Aug. 17, 1943. J. G. BRIGHT 2,327,012

APPARATUS FOR CLEANING SHIPS' BOTTOMS

Filed March 18, 1942 2 Sheets-Sheet 1

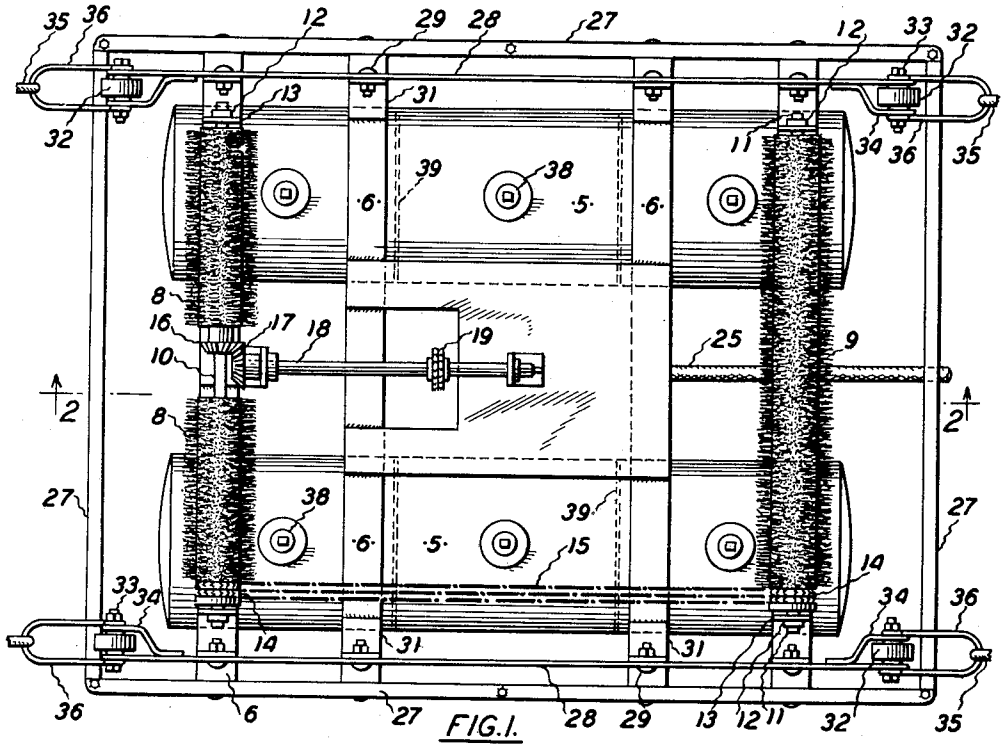


FIG. 1.

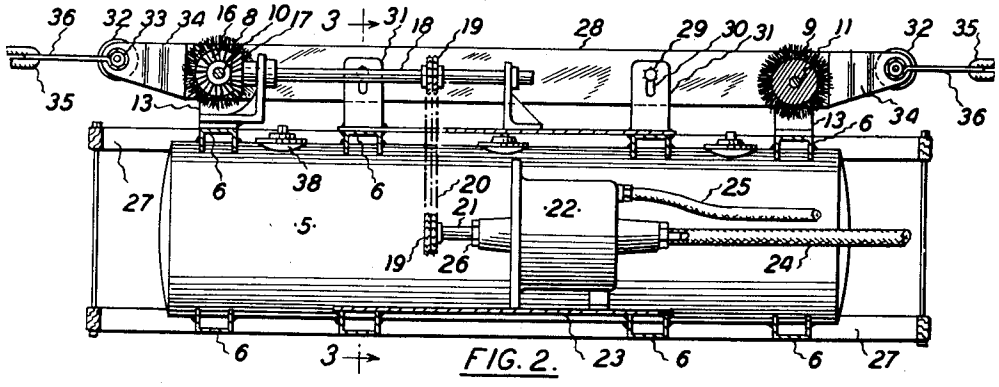


FIG. 2.

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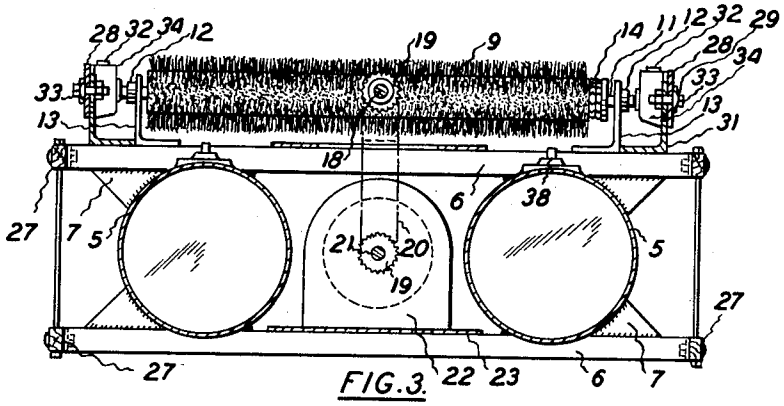


FIG. 3.

