Jan. 4, 1966 L. W. CAMPBELL 3,227,124

BOAT BOTTOM CLEANING APPARATUS

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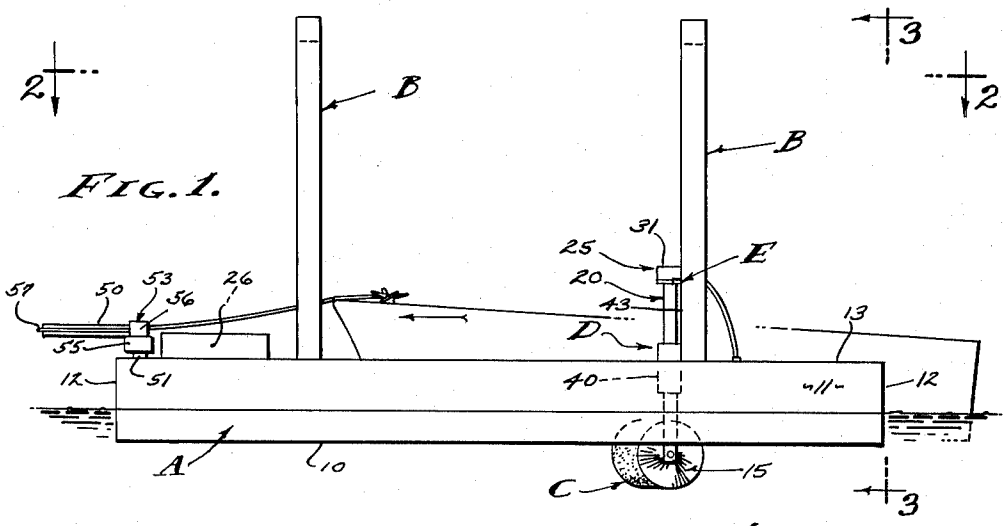


FIG. 1.

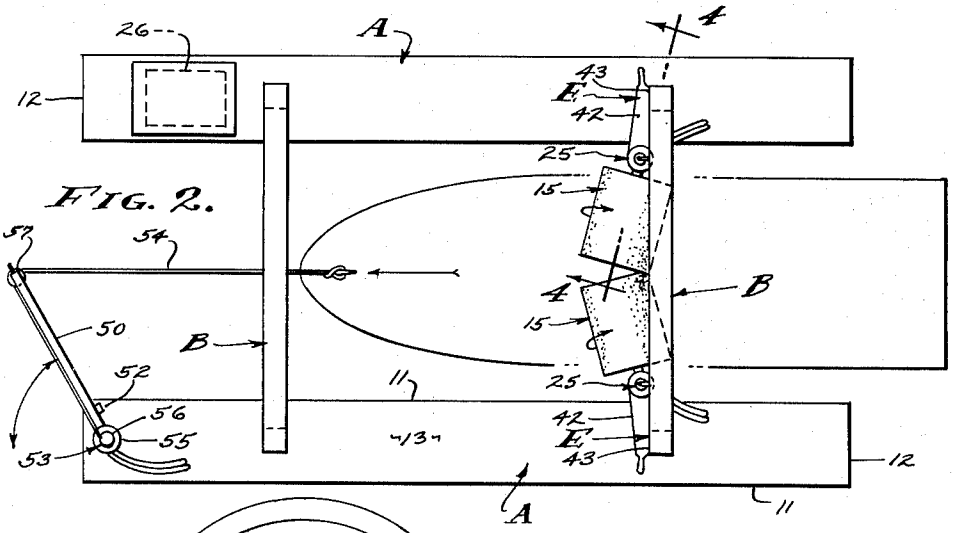


FIG. 2.

