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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Apparatus for use by a diver to brush or scrape the walls of structures lying underwater.**

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FR-A-2 342 875
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Courier Press, Leamington Spa, England.

Description

This invention relates to an apparatus for use by a diver to brush or scrape the walls of structures lying underwater of the type exemplified by ships and drilling platforms, the walls being for example curved or lying at an angle to one another, the apparatus comprising two brushes or scrapers driven for rotation in opposite directions to one another and mounted on a common frame.

An apparatus which is designed for the same purpose has been described in French Patent Application 2 342 875. The apparatus according to said application is fitted with two brushes which are hinged relative to a fixed frame. The diver which operates the apparatus can, because said brushes are fitted with a handle, adjust each brush independently from the other one at any angle relative to the frame and to one another.

The described apparatus has a disadvantage in that the diver has to adjust the brushes independently from one another, which is of advantage in but a very limited number of conditions. The drawback of the apparatus is to be seen in both brushes not adjusting automatically to irregularities of those surfaces to be cleaned. Underwater-lying ship walls, the legs or components from drilling platforms, etc., have locally substantial irregularities or projections as well as accumulations of shell-fishes and/or seaweeds. It is frequent to encounter such accumulations in the shape of compact calcereous deposits. When, during the use of such an apparatus, a single-sided resistance is encountered, this causes a change in those forces which act on said brushes. Due to the revolving motion of the brushes, a sidewise pressure is exerted on the apparatus. There results therefrom an uncontrolled rotation of the apparatus which has to be taken up by the diver and actually by adapting the adjustment angle of the other brush which is for the time being not in engagement with such an obstacle. The apparatus has then always to be brought in the suitable direction by swimming movements of the diver.

An apparatus comprised of a plurality of vacuum plates and means allowing pivotal movement between two adjacent plates is described in US 3,360,816. This apparatus is however not equipped with rotary scraping brushes, as it is used for just vacuuming swimming-pools and the like.

Not only the problems raised by the torque developed by the apparatus according to the invention are absent in the use of the vacuuming apparatus according to the above US patent, but it should be born in mind that the invention intends to solve the problems with which a diver is faced when cleaning underwater structures of the above referred to kind.

The invention has for an object to provide an apparatus which, due to synchronizing of the brushes and to the design of the apparatus, ensures an uniform propulsion thereof even when treating irregular surfaces, particularly when one brush encounters an obstacle which offers a higher resistance.

A further object of the invention is to provide an apparatus which makes possible a larger positive and negative angular displacement.

To reach these objects, the frame of the apparatus according to the invention, and of the kind referred to in the opening paragraph, comprises two major components hinged to one another by a connection which lies in that plane of symmetry of the apparatus which extends between the brushes or scrapers.

Other details and features of the invention will emerge from the following description, given by way of non limitative example and with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic showing of the apparatus when treating a cylinder-shaped structure.

Figure 2 is a diagrammatic front view of the apparatus as shown in figure 1.

Figure 3 is a bottom view in perspective, of the apparatus according to the invention.

Figure 4 is a top view in perspective, of the apparatus as shown in figure 3.

Figure 5 is a perspective showing on another scale, of the apparatus as shown in figures 3 and 4, as it is used by a diver.

The apparatus as shown in the figures, is comprised of two frame components 1 and 2, which are connected together by a hinge connection 3, which has been shown in figures 3 and 4 by a dot-and-dash line 3. A brush or knife disc 4 is rotatably mounted on each frame component. Each brush or disc is driven by a hydraulic motor 5, even if it might be considered to drive said brushes or discs with electric or pneumatic motors.

As the hinge 3 lies in that symmetry plane which runs through the apparatus between said frame components 1 and 2, the apparatus fits narrowly against the rounding of any curved structure 6 to be scoured or cleaned (figures 1 and 5).

To each frame component is secured a handle 7 which extends preferably slightly slanting outwards relative to frame components 1 and 2.

The hinge connection generally shown at 3 between said frame components 1 and 2, is comprised, in a preferred embodiment, of elements 8 and 9, the elements 9 being secured to frame component 1 and elements 8 to frame component 2. In each two-element set, one element 9 is hingedly water-tight connected to an element 8. Lines 10, 11 and 10', 11' respectively, connect the hydraulic or pneumatic motors 5 to the inlet line 12 and outlet line 13, respectively, and actually above each element set 8, 9. When the brushes are driven by electric motors, the lines 10, 11, 10', 11' are used as tubes for electric cables.

On the one handle 7 is mounted an operating member 14 which can control the starting as well as the stopping of the motors, by opening or closing a valve.