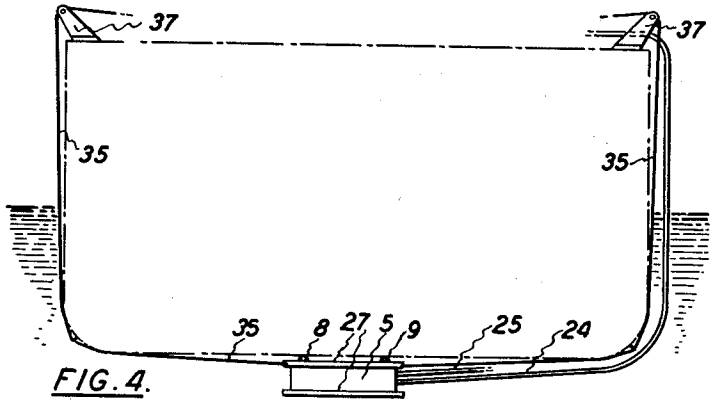


FIG. 4.

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APPARATUS FOR CLEANING SHIPS' BOTTOMS

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Application March 18, 1942, Serial No. 435,233
In Australia April 30, 1941

1 Claim. (Cl. 114—222)

The object of this invention is the provision of simple means whereby the immersed portion of the hull of a ship or other floating vessel may be readily and efficiently cleaned, thus to reduce need for dry docking.

According to this invention, the cleaning apparatus comprises a buoyant base having cleaning elements such as stationary or rotatable brushes, scrapers, or the like mounted thereon, and hauling devices such as cables or chains which are shackled to said base and enable it to be controllably moved relative to the immersed bottom of a vessel while the said cleaning elements are forcibly thrust into contact with the said bottom due to the buoyancy of the mentioned base.

In the accompanying drawings—

Fig. 1 is a plan of one embodiment of the present invention;

Fig. 2 is a sectional side elevation taken on line 2—2 in Fig. 1;

Fig. 3 is a sectional end elevation taken on line 3—3 in Fig. 2;

Fig. 4 is a sectional end view of a floating vessel schematically illustrating a manner of using the apparatus subject hereof.

The buoyant base consists of longitudinal members 5 and cross members 6. Members 5 are hollow closed drums to which buoyancy is due, and the members 6 are welded and gusseted (as shown at 7 in Fig. 3) or otherwise fixed to the drums in order to provide an unitary, rigid base structure.

In the illustrated arrangement, the cleaning elements are rotatable cylindrical brushes 8 and 9 having shafts 10 and 11 which are mounted in bearings 12 on brackets 13 fixed to the base. Shafts 10 and 11 have sprockets 14 connected by drive chain 15, and shaft 10 carries bevel wheel 16 which meshes bevel pinion 17. Pinion 17 is keyed on shaft 18 which is drive-connected (for example by sprockets 19 and chain 20) to the drive shaft 21 of a compressed air motor indicated by 22. This motor is mounted between the drums 5 on a plate 23 fixed to the base. The motor has a compressed air-feeding hose 24, and although during immersion the motor exhaust may bubble into the ambient water, a hose 25 is preferably provided to conduct the exhaust air to atmosphere, in order to ensure against water entering the motor. The motor is of conventional construction except for the inclusion therein of a stuffing box 26 to prevent entrance of water to the motor interior between the drive shaft 21 and the motor casing.

Although it is not absolutely essential, fender bars or frames 27 are preferably fixed to the base in order to protect the apparatus against the almost inevitable rough usage attendant on initial launching of the apparatus and the emplacement thereof relative to a hull to be cleaned.

In order to protect the brush bristles from undue crushing when they are being forcibly thrust against a vessel's bottom, a pair of skid bars 28 are preferably provided. These bars extend for practically the full length of the apparatus, and they are held to the base by bolts 29 passing through elongate bolt holes 30 in brackets 31 fixed to the base. The holes 30 enable height adjustment of the skid bars relative to the brushes. The skid bars are armed with freely revoluble end rollers 32 to assist the apparatus to negotiate bilge-keels, and generally to prevent scraping contact between the skid-bar ends and a hull being treated. The rollers 32 are mounted on pins 33 borne in the skid-bars and in brackets 34 fixed to said bars.

Hauling devices are connected to the buoyant assemblage in order that it may be traversed to-and-fro across a vessel's bottom. These devices may be ordinary flexible cables which are shackled to the base. Where the assemblage includes roller-shod skid-bars (as in the illustrated embodiment) the hauling devices may be cables such as 35 which for convenience are coupled to the ends of the skid-bars 28 by way of shackles 36 which take on the pins 33.