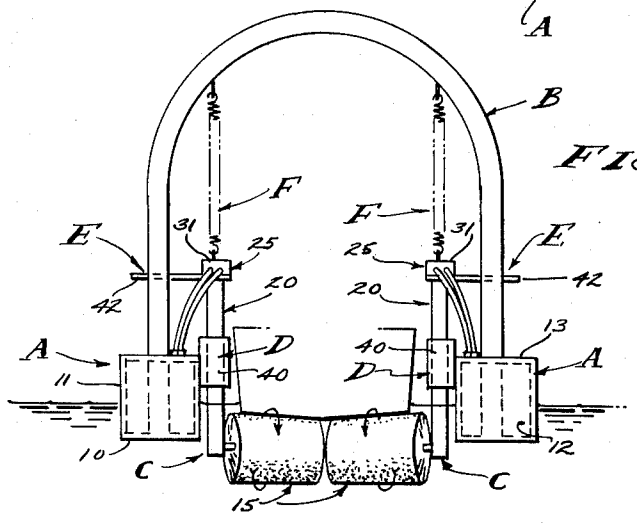


FIG. 3.

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FIG. 4.

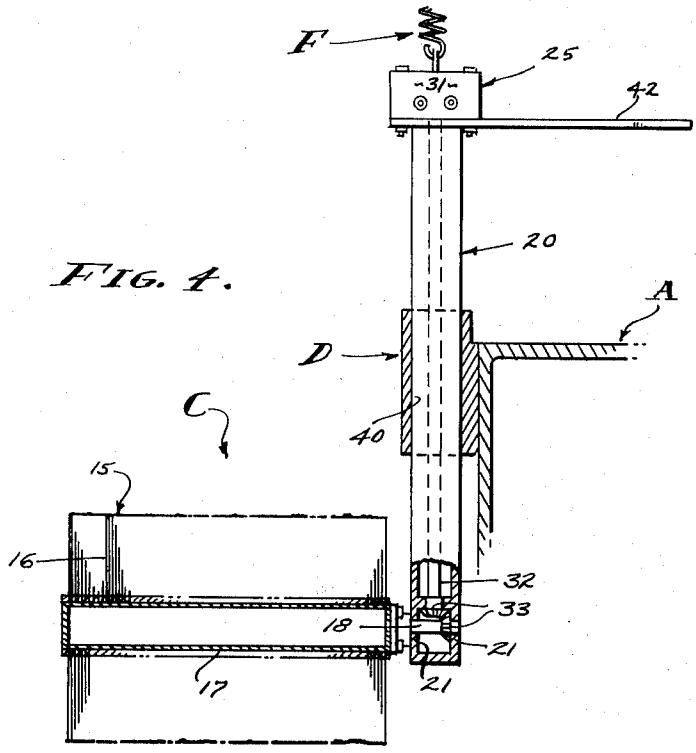
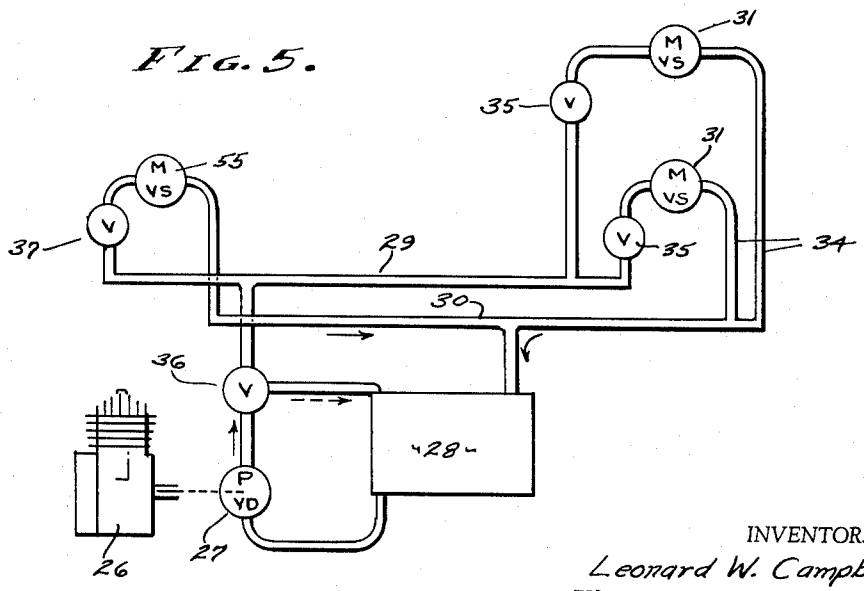


FIG. 5.