As the rotating brushes or discs cause underwater a suction force, whereby the apparatus presses strongly against the surface to be cleaned so that both frame components connect tightly to the surface to be cleaned, and as the brushes or

discs rotating towards one another cause a forward-directed force to be generated, it is very simple for the diver who operates the apparatus, to follow all of the irregularities of the surfaces to be treated. This is also due to that hinge axis, about which said components 1 and 2 with the brushes mounted thereon, swing, lying very near to the surface to be cleaned. When the brush hinge axis is located too far away from the surface to be cleaned, as this is the case according to said French Patent Application, it is essentially impossible to make use simultaneously of the brush suction force and the automatic adaptation of that angle under which the brushes work on the irregularities of the walls or surfaces to be scoured.

Due to the described structure, a positive as well as a negative angular arrangement of the frame components 1 and 2 is possible, and this in spite of the motors 5 and hinge elements 8 and 9 being covered with housings 20 (figure 5) in a preferred embodiment.

Referring again to figures 1 and 5, there will be noted the curved surface 6 as well as the angle whereunder the apparatus is adjusted, which angle corresponds to the rounding of the surface to be cleaned. Reference 15 shows underwater growth which is to be removed with the apparatus. The removed impurities are projected together with a water stream due to the turbine-action of the revolving brushes or discs, backwards relative to the apparatus. Said water stream with the removed impurities is generally shown at 16. Said lines 12, 13 and possibly an electric line 17 are arranged together in an interlaced sleeve 18, for example. Said sleeve or line 18 leads to a diagrammatically-shown drive unit 19.

To further increase the manoeuvrability under water of the apparatus, a material having a high buoyancy is fastened to components 1 and 2. Said material is not shown in the figures, but may take any shape and extent depending on the specific weight thereof.

It must be understood that the invention is in no way limited to the above embodiments and that many changes may be brought thereto without departing from the scope of the invention as defined by the appended claims.

Claims

1. Apparatus for use by a diver to brush or scrape the walls of structures lying underwater of the type exemplified by ships and drilling platforms, the walls being for example curved or lying at an angle to one another, the apparatus comprising two brushes or scrapers (4) driven for rotation in opposite directions to one another and mounted on a common frame, characterised in that the frame comprises two major components (1, 2) hinged to one another by a connection (3) which lies in that plane of symmetry of the apparatus which extends between the brushes or scrapers (4).

2. Apparatus as defined in claim 1, in which said brushes are disc-shaped brushes.

3. Apparatus as defined in either one of claims 1 and 2, in which a handle (7) is secured to each of said components (1, 2).

4. Apparatus as defined in any one of claims 1 to 3, in which on at least one of said handles (7) there is provided an operating member (14) for controlling either the fluid or the electric current for the driving of the hydraulic motors (5) or electric motors, respectively, which drive the brushes or disc-shaped tools (4).

5. Apparatus as defined in any one of claims 1 to 4, in which said hinge connection is formed by at least two sets of mutually-connected hinging elements (8, 9), wherein in each set the one element is secured to the one component, and the other element to the other component of said frame, and to each element is connected a line (10, 11; 10', 11') which connects said element to a motor, which line is used either as a line for a fluid, or as a tube for an electric cable.

6. Apparatus as defined in any one of claims 1 to 5, in which a material which has buoyancy is fastened to said components (1, 2) said frame is made of.

Patentansprüche

1. Vorrichtung für den Gebrauch durch Taucher, um Wände von unter Wasser liegenden Strukturen abzubürsten oder abzukratzen, beispielsweise von Schiffen oder Bohrplattformen, welche Wände beispielsweise gebogen sind oder unter einem Winkel zueinander verlaufen, mit zwei Bürsten oder Schabern (4), die in zueinander entgegengesetzten Richtungen in Drehung versetzt sind und an einem gemeinsamen Rahmen montiert sind, dadurch gekennzeichnet, daß der Rahmen aus zwei Hauptkomponenten (1, 2) besteht, die durch eine Verbindung (3) gelenkig miteinander verbunden sind, die in jener Symmetrieebene der Vorrichtung liegt, die sich zwischen den Bürsten oder Schabern (4) erstreckt.

2. Vorrichtung nach Anspruch 1, bei der die Bürsten scheibenförmige Bürsten sind.

3. Vorrichtung nach einem der Ansprüche 1 und 3, bei der ein Griff (7) an jeder der Komponenten (1, 2) befestigt ist.

4. Vorrichtung nach einem der Ansprüche 1 bis 3, bei der wenigstens einer der Griffe (7) mit einem Bedienelement (14) für die Steuerung entweder des Fluids oder des elektrischen Stroms zum Antrieb der Hydraulikmotoren (5) bzw. der Elektromotoren versehen ist, die die Bürsten oder scheibenförmigen Werkzeuge (4) antreiben.

