrusion temperatures in the range between 425° and 450°F. produce blown film which may be formed into the same type of extremely lightweight compressible fluffy fibrous bats. Since the specific gravity of polypropylene is about 0.90, these bats of material are buoyant and well adapted to serve as floating oil collection structures.

In the booms of the present invention, such as the boom 10 illustrated in the FIGS., a greatly elongated tubular net sleeve 11 encloses a series of wide, flat, thin, elongated bats 12 of this expanded polymer material just described, as shown in FIGS. 3, 4 and 5. The tubular net sleeve 11 is preferably formed of similar lightweight polymer fibers which may be heat sealed in net configuration or which may be woven or knotted like a fisherman's net in the form and spacing desired. The bats 12 are spaced apart longitudinally within the tubular sleeve 11 by a distance of from two to three times their thickness to permit accordion folding in the manner of the accordion folded oil spill boom shown in my U. S. Pat. No. 3,146,598. In the fabrication process illustrated in FIG. 4, a roll 13 of the netting material 11 is unrolled to draw a length of this material over a work station where a bat 12 is laid lengthwise along one-half of the net 11 drawn from the roll 13. Along the inner edge of the bat 12, a tension cable preferably formed of stainless steel wire rope 14 unreel from a storage reel 16 is also laid longitudinally down the central portion of the net 11 beside the bats 12. The free half of the net 11 is then folded across the upper surface of the bat 12 at fold point shown in FIG. 4, enclosing the cable 14 and overlapping to bring the opposite edges of the net 11 into juxtaposed relation. Net 11 thus forms a tubular sleeve enclosing the bat 12, with a heat sealed or stitched edge seam joining these two juxtaposed net edges along the boom edge 17 shown in FIGS. 4 and 5, on the opposite edge of the elongated bat 12 from the edge beside which cable 14 is laid. If desired a comparable seam may be stitched or heat sealed between cable 14 and bat 12 to form a small cable hem or pocket positioning the cable along the aligned edges of all of the bats 12 along the entire length of the boom 10.

The longitudinal spacing of the bats 12 within the tubular sleeve 11 is maintained by the formation of transverse seams between the bats 12. As shown in FIG. 4, these seams are preferably formed at the time the boom is fabricated. As the net 11 passing the fold point 11a is formed into a sleeve by the sewn or heat sealed seam 17 along the full length of the bat 12, a pair of transverse seams are preferably formed. The first is a rear end seam 18 extending transversely across the tubular sleeve 11 at a point directly behind the bat 12, bringing its upper and lower surfaces into juxtaposition and stitching or heat sealing them together to flatten the sleeve. At a point slightly spaced lengthwise along the flattened tubular sleeve toward the next bat 12, a frontend seam 19 likewise extends transversely across the flattened sleeve to form the forward edge of a pocket enclosing the next bat 12, as shown in FIG. 4.

The seams 18 and 19 are spaced apart longitudinally by a distance sufficient to permit the boom to be accordion folded in a stack such as stack 28 shown in FIG. 2 for storage and shipping. The distance between seams 18 and 19 should preferably be at least equal to the thickness of bats 12 to permit this accordion folding. Cable 14 may be caught at seams 18 and 19 if desired.

Suitable end fittings such as towing loops or shackles are preferably joined to the extreme ends of the cable 14 by swaged thimble fittings, eye splices or other common wire rope connection techniques.

As shown in FIG. 1, the completed boom is preferably deployed across the major part if not the entire width of a flowing body of water at a point downstream from the transfer terminal at which petroleum products are loaded or unloaded

from vessels where spills may occur. Thus in FIG. 1 a tanker 20 is shown in oil transfer position beside a dock 21, surrounded by an oil spill boom 22. Arrows 23 show the direction of the prevailing current passing the installation and the compressible collection boom 10 of the present invention is shown 5 deployed extending partway across the waterway from one shore toward the opposite shore at a point downstream from the tanker 20, positioned to receive oil carried downstream by the current 23.

As shown in FIG. 2, after an oil film has been brought into 10 contact with the collection boom 10 by the prevailing current and after all or the major portion of the oil film carried by the current 23 has been caught and collected in the interstitial spaces between the loosely matted fibers of the bats 12 along the length of the boom 10, the boom may be withdrawn from the waterway by such means as the pinch roll oil separation 15 apparatus illustrated schematically in FIG. 2. In this FIG. pinch rolls 24 and 26 which may be powered to draw between themselves the compressible boom 10 are shown in power driven operation and the boom 10 is moving from the water 20 between the pinch rolls 24 and 26 which have the effect of compressing each of the bats 12 in turn as these bats are drawn between the pinch rolls. As a result a large portion of the collected oil is squeezed out of the compressible bats 12 25 into a sump 27 beneath the pinch rolls. The squeezed collection boom 10 issuing from the pinch rolls is preferably accordion folded in a storage stack 28 near the shore 29 where it is ready for prompt deployment in the event of another oil spill.

Cable 14 provides unusually high strength to the fibrous polymer structure formed by the tubular net sleeve 11 and the light weight compressible bats 12, serving to position the boom in the shape and configuration and in the direction

desired for optimum oil-collecting performance.

While the objects of the invention are efficiently achieved by the preferred forms of the invention described in the foregoing specification, the invention also includes changes and variations falling within and between the definitions of the following claims.

I claim:

1. A compressible oil-collection boom comprising in combination:

- A. a porous elongated tubular net sleeve;
 - B. a plurality of thin flat elongated bats of compressible buoyant, oil sorbent material inside the length of the sleeve;
 - C. spacing means maintaining the adjacent bats longitudinally spaced apart by distances at least double their thickness, to permit accordion folding of the boom;
 - D. a tension-bearing cable extending longitudinally beside said bats along the length of said sleeve; and
 - E. terminal fittings secured to the ends of the cable near the corresponding ends of the tubular sleeve.
2. The boom defined in claim 1, wherein the net sleeve is formed of polymer fibers.
3. The boom defined in claim 1, wherein each elongated bat is formed of a randomly oriented mass of polymer fibers.
4. The boom defined in claim 1, wherein each elongated bat is formed of a mass of blown polymer film material.
5. The boom defined in claim 1, wherein said spacing means include transverse seams flattening the tubular net sleeve between adjacent bats.
6. the boom defined in claim 1, wherein the cable is formed as a length of stainless steel wire rope.

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