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United States Patent Office 3,227,124
Patented Jan. 4, 1966

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BOAT BOTTOM CLEANING APPARATUS

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Filed Feb. 24, 1964, Ser. No. 346,903
11 Claims. (Cl. 114—222)

This invention relates to vessels or boats and is particularly concerned with an apparatus for cleaning the bottoms thereof, it being a general object of this invention to provide a versatile apparatus which adapts itself to the many various shaped hulls of boats and which operates to remove growth therefrom.

A vessel or boat of any appreciable size is rather heavy and difficult to haul out of the water, with the result that the boat is often left in the water for considerable periods of time. Even though anti-fouling and/or toxic bottom paints are used on said boats, nevertheless the bottoms accumulate growth when left in the water. In any case, performance of the boat is adversely affected by bottom growth, which varies in different waters, and it is obvious that performance can be enhanced and kept at an optimum providing the bottom of the boat is kept clean.

With the foregoing bottom growth problem in mind it is an object of this invention to provide an apparatus which cleans the bottoms of boat hulls, and more specifically an apparatus that scrubs the bottoms of boats while normally floating in the water.

Another object of this invention is to provide a revolving brush unit that accommodates itself to the hull bottoms of various shapes.

Another object of this invention is to provide a traction means associated with a revolving brush which turns, reversely, to advance the hull of a boat so as to be cleaned from one end to the other.

It is still another object of this invention to provide a single drive means for advancing the boat hull over a plurality of independent cleaning means.

The various objects and features of this invention will be fully understood from the following detailed description of the typical preferred form and application thereof, throughout which description reference is made to the accompanying drawings, in which:

FIG. 1 is a side elevation of a typical embodiment showing a boat hull entered therein.

FIG. 2 is a plan view taken as indicated by line 2—2 on FIG. 1.

FIG. 3 is an end view taken as indicated by line 3—3 on FIG. 1.

FIG. 4 is a fragmentary sectional view taken substantially as indicated by line 4—4 on FIG. 2.

FIG. 5 is a diagram illustrating the drive means provided to activate the apparatus.

In the drawings I have shown a floating apparatus, it being understood that the principles of the invention can be applied to any dock or slip into which a boat can be inserted. Also, I have shown an arrangement wherein both sides of the boat are cleaned simultaneously, it being understood that one side at a time can be cleaned if so desired. However, in its preferred form the invention is embodied in a floating structure which is bilateral and adapted to simultaneously clean both sides, at the bottom of the boat. Generally, the apparatus involves a pair of pontoons A, spreaders B joining the pontoons A, a revolving brush unit C at each pontoon, rotatable and vertically shiftable mounting means D for each brush unit, stop means E to rotatably position each brush unit, elevating means F for each brush unit, and traction means G to advance a boat through the apparatus.

The pontoons A can vary widely in configuration and they are simply shown as barge type vessels, each having

a bottom 10, sides 11, ends 12 and a deck 13. The two vessels are buoyant and have a substantially constant waterline, providing they are consistently loaded.

The spreaders B are provided to join the pair of pontoons A and to maintain the pontoons in spaced parallel relationship with each other. In accordance with the invention the spreaders are essentially in the form of bridges that span between the pair of pontoons A and over the expanse of water therebetween. For example, the spreaders B may have a canopy or roof that covers the expanse between the pontoons, or as is shown the spreaders are arch shaped bows that project upward from the pontoons A and inwardly where they are integrally joined. Thus, a boat with a substantial superstructure can pass beneath the spreaders. As indicated, the spreaders B, are firmly anchored in the pontoons, respectively.