5. Vorrichtung nach einem der Ansprüche 1 bis 4, bei der die Gelenkverbindung von wenigstens zwei Sätzen miteinander verbundener Scharnierelemente (8, 9) gebildet ist, wobei in jedem Satz das eine Element an der einen Komponente und das andere Element an der anderen Komponente des Rahmens befestigt ist und an jedem Element eine Leitung (10, 11; 10', 11') angebracht ist, die das Element mit einem Motor verbindet, welche

Leitung entweder als Leitung für ein Fluid oder als Rohr für ein elektrisches Kabel verwendet ist.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, bei welcher ein Material, das eine Auftriebskraft hat, an den Komponenten (1, 2) befestigt ist, aus denen der Rahmen besteht.

Revendications

1. Appareil destiné à un plongeur pour racler ou gratter des structures situées sous l'eau tels que par exemple des navires ou des plates-formes de forage, dont les parois sont par exemple incurvées ou forment un angle entre-elles, ledit appareil comportant deux brosses ou racloirs (4) entraînés en rotation dans des directions opposées entre elles et montés sur un châssis commun caractérisé en ce que ledit châssis comporte deux éléments principaux (1, 2) articulés l'un par rapport à l'autre à l'aide d'une liaison à charnière (3) qui est située dans le plan de symétrie qui s'étend entre lesdites brosses (4) ou lesdits racleurs.

2. Appareil selon la revendication 1, caractérisé en ce que lesdites brosses sont des brosses en forme de disques.

3. Appareil selon l'une et l'autre des revendications 1 et 2 caractérisé en ce qu'une poignée (7) est fixée sur chacun des éléments (1 et 2).

4. Appareil selon l'une quelconque des revendications 1 à 3, caractérisé en ce que sur au moins une des poignées (7) est prévu un organe de manoeuvre (14) pour la commande soit de fluide, soit du courant électrique destiné à entraîner respectivement les moteurs hydrauliques (5) ou les moteurs électriques qui entraînent les brosses ou les outils en forme de disque (4).

5. Appareil selon l'une quelconque des revendications 1 à 4, caractérisé en ce que ladite liaison à charnière (3) est formée par au moins deux jeux d'éléments (8—9) articulés entre eux et caractérisé, de plus, en ce que dans chaque jeu un élément est fixé sur une partie du châssis et l'autre élément est fixé sur l'autre partie du châssis et à chaque élément est raccordée une conduite (10, 11; 10', 11') qui relie ledit élément à un moteur, ladite conduite servant soit de conduit pour un fluide, soit de gaine pour un câble électrique.

6. Appareil selon l'une quelconque des revendications 1 à 5, caractérisé en ce qu'un matériau ayant le pouvoir de flotter est fixé auxdits éléments (1, 2).

FIG. 1

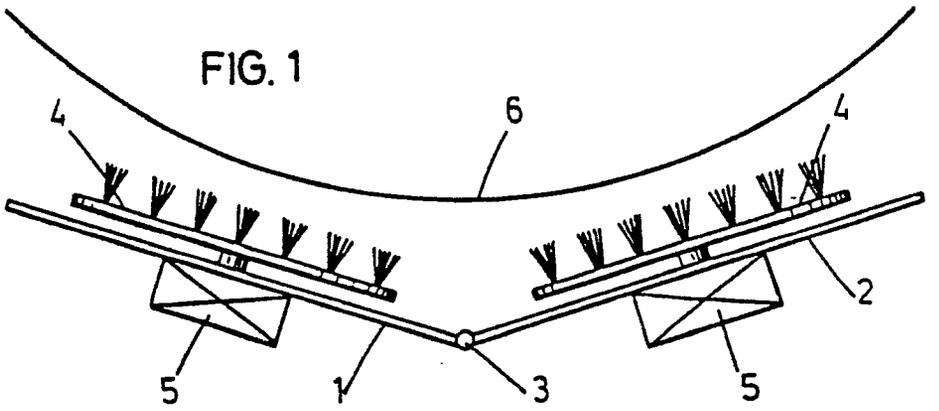
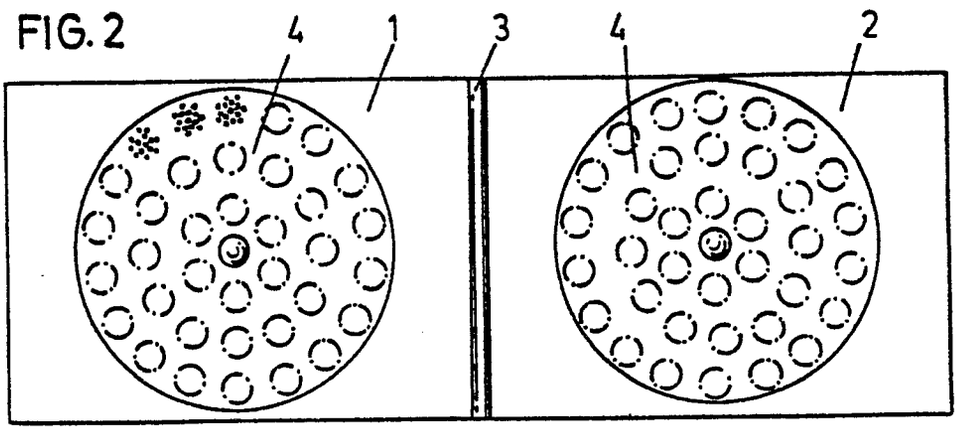