The apparatus subject hereof may be operated from the deck of the vessel to be treated or from the decks of two punts, barges, or the like positioned on opposite sides of the vessel to be cleaned.

Fig. 4 shows an example where the operative deck is the deck of the vessel whereof the bottom is to be cleaned. In use the buoyant assemblage is floated with its cleaning elements upwards alongside the vessel to be treated and near one end thereof. The cable 35 on one end of the buoyant base is then looped sufficiently to pass under the vessel. The cables are then hauled upon on one side of the vessel and payed out on the other side, thereby cleaning a swathe of the vessel's bottom. This "keel-hauling" procedure is carried out progressively along the full length of the vessel, the swathes being overlapped to ensure complete cleaning. The hauling of the cables may be performed manually or with the aid of manual or power operated winches as indicated at 37 in Fig. 4.

To enable the buoyancy of the buoyant assemblage to be varied to suit different sized vessels to be cleaned (and hence different depths of immersion) the members **5** may include at least one plug, such as **38**, which normally closes an orifice through which the member may be partly filled with water and thus ballasted to any selected degree.

This provision for ballasting is not absolutely essential, but it is desirable, and where such provision is incorporated it is preferred that the members **5** each have one or more partitions or bulkheads such as **39** (Fig. 1) included therein. The bulkheads **29** divide the members **5** into sub-compartments each or some of which may be independently ballasted in order to keep the ballast weight more or less evenly distributed about the centre of gravity of the unballasted buoyant assemblage. The illustrated apparatus is provided with three ballasting sub-compartments in each member **5**. There may, however, be more than three or only two of these sub-compartments in each of the members **5**.

The drawings depict a preferred embodiment of the invention which may be extensively varied without departure from the essence of the invention. For example, the buoyant assemblage may resemble a greatly enlarged rectangular scrubbing brush having a hollow back, or a backplate carrying an inflatable bag, or a mass of cork or like material (as the buoyant base), and a multiplicity of bristles or scraper blades mounted thereon, alternatively the fixed bristles or blades may be replaced by a plurality of rotor brushes or scrapers mounted on spindles in bearings fixed on the buoyant base. In this latter construction (as in that shown in the drawings) the rotor spindles may be turned manually through flexible drive means or by compressed air or other motors, or they are geared together for operation through a common drive shaft by a single motor. The motors (or motor) may be mounted on the buoyant base, or they (or it) may be mounted on the operative deck and connected to the rotor spindles by flexible drive members. Where drive motors are mounted on the buoyant assemblage, the type of motor must be selected with due regard to the necessity for immersion, or means must be provided to counteract the ill effects which immersion might give rise to. For example, if an electric motor is used it may be housed within a water tight casing having suitable leakproof stuffing boxes for the outgoing drive shaft and the current supplying leads must be suitably encased.

As a further alternative the rotatable brushes such as **8** and **9** may be height adjustable (in like manner to the skid bars **28**) relative to the brackets **13** in order to compensate for unequal brush wear. In such case the brush drive members may include jockey pulleys, swivel bearings and the like to enable such brush adjustment.

As previously indicated herein the cleaning elements may be bristles or blades which are fixed to the buoyant base or are revoluble thereon. As a further alternative the cleaning elements may be hard surfaced rollers which are mounted on the base in like manner to the brushes **8** and **9** but without necessity for mechanical drive therefor.

The cleaning effect resulting from the use of hard rollers would mainly result from their ability to crush oysters, mussels, barnacles and the like, and thereby effect considerable dislodgment of such matters from a vessel's bottom. In some cases it may be expedient to employ hardroller cleaning as a preliminary to brush or scraper cleaning. The term "cleaning element" as used herein is intended to include any fixed or movable device such as a hard roller or a brush or a group of bristles or blades or other element having the ability to dislodge accretions from a surface when thrust against that surface and simultaneously moved thereacross. The power transmission devices herein numbered **14**, **15**, and **16** to **20** may be encased either to prevent access of water thereto or simply to shield them from rough usage and fouling by dislodged accretions.

I claim:

Apparatus for cleaning the bottoms of floating vessels consisting essentially of a buoyant base composed of a plurality of hollow closed drums and a plurality of cross members to which said drums are fixed, fender frames fixed to said cross members, rotatable brushes mounted above said drums in bearings fixed on said cross members, a motor mounted on said base between said drums, power transmission mechanism also mounted on said base and adapted to transmit power from said motor to rotate said brushes, height adjustable skid-bars secured to said base in juxtaposition to said brushes, rollers borne in the ends of said skid-bars and hauling cables shackled to the ends of said skid-bars.

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