The revolving brush units C are alike and each involves a submersible revolving brush 15 rotatable on a horizontal axis, a vertically disposed column 20, and a drive 25 carried by the column to revolve the brush. The brush 15 can be constructed according to accepted practices, being an elongated cylindrical brush with bristles 16 radiating from a central shaft-like core 17. A feature of the brush, as shown, is that the core 17 is chambered for additional buoyancy. The said buoyancy is significant and by employing bristles made of natural fibers even greater buoyancy is advantageously gained.

The vertically disposed column 20 is provided to carry the brush 15 on its horizontal axis, and has therefor a transverse bearing 21, or spaced bearings, at its lower end portion. In practice, the column 20 is tubular with its lower end closed, and suitable seals or packing can be employed to exclude outside liquids. The column 20 has a smooth cylindrical exterior, and the brush 15 has a spindle 18 that is journalled in the bearing or bearings 21.

The drive 25 is provided to rotate the brush and can be any motor adapted to turn the spindle 18. In order to avoid submerged drive motors I provide a single prime mover 26, that operates a variable displacement liquid pump 27. The pump 27 draws liquid from a reservoir 28 and supplies moving liquid under pressure in a pressure line 29. A return line 30 returns liquid to the reservoir 28, said lines 29 and 30 being directed about the structure as circumstances require. In accordance with the invention a variable speed drive motor 31 is carried at the uppermost end of the column and coupled to shaft 32 depending through the column and coupled to the spindle 18 by means of bevel gears 33. Thus, the drive motor 30 is anchored to the column 20 and applies torque to the brush 15 by means of the transmission, as described.

The motor 31 is a liquid operated variable speed motor and has an exhaust 34 connected to the return line 30. Each motor is shown controlled by a valve 35 which can be used for speed regulation. In carrying out the invention, the liquid connection between the motors 31 and the liquid handling lines 29 and 30 are flexible hose connections as is indicated, whereby said motors 31 are free to be moved.

The rotatable and vertically shiftable mounting means D is provided for each brush unit C, to support each brush unit from a pontoon A. As shown, there is a brush unit C at each pontoon A, said brush units being disposed oppositely and so that the axes thereof project from the columns 20 and to the center of the apparatus. To this end, the inboard side 11 of each pontoon supports a vertically disposed slide 40 that affords both rotatable and longitudinal movement of the column 20. Thus, the column 20 is free to turn as well as to reciprocate upwardly. In one of its simple forms, the

slide 40 is a tubular part that encompasses the cylindrical exterior of the column 20 to have sliding engagement therewith.

The stop means E is provided to limit the rotatable movement of column 20 and in the case illustrated involves a lever 42 that engages a suitably positioned stop 43. From the drawings it will be clear that the vertically disposed portions of the spreaders B form the stops 43, said stops being forwardly faced. The lever 42 projects diametrically opposite the projecting brush axis so that the brush 15 swings forwardly limited by the engagement of said lever 42 with the vertically disposed stop 43. As is best illustrated in FIG. 2, the brush axis is limited by the stop 43 to angularly relate the said axis with the longitudinal disposition of the pontoon A by which it is carried. For example, the brush axis is limited in its rearward movement so as to be angled forwardly at about 15° as shown.

The elevating means F is provided to lift and/or yieldingly urge the brush unit C upwardly in a firm but uniform and gentle fashion. In practice, the above described buoyancy of the brush 15 with its buoyant bristles and buoyant core assists in the lifting of the unit C, and the revolving of the brush also adds to this effect by gathering air bubbles within the interstices that occur between the many bristles. However, a predetermined lifting force is advantageously employed to overcome the equilibrium and to force the unit C upwardly with at least minimum pressure required for proper abrading action by the brush bristles upon the bottom of the boat hull. Therefore, I provide means F preferably in the form of a tension spring trained between the top of the column 20 and overhead spreader B.