FIG. 2



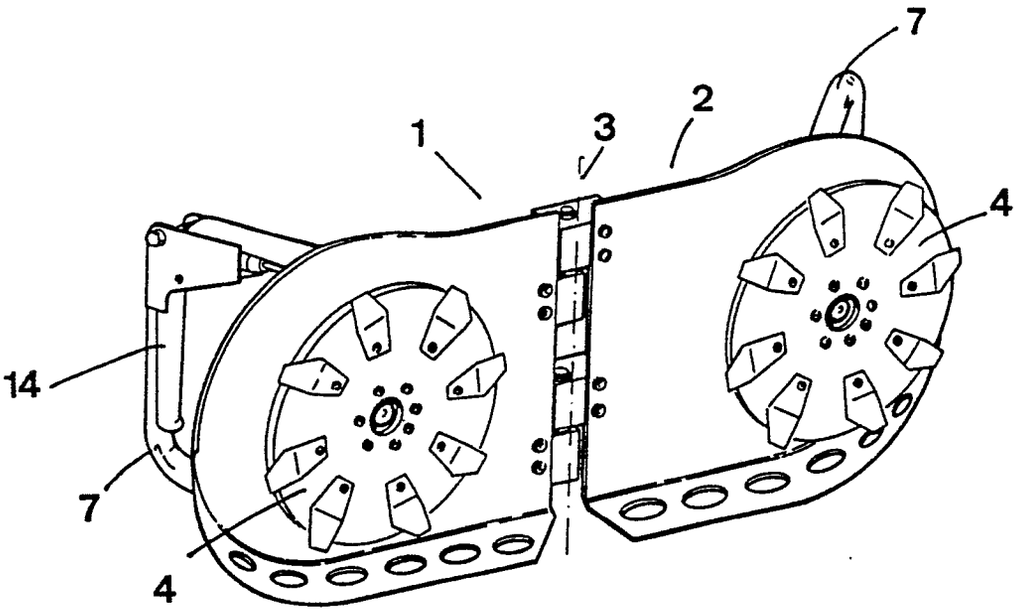


FIG. 3