The traction means G is provided to transport a boat through the apparatus, between the parallel pontoons A. As is shown, the means G involved a boom 50, a pivotal mounting 51 for the boom, a stop 52 to limit the boom, and a winch means 53 to transport the said boat. The boom 50 is a straight element adapted to reach to the center of the apparatus. The pivotal mounting 51 is supported by one of the pontoons A, at the forward deck portion thereof, said pivot being on a vertical axis. The stop 52 limits rearward swinging of the boom 50, as shown, but so that the boom is free to swing forwardly out of the path of the said boat. The winch means 53 comprises any device suitable for drawing a line 54 and it is shown as a variable speed motor 55 that revolves a capstan 56. The line 54 is wrapped around the capstan in order to draw the boat forwardly through the apparatus, said line 54 being trained over a sheave 57 at the end of the boom, and said line 54 being secured to the bow of the boat.

In order to utilize the apparatus as above described a boat is entered between the pontoons A and the brush units C are permitted to swing to the positions shown. The line 54 is secured to the bow of the boat and the prime mover 26 is activated. The liquid delivered by pump 27 is controlled by a main valve 36 and the motor 55 of means G is independently controlled by a valve 37. Upon activation of the motors the traction line 54 swings the boom 50 so that the sheave 57 is centered, the boom is stopped, and whereby the boat commences to move forwardly centrally of the pontoons A. In accordance with the invention, the brushes 15 are turned in a reverse direction with respect to the forward movement of the boat bottom. That is, the brush bristles move rearwardly as they abrade the boat bottom, while said boat bottom progresses forwardly. Since the said brush units C are angularly related, as above described, and because of the frictional engagement of the reversely moving bristle engagement, the line 54 is kept taut and maintains the boat centered between the pontoons. As the apparatus operates the bristles flex so as to accommodate various bottom contours, and the columns 20 seek heights as circumstances require. Further, as the brushes revolve

the air bubbles captured therein cause additional upward pressure upon the boat bottom, by reason of floatation, and this pressure is controlled by the speed at which the brushes are revolved in order to capture and retain said air bubbles. When protruding parts of the boat are encountered either one or both of the units C can be retracted by lowering and/or swinging the same away from said boat.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any modifications or variations that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. A boat bottom cleaning apparatus comprising;
(a) a brush unit with a fixedly positioned vertically disposed column extended below the boat bottom and having a substantially horizontally disposed revolving brush on an axis extended transversely beneath the boat bottom and with its upper periphery engaging the same,
(b) and transport means to advance the boat over the fixedly positioned and revolving brush.

2. A boat bottom cleaning apparatus comprising;
(a) a brush unit with a fixedly positioned vertically disposed column extended below the boat bottom and having a substantially horizontally disposed and rotatable brush on an axis extended transversely beneath the boat bottom and with its upper periphery having abrading engagement with said bottom,
(b) means to rotate the brush,
(c) and transport means to advance the boat over the brush unit,
(d) said brush being rotated to move the abrading bristles at the upper periphery thereof in a direction reversed with respect to the transport movement of the boat bottom over said brush.

3. A boat bottom cleaning apparatus comprising;
(a) a brush unit with a fixedly positioned and vertically disposed column extended from above the water level to below the boat bottom and having a substantially horizontally disposed and rotatable brush on an axis extended transversely beneath the boat bottom and with its upper periphery having abrading engagement with said bottom,
(b) drive means including a motor at the top of the column and a transmission coupling said motor to the brush to rotate the same,
(c) and transport means to advance the boat over the brush unit.