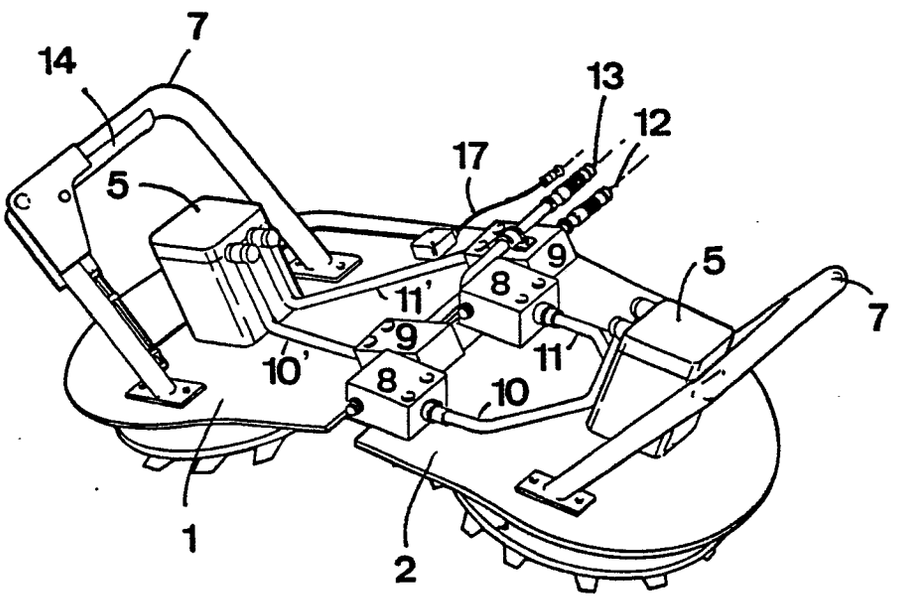


FIG. 4

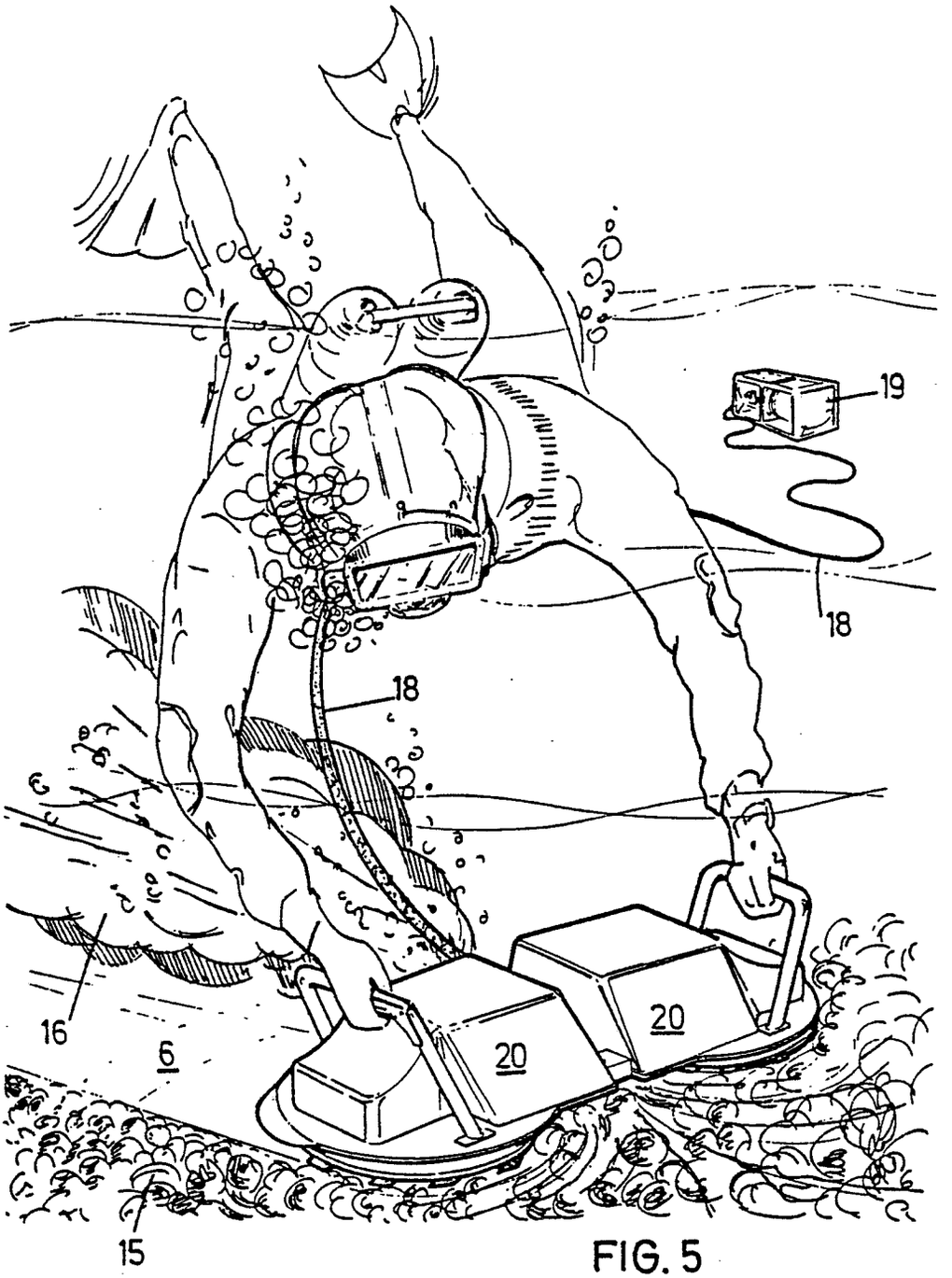


FIG. 5