4. A boat bottom cleaning apparatus comprising;
(a) a brush unit with a fixedly positioned and vertically shiftable column extended below the boat bottom and having a substantially horizontally disposed cylindrical and rotatable brush on an axis extended transversely beneath the boat bottom and with its upper periphery having abrading engagement with said bottom, said brush being buoyant,
(b) means to rotate the brush,
(c) and transport means to advance the boat over the brush to be engaged thereby through said buoyancy thereof.

5. A boat bottom cleaning apparatus comprising;
(a) a brush unit with a fixedly positioned and vertically shiftable column extended below the boat bottom and having a substantially horizontally disposed cylindrical and rotatable brush on an axis extended transversely beneath the boat bottom and with its upper periphery having abrading engagement with said bottom, said brush having a buoyant core,
(b) means to rotate the brush,
(c) and transport means to advance the boat over the brush to be engaged thereby through said buoyancy thereof.

6. A boat bottom cleaning apparatus comprising;
(a) a brush unit with a fixedly positioned and vertically shiftable column extended below the boat bottom and having a substantially horizontally disposed cylindrical and rotatable brush on an axis extended transversely beneath the boat bottom and with its upper periphery having abrading engagement with said bottom,
(b) elevating means to yieldingly urge the vertically shiftable column upwardly,
(c) means to rotate the brush,
(d) and transport means to advance the boat over the brush to be engaged thereby through said buoyancy thereof.

7. A boat bottom cleaning apparatus comprising;
(a) spaced elements between which the boat is entered,
(b) a brush unit carried by each element and each with a fixedly positioned vertically disposed column extended below the boat bottom and each having a substantially horizontally disposed revolving brush on an axis extended transversely beneath the boat bottom to the center of the apparatus and each with its upper periphery engaging the boat bottom,
(c) and transport means to advance the boat over the fixedly positioned and revolving brushes.

8. A boat bottom cleaning apparatus comprising;
(a) spaced elements between which the boat is entered,
(b) a brush unit carried by each element and each with a fixedly positioned vertically disposed column extended below the boat bottom and each having a substantially horizontally disposed rotatable brush on an axis extended transversely beneath the boat bottom to the center of the apparatus and each with its upper periphery having abrading engagement with the boat bottom,
(c) drive means at each brush unit and each including, a motor at the top of the column thereof and a transmission coupling said motor to the brush thereof to rotate the same,
(d) and transport means to advance the boat over the fixedly positioned rotating brushes.

9. A boat bottom cleaning apparatus comprising;
(a) spaced pontoons between which the boat is entered,
(b) a brush unit carried by each pontoon and each with a fixedly positioned vertically disposed column extended below the boat bottom and each having a substantially horizontally disposed revolving brush on an axis extended transversely beneath the boat bottom to the center of the apparatus and each with its upper periphery engaging the boat bottom,
(c) and transport means to advance the boat over the fixedly positioned and revolving brushes.

10. A boat bottom cleaning apparatus comprising;
(a) spaced pontoons between which the boat is entered,
(b) a brush unit carried by each pontoon and each with a fixedly positioned vertically disposed column extended below the boat bottom and each having a substantially horizontally disposed rotatable brush on an axis extended transversely beneath the boat bottom to the center of the apparatus and each with its upper periphery having abrading engagement with the boat bottom,
(c) drive means at each brush unit and each including, a motor at the top of the column thereof and a transmission coupling said motor to the brush thereof to rotate the same,
(d) and transport means to advance the boat over the fixedly positioned rotating brushes.

11. A boat bottom cleaning apparatus comprising;
(a) spaced pontoons between which the boat is entered,
(b) a brush unit carried by each pontoon and each with a fixedly positioned vertically disposed column extended below the boat bottom and each having a substantially horizontally disposed revolving brush on an axis extended transversely beneath the boat bottom to the center of the apparatus and each with a rearwardly moving upper periphery engaging the boat bottom,
(c) and transport means to advance the boat forwardly over the brushes and including a swinging boom stopped with its end centered between the pontoons and a winch drawing a line over the end of the boom, said line being secured to the foremost end of the boat to advance the same.

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